Methodologies and Guidelines for Training/ Orientation on Standards to Non-Standards Experts and Cross-Border Trade Compliance

Policy Makers; Fisheries and Aquaculture Managers; Fish Processors and Traders; University Students and Compliance Assessment for Cross-Border Trade
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## Abbreviations and Acronyms

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<tbody>
<tr>
<td>AUC</td>
<td>African Union Commission</td>
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<tr>
<td>AU</td>
<td>African Union</td>
</tr>
<tr>
<td>ARSO</td>
<td>African Organization for Standardization</td>
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<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
</tr>
<tr>
<td>PFRS</td>
<td>Policy Framework and Reform Strategy for Fisheries and Aquaculture</td>
</tr>
<tr>
<td>IQF</td>
<td>Individually Quick Frozen</td>
</tr>
<tr>
<td>ABC</td>
<td>Allowable Biological Catch</td>
</tr>
<tr>
<td>COFI</td>
<td>FAO Committee on Fisheries</td>
</tr>
<tr>
<td>CPUE</td>
<td>Catch per unit Effort</td>
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<tr>
<td>EAF</td>
<td>Ecosystem Approach to Fisheries</td>
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<tr>
<td>IOTC</td>
<td>Indian Ocean Tuna Commission</td>
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<tr>
<td>IPOA</td>
<td>International Plans of Action</td>
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<tr>
<td>IPOA-CAPACITY</td>
<td>International Plan of Action for the Management of Fishing Capacity</td>
</tr>
<tr>
<td>IPOA-IUU</td>
<td>International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing</td>
</tr>
<tr>
<td>IUU</td>
<td>Illegal, Unreported and Unregulated Fishing</td>
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Methodologies and Guidelines for Training/ Orientation on Standards to Non-Standards Experts and Cross-Border Trade Compliance

1. **Significance of Fisheries in Africa’s Development**

1.1 **Global Contribution of African Fisheries and Aquaculture**

It is acknowledged that Africa’s participation in global fish trade is fairly limited at approximately 4.9% and slid to being a net importer from 2011 (FAO, 2014). While UNCTAD (2013) puts official intra-African trade at an average of 11% from 2007 to 2011, intra-African trade in fish was reported to be 24% between 2010 and 2012 (FAO, 2014). WTO (2014) cites cotton, coffee and fish as being agricultural commodities with export potential for Africa. In addition, fisheries have the great potential to generate more food and nutrition security benefits and help to achieve other societal objectives such as reducing poverty and protecting the environment or promoting sustainable fisheries management. Since more trade tends to be associated with faster economic growths, expanding fish trade opportunities for small-scale fishers and fish farmers may help raise incomes and achieve sustainability of the African fisheries resources, which would in return sustain the natural wealth of the continent.

Underlining the importance of Agriculture and Food Security, the theme of the Twenty Third Ordinary Session of the AU Assembly in Malabo, Equatorial Guinea, from 26-27 June 2014, was phrased: “Transforming Africa’s Agriculture for Shared Prosperity and Improved Livelihoods through Harnessing Opportunities for Inclusive Growth and Sustainable Development, also marking the tenth Anniversary of the Adoption of the Comprehensive Africa Agriculture Development Programme (CAADP)” (AUC, 2014). It was during this 23rd Session that the Heads of State and Government made the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods (Assembly/AU/ Decl.1(XXIII). Among the commitments made in the declaration, African Member States committed to end hunger in Africa by 2025 through accelerating agricultural growth by at least doubling productivity levels by 2015 by among other things facilitating sustainable and reliable production and access to quality and affordable inputs (for crops, livestock, fisheries, amongst others) through, among other things, provision of “smart” protection to smallholder agriculture.

The Summit also endorsed the landmark Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa (AUC-NEPAD, 2014) which was formulated with the main purpose of facilitating coherent policy development for the sustainable management of fisheries and aquaculture resources in the member states of the African union. Abbreviated as PFRS, the document provides for the guidelines on how countries should better capture the wealth of fisheries, reduce poverty, increase food and nutritional security and ensure equitable distribution of the benefits particularly for the poorest, marginalized and most vulnerable in society, such as women. It provides a framework for guiding the development and benchmarking of sustainability standards and certification for fisheries in Africa in order for the standards to convey a true message of sustainability which is reflected in the improved productivity of fisheries and aquaculture as well as enhanced contribution of fish to sustainable food and nutritional security, economic wellbeing of fishing communities and aquaculture stakeholders, environmental and biodiversity conservation, efficient, effective and transparent governance and improved national incomes.
1.2 Fisheries Contribution in African Economies and Livelihoods

Many African countries are endowed with fish resources from oceans, seas, lakes, rivers, floodplains and fish farms, which generate a range of benefits including food and nutrition security, livelihood, exports and biodiversity. Africa produced a total of 9.9 million tonnes of fish in 2010, of which 2.7 million (1/3) came from inland fisheries, 1.49 million tonnes from aquaculture and the rest from marine capture fisheries (FAO, 2014). The value provided by the fisheries sector as a whole in 2011 was estimated at more than US$24 billion, representing 1.26% of the Gross Domestic Product (GDP) of all African countries, with aquaculture producing an estimated value of almost US$3 billion per year (de Graaf et al., 2014).

Furthermore, fisheries sector as a whole employs 12.3 million people as full-time fishers or full-time and part-time processors, accounting for 2.1% of Africa’s population of between 15 and 64 years old. Of these employed, almost half were fishers; 42.4% were processors and 7.5% were engaged in aquaculture. Women are heavily involved in the fish sector, accounting for about 27.3% of the total workforce in fisheries and aquaculture, and they are directly involved in fishing (3.6%), processing (58%), and aquaculture (4%). With regard to food and nutrition security, fish is very important source of animal protein, accounting for an average of around 5% of total protein FAO (2014). Per capita consumption of fish in Africa was reported to be 9.7 kg per year; lower than the world average (18.9 kg/year); with some countries (Congo, Gabon, Liberia, Malawi and South Africa) experiencing stagnant or declining per capita FAO (2014).

1.3 ARSO’s Contribution to the Objectives of the Fish Trade Program

In order to contribute to the Fish Trade Program, ARSO and WorldFish signed an MOU on 13th August 2015 which forms the basis for the current contract. While the first activity focused on the Study on Regional Analysis/Mapping of Certification Procedures and Standards in Africa, this second study is purposed to achieve the following objectives:

(i) Based on the outcomes of the first MOA, to develop methodologies and guidelines for training/orientation of non-standards experts, including policy-makers, fisheries managers (from Ministries/Departments of Fisheries), processors and traders in order to help them understand the implications of standards on fish trade and management of fisheries and aquaculture policy. This could include the potential a High Level Awareness of Fish Standards at the EAC Parliament in 2016;

(ii) To develop methodologies and conduct training/orientation of the students who are working on standards and well as support them with design and implementation of their research work, including access to the African Standards databank;

(iii) To develop the Compliance Assessment for fish trade and support countries to use it on a pilot cross-border trade facilitation, using the COMESA-CABI Breaking Barriers Project, in partnership with East African Community (EAC) and Lake Victoria Fisheries Organizations (LVFO) (on Uganda-Kenya Border);

(iv) To develop a Road Map for rolling out of the African Eco-labelling Mechanism (AEM) standards, as a model for testing “Trade-For-Sustainability” using Kenya aquaculture as a pilot, in collaboration with the Department of Fisheries.
2. **Study Methodology: Content Outlines**

2.1 **Stakeholder Modular Approach**

The Fish Trade Program fits into the current standards harmonization process while providing a much needed impetus due to its stakeholder-oriented approach. ARSO is cognizant of the fact that the technical nature of many standards has been identified as a major contributing factor to the low uptake and utilization of standards among African enterprises and communities. The situation is exacerbated by the fact that many African countries do not offer specialized expert interpretation of standards for implementers. In the food and agriculture sector, the stakeholders mostly constitute smallholder farmers with limited exposure to technical language.

From the foregoing, it emerges that the harmonization of standards alone cannot sufficiently address the needs of the African people in terms of realizing the benefits of implanting the standards. Thus, there exists a gap in the simplification of the technical language of the standards to the level where the target population understands the principle requirements and underlying rationale of the standards and hence empowering them to deploy the standards in their operations.

Furthermore, there is need to sensitize Members of Parliament especially the EAC on the role of the political leadership in supporting capacity development and facilitating fish trade in Africa. Food trade is heavily influenced by politics (Nestle, 2010; Leal, 2010; Herring, 2015) and this fact has to be taken into account if Africa has to coherently address fish trade within the continent as well as in the global market arena.

ARSO recognizes the need to diffuse knowledge on standards development to upcoming standardizers and sector players especially those undertaking fisheries-related studies in universities and other tertiary institutions. ARSO has undertaken to develop methodologies and guidelines for orientation and training on standards and the implications on policy and market access, including sample sites and rationale for conducting test sessions for high and middle level officials as well as students. This is aimed at filling the existing gap which tends to create an impression of standards being elitist instruments rather than tools common for use by all stakeholders to facilitate trade and development especially in the fisheries and aquaculture sector.

2.2 **Stratification of Stakeholders**

The stakeholders are stratified into the following groups in order to help them understand the implications of standards on fish trade and management of fisheries and aquaculture policy and their respective roles:

(i) policy-makers including political leaders and parliamentarians

(ii) fisheries managers (from Ministries/Departments of Fisheries)

(iii) processors and traders

(iv) university students who are working on standards and research work

2.3 **Methodologies and Guidelines for Training/Orientation of Policy Makers**

This strata of stakeholders is proposed to include Members of Parliament; Ministers,
permanent secretaries and directors of fisheries and senior persons having political and policy formulation responsibilities. The session is intended to be not more than six hours, with flexibility depending on the agreement with the stakeholders. Political leadership and involvement is often necessary although many African countries tend to relegate most of these issues to technocrats. The following perspectives are covered for this stratum of stakeholders:

(i) The role of the quality infrastructure in facilitating industrialization, trade and development
(ii) The WTO and food trade: Impacts of the TBT and SPS Agreements
(iii) The politics of food safety and food security indicators
(iv) The political economy of undernutrition: Fisheries and aquaculture role
(v) The politics of international food standards
(vi) Poverty reduction and rural development: Fisheries and aquaculture as strong contenders
(vii) The case for an enhanced regional fish trade framework
(viii) Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa
(ix) Securing Africa’s fisheries resources for development: Marine and shared water resources (stopping the looting - IUU)
(x) Ecosystems for water and food security: Security of watersheds

2.4 Fisheries Managers (from Ministries / Departments of Fisheries)

This stratum consists of personnel with managerial responsibilities for fisheries and aquaculture in ministries or departments of fisheries. This group is expected to be responsible for the initiation of policy positions, implementing and/or enforcing government policies, regulations and standards at the operational level. This cadre of personnel will be responsible for operational matters in projects and programmes for value addition and product development, animal health, food safety, preparation of positions for trade negotiations, market access issues, market research and development among other functions. Being a capacity building session, the duration allocated is three days as a minimum and will cover the following broad areas:

(i) Fisheries and aquaculture resource endowments of Africa: A review
(ii) The role of the quality infrastructure in facilitating industrialization, trade and development
(iii) Standards for fisheries and aquaculture: Identification of standardization needs, stakeholders and networks
(iv) Standards and conformity-oriented value addition in fisheries and aquaculture
(v) Sustainability practices in fisheries resource management
(vi) Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa
(vii) Introduction to ARS/AES 02:2014, *Fisheries — Sustainability and eco-labelling — Requirements*

(viii) Public and private standardization systems for fisheries and effective articulation of national position and interests

(ix) The rules-based nature of fish trade: Implications of the WTO TBT and SPS Agreements — The national obligations under the OIE and WTO fish trade facilitation regimes

(x) Standards and food safety regulations: Exploring the intersections

(xi) Utilization of standards for regulation

(xii) Regulation for development in the fisheries and aquaculture sector

(xiii) The politics of food safety and food security indicators: The politics of international food standards

(xiv) The case for an enhanced regional fish trade framework

(xv) The political economy of undernutrition: Bringing fisheries and aquaculture to bear

(xvi) Best practices in securing and enforcing of fisheries resource instruments

(xvii) Securing Africa’s fisheries resources: Marine and shared water resources

(xviii) Ecosystems for water and food security: Security of watersheds and hinterlands

### 2.5 Fish Processors and Traders

This stratum of stakeholders includes fish processors involved in adding value to fish products and fish traders involved in national, regional and international fish trade. The topics covered include those aimed at imparting the necessary knowledge for facilitating standards-based value addition which ensures conformity with market requirements and thus ease of access to markets and establishing a strong foundation for sustainable industrialization in the sector. Fish traders of all categories are addressed through content which makes the products access markets and eliminate hardships from possible trade barriers. A two-day training duration is envisaged. The outline includes the following topics:

(i) Fisheries and aquaculture resource endowments of Africa: A review of opportunities and challenges

(ii) The rules-based nature of fish trade: Implications of the WTO TBT and SPS Agreements — The national obligations under the OIE and WTO fish trade facilitation regimes

(iii) Exploration of standards and regulations applicable to fisheries and aquaculture

(iv) The central concern of standards and regulations

(v) Value addition: Product development and innovation in fisheries and aquaculture
2.6 **University Students Working on Standards and Research Work**

This module is designed to introduce university students into the processes involved in standardization, trade facilitation, the real-world state of play in fish trade, the application of standards in research and innovation and the development dimensions of fisheries and aquaculture. The session is expected to be two weeks during which the students should be able to develop an outline of a standards development proposal. The following topics are proposed:

(i) Fisheries and aquaculture resource endowments of Africa: A review

(ii) The role of the quality infrastructure in facilitating industrialization, trade and development

(iii) Standards: Their nature, types and applications

(iv) Standards and food safety regulations: Exploring the intersections

(v) The process of standards development: African Standards Harmonization Model (ASHAM), the national and international processes

(vi) Standards as products of scientific knowledge and research

(vii) Standards as catalysts for research and innovation

(viii) The socioeconomic impact of standardization: Impacts, networks and state of play

(ix) Value addition and product development and innovation in fisheries and aquaculture: Role of standards and conformity assessment

(x) Conformity assessment for fisheries products: Quality assurance, testing, inspection and certification

(xi) Standards for fisheries and aquaculture: Identification of standardization needs, stakeholders and networks

(xii) Utilization of standards for regulation
3. Methodologies and Guidelines for Training/Orientation of Policy Makers

3.1 Methodology of Delivery

The methodology is proposed as a one-day sensitization and advocacy workshop spread over six hours or such duration as agreed between the lead institution and the ARSO team.

The mode of delivery is expected to be PowerPoint presentations with substantive papers prepared and bound for ease of reference.

3.2 Institutional Coordination

ARSO will be primarily responsible for ensuring effective delivery of the workshop. Coordination with the departments of fisheries, national WTO TBT and SPS coordinators, national standards
coordinators and PAQI will be considered.

3.3 Content Outlines: Policy Makers

The following provides the framework of the content to be delivered for policy makers and the political leadership in the fisheries and aquaculture sector. The orientation should emphasize the political role in institutional capacitation and governance responsibility as the ultimate duty of the policy makers and political leadership. The outlines are expected to guide the content development and presentations in the direction which ARSO considers to be relevant in creating a good understanding of the crucial role of standards and conformity assessment in fish trade.

3.3.1 The World Runs on Standards: PAQI Awareness Pack

This is a climate setting presentation which explores the application of standards starting from the negative perspective of what happens when standards are not implemented in various sectors of the economy. The presentation serves as a critical connector between the daily occurrences and the role of standards in addressing the apparent gaps and thus avoiding the negative consequences.

Although based on the dramatic physical effects perceptible to the eye, the presentation will be customized to reflect events in the fisheries and aquaculture sector as well as the food sectors.

The delivery will be done by a PAQI representative.

3.3.2 The Role of the Quality Infrastructure in Facilitating Industrialization, Trade, Development and Regional Integration

3.3.2.1 Regional integration essentially refers to the process in which countries enter into a regional agreement in order to enhance regional cooperation through regional institutions and rules in various sectors. Many of the regional integration initiatives are driven by political, economic and security considerations leading to a wide range of forms of integration involving many African countries. The following are the common forms and characteristics of regional integration:

(a) **Preferential Trade Area (PTA):** Agreement of preferential conditions, such as lower customs duties or higher import quotas for certain goods.

(b) **Free Trade Area (FTA):** Extensive reduction of trade restrictions between the member states, usually covering the overall trade in goods.

(c) **Customs Union (CU):** Elimination of internal trade restrictions and introduction of common external tariffs, often in connection with the reduction of additional impediments, such as administrative barriers.

(d) **Common Market (CM):** Expansion of the freedom of movement of goods to the elimination of obstacles in other areas, such as free movement of capital, services and labour.

(e) **Economic Union:** Establishment of a uniform internal market, including the harmonization of national policies and of the economic framework.

3.3.2.2 Miesner (2009) reports that FTAs dominate regional integration schemes with 139 of the 152 WTO notified Regional Trade Agreements (RTAs) being defined as Free Trade Agreements (FTAs) whereas Customs Unions only account for 13 cases. Moreover, the establishment of regional economic communities is influenced by a range of economic, political
and security-related considerations which may be summarized as follows (Crawford et al., 2005):

(i) Exploiting economies of scale and benefits from specialization by expanding the domestic market and developing new markets

(ii) Attracting foreign direct investments, particularly for countries with low labour costs and a preferential access to larger markets

(iii) Enhancing integration processes in areas that are currently only insufficiently covered by multilateral agreements, such as investments, competition, environment or labour standards

(iv) Supporting the negotiating power in multilateral agreements by forming regional blocks and strengthening geopolitical alliances

(v) Consolidating peace processes and promoting violent-free solutions to conflicts by a regional cooperation on security issues

3.3.2.3 The elimination of technical barriers to trade (TBTs) constitutes one of the fundamental requirements of any regional integration. These TBTs arise due to the discrepancy of national standards of trading partners from international standards and they have the following consequences for international trade:

(i) products, processes and systems are subject to different mandatory requirements and may therefore violate legal regulations of the trading partner,

(ii) testing procedures that assess the conformity of products, processes and systems against defined requirements may not be recognized,

(iii) conformity assessment bodies of the trading partner which cannot prove their competence against agreed standards may not be trusted.

3.3.2.4 WTO (2005) highlights the importance of standards in trade by stating that it is through sharing a common standard that anonymous partners in a market can communicate, can have common expectations on the performance of each other’s product, and can trust the compatibility of their joint production. Thus, standards are necessary for the smooth functioning of anonymous exchanges – and therefore, for the efficient functioning of the market. It is for this reason that the issue of a quality infrastructure has always been a key part of regional trade agreements. Recent reports indicate that over 80% of the global trade is already affected by standards and technical regulations (Gonçalves et al., 2011). This means that for a regional integration agreement to function smoothly, there must be a robust quality infrastructure to underpin it. Miesner (2009) explains that the contributions of the quality infrastructure to regional economic integration depends on the selected form of integration and include:

(1) **Removal of technical barriers to trade**: Regional economic integration aims at reducing trade barriers between the member states. A quality infrastructure is fundamental to the harmonization and mutual recognition of standards, technical regulations and conformity assessments, thus providing the basis to overcome non-tariff trade barriers.

(2) **Improvement of competitiveness of enterprises**: Regional economic integration creates larger domestic markets and promotes the establishment of transnational value chains. A quality infrastructure increases the compatibility
between suppliers and customers, reduces transaction costs, provides developing countries with an easier access to international good practices and improves the competitiveness of small and medium-sized enterprises in particular.

(3) **Strengthening of socio-economic coherence:** Regional economic integration is often characterized by cooperation in the field of individual sector policies, such as environmental and health policies. A quality infrastructure provides the technical framework for establishing common limiting values and other regulatory requirements and provides capacities for the effective implementation of those requirements.

(4) **Safeguarding of interests from other regional economic blocks:** Regional economic integration leads to the creation of economic blocks that significantly shape the global economic framework. A quality infrastructure combines the available technical know-how of its member states and channels the input into multilateral negotiation processes in order to safeguard regional interests.

(5) **Strengthening the negotiating position in trade disputes:** Regional economic integration requires a common position in trade disputes with other economic blocks that will often involve the interpretation of TBT-related facts and findings (such as bans on the import of contaminated food products). A quality infrastructure supports trade policy dialogues with the aid of scientific-technical insights based on recognized test results.

(6) **Consolidating the regional technological autonomy:** Regional economic integration facilitates the bundling of regional resources in order to establish competitive institutions for research and development. A quality infrastructure helps to utilize existing national know-how, to develop specialized networks, and to enhance the technological emancipation of the region.

**3.3.2.5** The degree of contributions of the quality infrastructure to regional integration must be coupled with the other fundamental structures such as the condition of regional transport and communications networks and the development stage of local production facilities as well as the quality of technical, administrative and political institutions in general.

**References**

*The Answer to the Global Challenge: A National Quality Infrastructure* (Sanetra et al., 2007)

*Contributions of Quality Infrastructure to Regional Economic Integration: Insights and Experiences Gained from Technical Cooperation of PTB* (Miesner, 2009)

*Non-Tariff Measures and Regional Integration in the Southern African Development Community* (UNCTAD, 2015)

*Toward Open Recognition? Standardization and Regional Integration Under Article XXIV of GATT* (Trachtman, 2002)

*Standards Harmonisation in ASEAN: Progress, Challenges and Moving Beyond 2015* (Pettman, 2013)

3.3.3 Fisheries and Aquaculture Resource Endowments of Africa: A Review

A. Introduction
The fisheries resources in Member States include the following depending on the geographical positioning:

(a) Marine capture fisheries
(b) Inland capture fisheries and
(c) Aquaculture

B. Marine Capture Fisheries
This is practiced both at artisanal and industrial scales. Key fish species include:

(1) Hake
(2) Horse mackerel
(3) Anchovy
(4) Pilchards
(5) Lobsters
(6) Tunas: Bluefin tuna; Southern albacore; Yellowfin; Bigeye; Skipjack
(7) Shrimps and prawns
(8) Demersal fish: breams; Groupers, and Snappers
(9) Octopuses
(10) Scallops and clams

C. Inland Capture Fisheries
This is practiced both at artisanal and industrial scales. Key fish species include:

(1) Nile perch: *Lates niloticus* and *L. macropthalmus*
(2) Tilapias:
(3) Small pelagic fishes: *Rastrineobola argentea* (Dagaa/Omena/Mukene), *Stolothrissa tanganicae* and *Limnothrissa moidon* (Kapenta), *Poecilothrissa muweruensis* and *Bangweluensis* (Engraulicypris moeruensis) (Chisense) *Neobola bredoi* (Muziri) and *Brycinus nurse* (Ragoogi)
(4) African Lungfish
(5) African catfish: *Clarias gariepinus*
(6) Common Shrimp: *Caridina nilotica*
(7) *Stolothrissa tanganicae*: Lake Tanganyika sprat — Chilwe, Kapenta, Nsembe (Zambia); Ndagala (Burundi); Dagaa, Ndagala, Ndakala (Tanzania); Ndagala (DR Congo).

**Table 1: Some Common Fish Species in African Water Bodies**

<table>
<thead>
<tr>
<th>Lakes</th>
<th>Coverage (km²)</th>
<th>Production</th>
<th>Main species</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>68,800 km²</td>
<td>900,000</td>
<td><em>Lates niloticus</em> (Nile Perch)</td>
<td>Dagaa (60%), Lates (30%) and Oreochromis (7%)</td>
</tr>
<tr>
<td>Lakes</td>
<td>Coverage (km²)/ Countries</td>
<td>Production</td>
<td>Main species</td>
<td>Remarks</td>
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<tr>
<td>Tanganyika</td>
<td>32,900 km² Burundi, DRC (45%), Tanzania (41%) Zambia</td>
<td>200,000 tons in (2011)</td>
<td>Stolothrissa tanganicae and Limnothrissa moidon (Kapenta) Lates stappersii (Bukabuka Mukeke) Lates angustifrons (Capitaine) lates Marie (Ngonzi, Sangala) Lates microlepis (Nonzi/Nyunvi) Tilapiine</td>
<td>About 94,800 active fishers (2011). Kapenta contributes 60% to total catch and lates stappersii 30%</td>
</tr>
<tr>
<td>Malawi/Nyasa</td>
<td>29600 km² Malawi, Tanzania and Mozambique</td>
<td>50,600 (2007)</td>
<td>Haplochronis spp. (Mbuya), Copadichromis spp. (Utaka), Preochromis spp. (Chambo), Rhaphochromis spp. (Ncheni). Engraulicypris sandella (Usipa), Barbus paludinosus (Matemba), Bagrus meridionalis (Kapango) and Clarias, garepinus (Mlamba)</td>
<td>About 50,000 fishers and over 350,000 fish processors, traders etc in Malawi</td>
</tr>
<tr>
<td>Turkana</td>
<td>7200(7570) km² Kenya and Ethiopia</td>
<td>2.493 (2005)</td>
<td>Nile perch, Tilapia, Labeo, barbus, Ctharinus, Distichodus, Clarius, Symodontis, Hydrocynus forskali</td>
<td>New Supplier to regional trade for DRC</td>
</tr>
<tr>
<td>Albert</td>
<td>5270 km² DRC 46% and Uganda 54%</td>
<td>More than 150,000 (in 2010)</td>
<td>Atlethes baremo (Nyaran) Hydrocynus forskoli, Lates niloticus, L. macrophthalmus, Brycinus nurse (53%), Neobola (22%) Bagrus bayad</td>
<td>The small pelagic (Ragoogi and Muziri) catch is over 60% of the Lake in Uganda Production data is for Uganda only</td>
</tr>
<tr>
<td>Merewu-Luapula</td>
<td>4580 km² Zambia 58% And DRC 42%</td>
<td>More than 22,000 (in 2010)</td>
<td>Poecilotheisswa mukeniensis and Bunganleuensis (Chisesne) Oreochromis macrochir (Tilapia) Hydrocynus vitatus (Tiger fish)</td>
<td>About 25,000 fishers in Zambian waters</td>
</tr>
<tr>
<td>Edward</td>
<td>2325 km² Uganda 29% DRC 71%</td>
<td>10,000 (2010)</td>
<td>Tilapia, barbus, protopterus. Clarias, Haplochronis</td>
<td>516 fishers (No. of fishers, boats and fishing gears are controlled/set in Uganda</td>
</tr>
<tr>
<td>Kivu</td>
<td>2370 km² Rwanda 42% DRC 58%</td>
<td>7000 (1991)</td>
<td>Oreochromis niloticus, (Ingerge), Stolothrissa tanganicae and Limnothrissa moidon (Kapenta) Barbus spp., Clarias spp. Haplochronis spp.</td>
<td>About 6500 fishers Kapenta (Limnothrissa contribute over 80% of the total catch</td>
</tr>
</tbody>
</table>

D. Aquaculture Fisheries

African aquaculture can broadly be divided into two: community based aquaculture which is promoted by international organizations, aid agencies and governments as part of their efforts to alleviate poverty, create livelihoods and improve the food supply situation; and commercial aquaculture, which is mainly privately financed and export oriented. Key fish species include:

1. African catfish (Clarias garepinus)
2. Trouts
3. Tilapias (Oreochromis niloticus, O. andersonii, O. macrochir, and Tilapia rendalli especially)
4. Common carp (Cyprinus carpio)
5. Freshwater prawns (Macrobraccium rosenbergii)
6. Marine species include the Black Tiger prawn (Penaeus monodon); Tuna
7. Oysters (primarily the Pacific Oyster Crassostrea gigas)
8. Abalone
E. Non-Fish Aquatic Resources

There is a markedly significant farming of the Nile crocodile (*Crocodylus niloticus*) in some African countries for skin and meat.

F. Economic Contribution of African Fisheries and Aquaculture

A recent study by de Graaf *et al.* (2014) estimates the value added by the fisheries sector as a whole in 2011 to be more than US$24 billion, 1.26 percent of the GDP of all African countries. Detailed figures by subsector highlight the relevance of marine artisanal fisheries and related processing, and also of inland fisheries, which contribute one-third of the total catches in African countries. Aquaculture is still developing in Africa and is mostly concentrated in a few countries but it already produces an estimated value of almost US$3 billion per year. As data on licence fees paid by foreign fleets were not easily available to the national experts participating in this study, an attempt was also made to estimate the value of fisheries agreements with Distant Water Fishing Nations (DWFNs) fishing in the exclusive economic zones of African States. Considering that 25 percent of all marine catches around Africa are still by non-African countries, if also these catches were caught by African States in theory they could generate an additional value of US$3.3 billion, which is eight times higher than the current US$0.4 billion African countries earn from fisheries agreements.

According to the new estimates produced by the study, the fisheries sector as a whole employs 12.3 million people as full-time fishers or full-time and part-time processors, representing 2.1 percent of Africa’s population of between 15 and 64 years old. Fishers represent half of all people engaged in the sector, 42.4 percent are processors and 7.5 percent work in aquaculture. About 27.3 percent of the people engaged in fisheries and aquaculture are women, with marked differences in their share among fishers (3.6 percent), processors (58 percent), and aquaculture workers (4 percent).

**Table 2: Fisheries and Aquaculture Contribution to GDP in the Whole Africa by Subsector**

<table>
<thead>
<tr>
<th>Subsector</th>
<th>Gross Value Added (US$ millions)</th>
<th>Contribution to GDP %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total GDPs African countries</td>
<td>1,909,514</td>
<td></td>
</tr>
<tr>
<td>Total Fisheries and Aquaculture</td>
<td>24,030</td>
<td>1.26</td>
</tr>
<tr>
<td><strong>Total Inland Fisheries</strong></td>
<td>6,275</td>
<td>0.33</td>
</tr>
<tr>
<td>Inland fishing</td>
<td>4,676</td>
<td>0.24</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>1,590</td>
<td>0.08</td>
</tr>
<tr>
<td>Local licences</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total Marine Artisanal Fisheries</strong></td>
<td>8,130</td>
<td>0.43</td>
</tr>
<tr>
<td>Marine artisanal fishing</td>
<td>5,246</td>
<td>0.27</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>2,870</td>
<td>0.15</td>
</tr>
<tr>
<td>Local licences</td>
<td>13</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total Marine Industrial Fisheries</strong></td>
<td>6,849</td>
<td>0.36</td>
</tr>
<tr>
<td>Marine industrial fishing</td>
<td>4,670</td>
<td>0.24</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>1,878</td>
<td>0.10</td>
</tr>
<tr>
<td>Local licences</td>
<td>302</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Total Aquaculture</strong></td>
<td>2,776</td>
<td>0.15</td>
</tr>
</tbody>
</table>

(de Graaf *et al.*, 2014)
In West Africa fishing activities, mostly in the marine artisanal subsector, are a major contributor to GDP with high overall contributions in Ghana, Mauritania and Sierra Leone. In Central Africa, inland fisheries is the major contributor to GDP with high overall contributions by the Democratic Republic of the Congo and Uganda. In Southern Africa, marine industrial fisheries is the major contributor to GDP.

The total GDPA is compiled by the national statistical offices according to the International Standard Industrial Classification (ISIC). It includes “Agriculture, livestock, hunting, forestry, and fishing” but excludes processing, which is covered under “Manufacture of Food Products”. Therefore, the contribution of fisheries to GDPA can be only calculated as the share of fishing and aquaculture economic activities in the agriculture production but excluding the value generated by post-harvest.

Total value added of fishing and aquaculture in Africa is US$17.4 billion. With a total GDPA of US$288.4 billion, the fisheries sector contributes 6 percent of the GDPA for the whole of Africa. The highest contribution is from marine artisanal fishing contributing 1.82 percent of total GDPA, whereas inland fishing and marine industrial fishing have the same contribution of 1.62 percent, and aquaculture contributes almost 1 percent.

References
The Value of African Fisheries (de Graaf et al., 2014)
Harnessing Fishery Resources: Swimming the Tide to Africa’s Development (UNECA, 2012)
Mariculture in the WIO Region: Challenges and Prospects (Troell et al., 2011)
A Complete Guide to the Freshwater Fishes of Southern Africa (Skelton, 2001)
A Guide to the Common Sea Fishes of Southern Africa (Van der Elst, 1993)
Field Identification Guide to the Living Marine Resources of Kenya (Anam et al., 2012)
Maximizing Utilization of Pelagic Fish Resources (Hariono et al., 2006)

3.3.4 The WTO and Food Trade: Impacts of the TBT and SPS Agreements

A. Introduction

Trade within national jurisdictions and across borders is increasingly affected by the proliferation of standards and technical regulations with increased regulatory intensity being particularly noticeable in the food and agricultural sectors covering cereals; fish, crustaceans and other aquatic vertebrates; edible preparations of meat, fish and crustaceans; edible vegetables, roots and tubers; prepared vegetables, fruit, nuts and other plant parts; and prepared cereals and flours (Sheldon, 2013). The proliferation of standards and technical regulations in both the food and agricultural sectors is typically regarded as the response of policymakers to consumer demands for improved product safety, increased environmental protection, and greater product information. Standards and technical regulations “have as their prima facie objective the correction of market inefficiencies stemming from regional,
national, transnational, or global externalities associated with the production, distribution, and consumption of these products.

Standards in the food and agricultural sector can be classified under two broad categories: (i) provision of public goods such as control of pesticide use in agricultural production; and (ii) reduction of transactions costs associated with information asymmetries between producers and consumers concerning food product characteristics, e.g., the extent of pesticide residues in a product which consumers are unable to ascertain either before or after its consumption. While the theory of optimal intervention prescribes that market distortions should be targeted at source, there is also acknowledgement that they may also provide protection for domestic producers and are, therefore, subject to “regulatory capture” (Sheldon, 2013). Given the potential for standards and technical regulations to distort international trade, a key outcome of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994 was the securing of multilateral disciplines on their use through the World Trade Organization's (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS), and the Agreement on Technical Barriers to Trade (TBT). The objective of these agreements is to ensure that standards and technical regulations, while potentially meeting legitimate economic objectives, are not disguised restrictions on international trade.

Sheldon (2013) reports that there has been considerable discussion of the problems of regulatory compliance faced by developing countries in accessing developed country markets, given the latter typically have higher levels of regulatory intensity than the former. Testing the hypothesis of “standards as barriers” has been a dominant feature of the limited amount of empirical research on the impact of food safety regulations on trade flows of specific food and agricultural commodities. A common finding of these empirical studies is that more stringent standards imposed by developed countries act as barriers to trade.

B. Basic Definitions under WTO SPS and TBT Agreements

Certification system: the set of rules for executing of works on certification, its participants and rules for operation of the certification system as a whole.

Standard: a document establishing, for the purposes of voluntary multiple use, the product performances, the rules for realization and the characteristics of processes of production, operation, storage, transportation, marketing and utilization, executing of works or rendering of services. The standard may also contain the requirements for terminology, symbology, packing, marking or labelling, and the rules for their affixing.

Standardization: the activity of establishing of rules and performances for the purpose of their voluntary multiple use, aimed at achievement of orderliness in the spheres of production and circulation of products, and at heightening of competitiveness of products, works or services.

Technical regulating: the legal regulating of relations in the field of establishing, application and executing of obligatory requirements for products, processes of production, operation, storage, transportation, marketing and utilization, and also in the field of establishing and application, on a voluntary basis, of the requirements for products, processes of production, operation, storage, transportation, marketing and utilization, executing of works or rendering of services, and legal regulating of relations in the field of conformity assessment.

Technical regulation: a directive, compliance with which is mandatory, whereby the competent authority, through an administrative action, establishes the characteristics of a product or the production processes or methods relating to the product, including applicable administrative provisions. It may also include, or exclusively address, requirements in the areas of terminology, symbols, packaging, branding or labelling applicable to products, including buildings, structures and constructions, for processes of production, operation,
storage, transportation, marketing and utilization. Preparation, adoption and application shall be the responsibility of the respective Ministries or agencies duly authorized for this purpose.

C. Pivotal Provisions of the WTO SPS Agreement

SPS measures include all relevant laws, decrees, regulations, requirements and procedures including, inter alia, end product criteria; processes and product methods; testing, inspection, certification and approval procedures; quarantine treatments including relevant requirements associated with the transportation of animals and plants, or with the materials necessary for their survival during transport; provisions on relevant statistical methods, sampling procedures and methods of risk assessment; and packaging and labelling requirements directly related to food safety.

D. Key Expectations

(i) Except under very special circumstances, countries generally benefit from removal or reduction trade barriers arising from SPS measures and technical regulations.

(ii) In principle, SPS standards are introduced by government in the interest of the society, to protect public, animal and plant health, and the environment.

(iii) In theory, establishment of SPS standards (or other technical standards) could facilitate trade through reducing transaction cost, by assuring consumers that the food they consume is of an acceptable standard and reducing the cost of uncertainty that they face in assessing product quality.

(iv) Standards can serve to signal quality in foreign markets and thus contribute to increasing elasticity of substitution between similar goods produced in different countries, thereby permitting relatively more efficient producers to thrive through export expansion.

(v) Efficiency of production would be increased through standardization as it reduces information asymmetries between buyers and sellers, and promotes product commutability, thereby allowing for increased economies of scale and scope.

E. Key Impacts

Importing countries may deliberately craft SPS measures that impose a cost or other disadvantage on foreign competitors to provide protection for domestic producers.

Even when comparable SPS measures are applied in developed countries to both domestic and imported products, they can act to impede imports from developing countries because of asymmetry in compliance cost.

Food safety has the potential of mutating to a ‘luxury’ good whose demand rises as income levels rise, and greater prosperity tends to be accompanied by increased demand for more stringent SPS standards in developed countries. Many in developed countries see the much laxer SPS standards that often prevail in developing countries as a threat precipitating ‘a race to bottom’.

As traditional trade barriers such as tariff and quantitative restrictions continue to decline, protectionist interests are likely to make increasing use of food safety regulations and other technical barriers to block trade.

Among African countries, TBTs and SPS measures have been deployed on the instigation of
Foreign interests to hinder intra-African trade.

Institutional capacity constraints to conduct conformity assessment on fish products coupled with rapid changes in the food safety perceptions of export destination countries. Significant investments are usually required to procure equipment, materials and competent human resources which represent a major barrier to developing countries.

Discriminative technical and financial assistance and transitional periods for the application of environmental and biodiversity safeguards such as turtle excluder devices (TEDs) in shrimp trawlers to reduce sea turtle mortality (Asche et al., 2009).

The globalization of the fish trade has led to substantial product that is exported to one country, processed, and then re-exported, sometimes back to the original country. If product is processed in a country besides the one harvesting or producing it, traceability may be more difficult. Traceability requirements could then become technical barriers to trade not just for raw product but also for processed product that ostensibly originates in the importing country.

Export-oriented fisheries are subjected to legislative and regulatory pressures in the export destinations which may demand significant costs in legislative and regulatory reforms and upgrades of processing facilities, and in some cases loss of markets and closing down of facilities unable to upgrade (Henson et al., 2004).

The WTO SPS Agreement anticipates SPS measures differ in the first instance due to significant differences in tastes, diets, income levels and perceptions that influence the tolerance of populations toward these risks. Differences in climate and in the available technology (from refrigeration through to irradiation) affect the incidence of different food safety and agricultural health hazards. Standards reflect the feasibility of implementation, which itself is influenced by legal and industry structures as well as available technical, scientific, administrative and financial resources. Some food safety risks, for example, tend to be greater in developing countries due to weaknesses in physical infrastructure (for example standards of sanitation and access to potable water) and the higher incidence of certain infectious diseases. Further, tropical or sub-tropical climatic conditions may be more conducive to the spread of certain pests and diseases that pose risks to human, animal and/or plant health (Jaffee et al., 2004).

F. Key Obligations of Member States under WTO SPS and TBT Regimes

Member States are under the following obligations whenever they anticipate developing and adopting SPS measures and technical regulations:

F.1 SPS Measures

(1) Relevant technical regulatory authorities shall prepare, adopt and enforce technical regulations establishing essential minimum SPS measures in relation to products originating from the separate countries and/or places, including the restriction of import, use, storage, transportation, marketing and utilization, providing biological safety (irrespective of the ways of safety assurance used by the manufacturer).

(2) The SPS measures may provide for the requirements for products, for methods of product processing and production, for procedures of product testing, inspection, conformity assurance, the quarantine rules, including the requirements connected with transportation of animals and plants, for materials necessary to ensure life or health of animals and plants during their transportation, and also for methods and procedure of sampling, for methods of
test and evaluating of risk and other requirements contained in technical regulations.

(3) Regulatory authorities shall ensure that any SPS measure that it prepares, adopted, maintained or enforced is:

(a) based on scientific principles, taking into account relevant factors including, where appropriate, different geographic conditions;

(b) not maintained where there is no longer a scientific basis for it; and

(c) based on a risk assessment, as appropriate to the circumstances.

(4) Each regulatory authority shall ensure that an SPS measure that it adopts, maintains or applies does not arbitrarily or unjustifiably discriminate between domestic goods and like goods of another country, or between goods of another country and like goods of any other country, where identical or similar conditions prevail.

(5) SPS Measures shall be proportionate to the appropriate level of protection, taking into account technical and economic feasibility.

(6) Regulatory authorities shall not adopt, maintain or apply any SPS measure with a view to, or with the effect of, creating a disguised restriction on trade.

(7) Technical regulatory authorities shall use, as a basis for preparing sanitary and phytosanitary measures, relevant international standards, guidelines or recommendations which will not be trade disruptive.

(8) Governments shall continuously register and analyse all cases causing harm, as a result of violation of requirements of SPS measures, to life or health of people, property of natural or legal persons, state or municipal property, environment, life or health of animals and plants, taking into account the weight of this harm, and also shall organize the informing of purchasers, manufacturers and sellers on the situation in the field of observance of technical regulation requirements.

F.2 Technical Regulations

(1) The following objectives shall constitute the legitimate purposes for the preparation, adoption and application of technical regulations in consistency with the provisions of the WTO TBT Agreement:

(a) protection of life or health of people, property of natural or legal persons, state or municipal property;

(b) protection the environment, life or health of animals and plants;

(c) prevention of actions misleading the purchasers / deceptive practices.

(2) In pursuing the legitimate objectives, regulatory authorities may establish the levels of protection that it considers appropriate.

(3) Regulatory authorities shall not prepare, adopt, maintain or apply any technical regulations with a view to or with the effect of creating an unnecessary obstacle
to trade. An unnecessary obstacle to trade shall not be deemed to be created where:

(a) the demonstrable purpose of the measure is to achieve a legitimate objective; and

(b) the measure does not operate to exclude products of other Member States that meet that legitimate objective.

(4) Regulatory authorities shall ensure that a technical regulation shall:

(a) serve clearly identified policy goals, and be effective in achieving those goals;

(b) have a sound legal and empirical basis;

(c) produce benefits that justify costs, considering the distribution of effects across society and taking economic, environmental and social effects into account;

(d) minimize costs and market distortions;

(e) promote innovation through market incentives and goal-based approaches;

(f) be clear, simple, and practical for users;

(g) be consistent with other regulations and policies; and

(h) be compatible as far as possible with competition, trade and investment-facilitating principles at domestic and international levels.

G. WTO Dispute Resolution Mechanism

For any state or customs territory, WTO membership implies accepting limitations on regulatory autonomy in five areas: (1) trade in goods; (2) trade in services; (3) the protection of intellectual property rights; (4) the settlement of disputes; and (5) periodic review of national trade policies (Hoekman et al., 2007).

SPS and TBT Agreements address trade in goods and services and under the WTO legal obligations, all disputes arising from the implementation of these agreements shall exclusively be addressed through the Dispute Settlement Body (DSB).

Settling disputes is the responsibility of the Dispute Settlement Body (the General Council), which consists of all WTO members. The Dispute Settlement Body has the sole authority to establish “panels” of experts to consider the case, and to accept or reject the panels’ findings or the results of an appeal. It monitors the implementation of the rulings and recommendations, and has the power to authorize retaliation when a country does not comply with a ruling.

- **First stage: consultation** (up to 60 days). Before taking any other actions the countries in dispute have to talk to each other to see if they can settle their differences by themselves. If that fails, they can also ask the WTO director-general to mediate or try to help in any other way.
Second stage: the panel (up to 45 days for a panel to be appointed, plus 6 months for the panel to conclude). If consultations fail, the complaining country can ask for a panel to be appointed. The country “in the dock” can block the creation of a panel once, but when the Dispute Settlement Body meets for a second time, the appointment can no longer be blocked (unless there is a consensus against appointing the panel).

Figure 1: The structure of the WTO (Hoekman et al., 2007)

Officially, the panel is helping the Dispute Settlement Body make rulings or recommendations. But because the panel’s report can only be rejected by consensus in the Dispute Settlement
Body, its conclusions are difficult to overturn. The panel’s findings have to be based on the agreements cited.

The panel’s final report should normally be given to the parties to the dispute within six months. In cases of urgency, including those concerning perishable goods, the deadline is shortened to three months.

The agreement describes in some detail how the panels are to work. The main stages are:

1. **Before the first hearing:** each side in the dispute presents its case in writing to the panel.

2. **First hearing: the case for the complaining country and defence:** the complaining country (or countries), the responding country, and those that have announced they have an interest in the dispute, make their case at the panel’s first hearing.

3. **Rebuttals:** the countries involved submit written rebuttals and present oral arguments at the panel’s second meeting.

4. **Experts:** if one side raises scientific or other technical matters, the panel may consult experts or appoint an expert review group to prepare an advisory report.

5. **First draft:** the panel submits the descriptive (factual and argument) sections of its report to the two sides, giving them two weeks to comment. This report does not include findings and conclusions.

6. **Interim report:** The panel then submits an interim report, including its findings and conclusions, to the two sides, giving them one week to ask for a review.

7. **Review:** The period of review must not exceed two weeks. During that time, the panel may hold additional meetings with the two sides.

8. **Final report:** A final report is submitted to the two sides and three weeks later, it is circulated to all WTO members. If the panel decides that the disputed trade measure does break a WTO agreement or an obligation, it recommends that the measure be made to conform with WTO rules. The panel may suggest how this could be done.

9. **The report becomes a ruling:** The report becomes the Dispute Settlement Body’s ruling or recommendation within 60 days unless a consensus rejects it. Both sides can appeal the report (and in some cases both sides do).

**Appeals**

Either side can appeal a panel’s ruling. Sometimes both sides do so. Appeals have to be based on points of law such as legal interpretation — they cannot re-examine existing evidence or examine new issues.

Each appeal is heard by three members of a permanent seven-member Appellate Body set up by the Dispute Settlement Body and broadly representing the range of WTO membership. Members of the Appellate Body have four-year terms. They have to be individuals with recognized standing in the field of law and international trade, not affiliated with any government.
The appeal can uphold, modify or reverse the panel’s legal findings and conclusions. Normally appeals should not last more than 60 days, with an absolute maximum of 90 days.

The Dispute Settlement Body has to accept or reject the appeals report within 30 days — and rejection is only possible by consensus.

H. Scientific Evidence as Basis for WTO Engagements

The proliferation and enhanced stringency of food safety and agricultural health standards is a source of concern among many developing countries and those promoting the increased integration of these countries into the world trading system. Reflecting wider changes in the trade regime for various agricultural and food products, there is a presumption that food safety and agricultural health measures can (and will) be used as a protectionist tool, providing ‘scientific’ justifications for prohibiting imports of certain products altogether, or discriminating against imports by applying higher standards and/or more rigorous regulatory oversight than on domestic suppliers.

The SPS Agreement permitted measures that were ‘necessary to protect human, animal or plant life and health’, yet required regulators to: (1) base measures on a scientific risk assessment; (2) recognize that different measures can achieve equivalent safety outcomes; and (3) allow imports from distinct regions in an exporting country when presented with evidence of the absence or low incidence of pests or diseases.

Scientific justification is called for wherever standards are deemed to not be based on established international standards. Yet, complications are inevitable given the wide range of areas for which no agreed international standards exist and given broad (and emerging) areas for which the state of scientific knowledge is incomplete. Hence, many of the controversies which have occurred surround the legitimacy and appropriateness of measures in the context of scientific uncertainty.

I. Capacity of African Member States to Engage in WTO

Most African countries have not developed the capacity to demonstrate compliance of their fish products to international or regional standards. The imposition of scientifically unproven limits or disproportionate requirements on products originating from African countries has not been scientifically challenged due to low capacity of Member States in carrying out comparative research.

To establish and enforce appropriate standards requires building expertise and devoting additional resources to applied science and public management. To a great extent this effort can be left to private firms wishing to expand domestic and international sales, but there remains a role for government in light of the public-good nature of effective standards. In defining and implementing more effective standards, however, many poor countries will need technical assistance from international organizations and specialists with expertise (Hoekman et al., 2002).

The SPS and TBT agreements have set a bar that must be met by exporting firms in developing countries. These agreements strongly encourage importing nations to adopt product standards that are at least as rigorous as those developed by international standards-setting bodies. Over time, all WTO members can be expected to adopt such regulations, with the richer members choosing even stronger rules. Thus, developing economies have no choice but to meet recognized international standards, at least for exports. It is likely, however, that such standards would have to be applied to all production within each country simply to inspire confidence in importing markets that goods are produced safely by all potential supply sources.
In this context, problems relating to the implementation of obligations under the TBT and SPS agreements rank high among developing country concerns. Lack of modern technical infrastructure and capacity to engage in international standards development activities and to provide internationally recognized testing and certification procedures for products is a common constraint. Without the resources necessary for building and maintaining modern standards and conformity assessment systems, it is difficult either to ensure rights or to exercise responsibilities under existing WTO rules. If developing countries lack resources to access information on international standards or to participate in their development, a key link between the rule of law as specified in the WTO system and developing countries’ ability to fulfil their obligations and defend their rights is called into question.

Many countries are also concerned to clarify provisions regarding special and differential treatment in the TBT and SPS agreements. India, for example, has recommended extending the timeframe for compliance by developing country members with the existing provisions of WTO agreements referencing standards. In a related vein, a number of developing countries have cited problems with their ability to react to notifications of new TBT and SPS measures. A notification of intent to promulgate a new regulation, with a 60-day open comment rule, is of questionable value to developing countries that have no capacity to respond.

Concern over the use of environmental standards to restrict imports is also prevalent among developing countries. The use of trade measures to enforce environmental standards is viewed with serious alarm by many countries with regard to both manufactures and agricultural products. Among other issues, the lack of clear rules on the appropriate use of labels to indicate environmental impact and the rise in the use of standards for process and production measures in industrial countries have been noted in developing country submissions to the WTO.

Questions of how and under what circumstances mutual recognition agreements (MRAs) are best implemented to facilitate trade have also been raised. Such agreements are used to reduce the trade-impeding effect of technical barriers through mutual recognition of national product testing and certification procedures. To date, they have only been negotiated between industrial countries, although both the TBT and SPS agreements encourage all WTO members to enter into MRAs.

Developing countries may use the WTO dispute resolution mechanism to raise concerns about whether particular standards in import partners meet SPS and WTO rules. This situation likely means that WTO panels must give greater voice to scientific evidence and representations by members of civil society. Developing countries need to monitor the development of dispute settlement in this regard and assert their own interests. It must be recognized, however, that the WTO itself is not a standards-setting body; it has neither the expertise nor the resources for this purpose. Ultimately, the real concern of developing countries must be to influence the development of global standards in ways that at least pay attention to their concerns.

**J. WTO and the North-South Politics**

There are arguments that since SPS standards have the latitude of protecting the health and safety of human, plant and animal life, their adoption and enforcement tend to be less transparent, allowing ample room for tweaking them to make them stronger than necessary for achieving optimal levels of social protection and to twist the related testing and certification (conformity assessment) procedures to make competing imports less competitive (Athukorala et al., 2003).

An example is given of the 1998 EC regulation that reduced the maximum permissible level of aflatoxin in foodstuffs and animal feed to a lower level than international standards specified by the Codex Alimentarius (EEC, 1998). The results suggest that the EU standards, which
would reduce health risk by approximately 1.4 death per billion a year would reduce exports by
more than 60% or US$ 670 billion from 9 countries (Cameroon, the Dominican Republic,
Ghana, Nicaragua, Nigeria, Sudan, Senegal, Tanzania and Zambia) (Athukorala et al., 2003), as
compared with regulation based on the international (Codex) standard.

There is evidence of some instances where standards prohibit trade altogether (Athukorala et al., 2003:432). For example, a EU regulation requires that dairy products be manufactured from milk produced by cows kept on farms and milked mechanically. This regulation virtually precludes imports from many DCs where milk production is by and large a smallholder activity. The EU recently invoked this regulation to ban import of camel cheese from Mauritania, bringing hardship to a small enterprise, which developed the product at a considerable cost (Athukorala et al., 2003). The EU also raised the issue that Mauritania is not free of foot-and-mouth disease, although there is little scientific evidence to suggest that camels (or, in particular, camel milk) can transmit the associated virus. An Australian quarantine regulation requires that chicken meat imported from Thailand must be heated at 70 Celsius for 143 minutes to avoid the possibility of carrying a certain disease. This has effectively closed the Australian market for Thai chicken exporter (It is said that the required heat treatment transforms chicken into paper!). In June 2002, Thai authorities provided the Australian government with a risk assessment report showing that the risk of introducing IBDV to backyard flocks through cooked chicken meat was negligible.

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The Impact of Food Safety and Quality Standards on Developing Countries Agricultural Producers and Exports (Chemnitz, 2011)

Trade and Competitiveness in African Fish Exports: Impacts of WTO and EU Negotiations and Regulation (Ponte et al., 2005)

Trade and Fisheries: Key Issues for the World Trade Organization (Asche et al., 2009)

Kenyan Exports of Nile Perch: Impact of Food Safety Standards on an Export-Oriented Supply Chain (Henson et al., 2004)

Bridging the Standards Divide: Recommendations for Reform from a Development Perspective (Wilson, 2001)


The Role of Science in the Uruguay Round and NAFTA Trade Discipline (Wirth, 1994)
3.3.5 The Politics of Food Safety and Food Security Indicators

A. Introduction
The general public as consumers want food to be safe—or safe enough—and they expect the food industry and government to make sure that it is. The public is also part of the political equation. Food safety is a matter of politics as well as science and stakeholders need to recognize the political forces at work in safety matters. One of the noticeable weaknesses of food safety systems governance in most countries is the fragmented, overlapping, and confusing distribution of authority among the national agencies concerned with food safety. While these disparate authorities are responsible for making sure that unsafe food does not get into the human food supply, most often the system fails to ensure that food companies follow rules designed to protect public health. The mandate overlap complicates government oversight of microbial contaminants in food, genetically engineered foods, and protection of the food supply against potential threats of bioterrorism.

There is a tendency by the food industries to promote economic self-interest at the expense of public health and safety. Whenever things go wrong, culpable companies shift blame to others or variables outside their control, and oppose, resist, and undermine food safety guidelines, following them only when forced to do so by government action or public opinion.

The food industry invokes science as a rationale for self-interested actions. In the case of the ongoing debate about the safety of genetically engineered foods, companies use scientific arguments that the products are not yet known to cause food safety concerns push for registration and approval of their products. Unscrupulous food companies use science as a political tool to oppose requirements to keep harmful microbes out of food, label genetically modified foods, or institute protective measures against bioterrorist threats. Greater attention to food safety has been raised partly by the extensive media coverage in recent years given to food scandals, food-borne human diseases, fears with regard to genetically modified foods, and, recently, consideration of the vulnerability of food and water supplies to terrorist activity.

Food safety is used as a means through which consumer advocacy groups raise issues about the self-interested exercise of corporate power, the imbalance in power between corporate and public interests, and the collusion of government policies with business interests. Advocacy groups can use questions of safety to address much broader social and political concerns.

B. Perceptions of Food Safety Risk
Safety is relative; it is not an inherent biological characteristic of a food. A food may be safe for some people but not others, safe at one level of intake but not another, or safe at one point in time but not later. Instead, we can define a safe food as “one that does not exceed an acceptable level of risk” (Nestle, 2010). Decisions about acceptability involve two overlapping approaches in which people assess risk to decide whether a food is safe: from the perspective of “science” and from the perspective of “values.” A “science-based” approach to food safety, which balances risk against benefits and costs and contributes to the estimation of risk, is distinguished from a “value-based” approach focused on the acceptability of risk, which tends to balance risk against dreaded outcomes or feelings of outrage. Scientific questions do not arise in value-free contexts and value-based approaches often consider scientific arguments. When such decisions have implications for commercial or other self-interested motives, food safety enters the realm of politics.

Nestle (2010) argues that the estimation of risk is a scientific question—and, therefore, a legitimate activity of scientists in government agencies, in universities and in the research institutions while the acceptability of a given level of risk, however, is a political question to be determined in the political arena.
Table 3: Comparison of “science-based” and “value-based” approaches to evaluating the acceptability of food safety risks

<table>
<thead>
<tr>
<th>“Science-Based”</th>
<th>“Value-Based”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts and calculates:</td>
<td>Assesses whether risk is:</td>
</tr>
<tr>
<td>• Cases</td>
<td>• Voluntary or imposed</td>
</tr>
<tr>
<td>• Severity of illnesses</td>
<td>• Visible or hidden</td>
</tr>
<tr>
<td>• Hospitalizations</td>
<td>• Understood or uncertain</td>
</tr>
<tr>
<td>• Deaths</td>
<td>• Familiar or foreign</td>
</tr>
<tr>
<td>• Costs of the risk</td>
<td>• Natural or technological</td>
</tr>
<tr>
<td>• Benefits of the risk</td>
<td>• Controllable or uncontrollable</td>
</tr>
<tr>
<td>• Costs of reducing the risk</td>
<td>• Mild or severe</td>
</tr>
<tr>
<td>• Balance of risk to benefits</td>
<td>• Fairly or unfairly distributed</td>
</tr>
<tr>
<td>Balances risk against benefit and cost</td>
<td>Balances risk against dread and outrage</td>
</tr>
</tbody>
</table>

Source: (Nestle, 2010)

Thus each dispute has two main components, factual issues and value issues. Factual questions include: What risks are involved? How big are they? Who is at risk? These are scientific questions. The central value question is: Given those facts, what should society do? A more detailed examination of the two approaches to evaluating risks—called, for lack of better terms, science-based and value-based—helps to explain why food safety issues are so political.

### B.1 Science-Based Approaches: Counting Cases and Costs

Science begins with an observation, but rather than accepting an observation as a universal truth, scientists question its accuracy, interpretation, and relevance; develop theories to explain its significance; and design and conduct experiments to test those theories (Nestle, 2010). The quality of scientific research depends not only on the question under investigation (some research questions are more interesting and important than others) and the care ("rigour") with which studies are conducted, but also on the ability of the studies to eliminate ("control for") all possible causes of the observation other than the one being tested. Scientific methods also extend beyond observations to suggest probable causes, to exclude irrelevant causes ("confounding variables"), and to estimate the probability that a particular cause is the true reason for the observation of interest. However, probability is not the same as proof. Biological experiments in humans are complicated by genetic variation and behavioural differences, and study results nearly always depend on probabilities and statistics. This means that they are subject to interpretation and, therefore, to perception, opinion, and judgment. Scientists tend to minimize the subjective nature of interpretation and to view knowledge gained through the testing of theories as objective, accurate, evidence-based, hypothesis-driven, and rigorous.

In practice, a science-based approach to food safety is one that appears to focus exclusively on the characteristics of the risk itself: annual cases of illness, doctor's visits, hospitalizations, deaths, costs to individuals and to society, the benefits of doing nothing about the risk, and the benefits and costs of risk reduction. From this perspective, risks are measurable and, therefore, “scientific” and “objective.” Researchers and government officials evaluate potential hazards through a formal process of risk assessment that involves identifying the hazard, characterizing it, determining its degree of exposure in the population, and calculating the balance of risk to benefit and cost. Using this science-based approach, government agencies
identify the primary preventable food safety hazards as microbial infections, antibiotic resistant Salmonella, food allergens, and certain pesticides. Because so much self-interest is at stake in such decisions, these areas have political as well as scientific dimensions—whether recognized or not.

### B.2 Value-Based Approaches: Estimating Dread and Outrage

Scientific methods estimate the probability that something in a food might lead to illness, but they do not consider the intangible value or significance of that food to the people eating it. Many people, however, evaluate risks not only for their potential to cause health problems but also from the standpoint of personal beliefs and values that depend on a host of psychological, cultural, and social factors. These personal perspectives about food have also been studied extensively. Anthropologists, for example, tell us that the act of consuming food—taking it into our bodies—is so primal that societies create myths to explain the transformation of food into us. Because, in that sense, we truly are what we eat, food raises questions of intimacy and identity and provokes feelings of anxiety. People do not necessarily want food to be perfectly safe (or we would never eat wild mushrooms or raw oysters). We are just more comfortable knowing what we are eating. At some deep psychological level, “If we are what we eat, and we don’t know what we are eating, then do we still know who we are?”

On the ranking of potential hazards according to the degree of perceived harm, studies indicated that people worry most about risks perceived as highly dangerous, particularly to pregnant women and small children (a science-based concept), but they are also concerned about risks perceived as involuntary, unpreventable, unfamiliar, and inequitably distributed—factors based on values (Nestle, 2010). People are less willing to accept risks induced by technology, those poorly understood by science, and those subject to contradictory statements from experts. The more such value-based factors characterize a particular risk, the more the risk generates feelings of anxiety, alarm, dread, and outrage. In fact, risk communication researchers rank such factors on a predictable scale of dread and outrage.

With respect to food, acceptance of risk depends far more on perception of the number and intensity of dread-and-outrage factors than it does on the number of cases of illness. On a population basis, microbial contaminants unquestionably pose the most prevalent foodborne threat to health. The public, however, also ranks chemical pesticides and additives, irradiation, and genetic engineering high on the list of perceived risks, largely because exposures to them are invisible, involuntary, imposed, and uncontrollable. The health risks of genetically modified foods (however remote they may be) are hidden and undemocratically applied and as a result are far less acceptable. Because questions of who imposes risks and who takes risks are crucial in assessing whether a risk is acceptable, decisions about food safety take on political dimensions.

A comparison of the two approaches to assessing risk explains why whenever someone invokes science in discussions of food safety, we can be reasonably certain that questions of self-interest are at stake but are excluded from debate. Scientists talk about risk as a matter of illness and death. The public wants dread-and-outrage factors to be considered as well. The failure of food companies, scientists, and government agencies to recognize the need to address values as well as science in matters of food safety leads to widespread distrust of the food industry and its regulators. When officials and experts dismiss dread-and-outrage concerns as emotional, irrational, unscientific, and indefensible, they raise questions about their own credibility and competence. They fail to recognize their own biases as well as the predictability of public responses to food safety risks. When a risk manager continues to ignore these factors—and continues to be surprised by the public’s response of outrage—it is worth asking just whose behaviour is irrational (Nestle, 2010).
**B.3 The Precautionary Principle: Look Before You Leap**

The differences in the two approaches to food safety risk have an additional political dimension. They imply different expectations for the ways in which authorities make decisions about the release of new foods and ingredients. The science-based approach works on the proposition “nothing ventured, nothing gained.” Regulators determine as well as they can whether a food or ingredient is likely to cause harm and permit those that seem reasonably safe to enter the food supply. Food safety authorities use this approach for food additives characterized as “generally recognized as safe” (GRAS). If problems occur, the authorities deal with them after the foods are marketed. This approach requires neither premarket testing nor labelling; it is based on a standard that requires food manufacturers to demonstrate “reasonable certainty of no harm.” This standard, which translates as “safe enough to be acceptable,” leaves plenty of room for subjective opinion and judgment.

An alternative approach is one that has come to be known as the principle of precautionary action, or the “precautionary principle.” Whether or not to invoke the Precautionary Principle is a decision exercised where scientific information is insufficient, inconclusive, or uncertain and where there are indications that the possible effects on the environment or human, animal or plant health may be potentially dangerous and inconsistent with the chosen level of protection. The appropriate response in a given situation is thus the result of a political decision, a function of the risk level that is “acceptable” to the society on which the risk is imposed. In practice, invocation of the precautionary principle can be used to require companies to demonstrate that foods are safe before they are marketed. Further stressing the principle, the Wingspread statement on the precautionary principle states: “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context, the proponent of the activity, rather than the public, should bear the burden of protection” (Nestle, 2010). Further to this, European and United States experts on food biotechnology issued a joint statement in 2000 saying, “When substantive uncertainties prevent accurate risk assessment, governments should act protectively on the side of safety.” Even so mild a statement suggests that companies will have to do more to demonstrate safety in advance. But because testing can never prove that a food is perfectly safe, public willingness to accept a new food depends on how well it meets the value concerns summarized in Table 3. If a food ranks high in dread and outrage, it will never appear safe enough, no matter how much effort goes into attempts to prove it harmless.

**C. The Political Economy of Foodborne Illness**

The strengthening of food laws is a necessary political process intended to control food safety for which the society expects governments and their regulatory agencies to take responsibility. Accurate burden-of-illness estimates for foodborne diseases are useful for policy makers and others that seek to characterize and prioritize resources dedicated to addressing the problem of these diseases (Scharff, 2012).

Government agencies that employ economic cost data in regulatory analyses typically use either a basic cost-of-illness model that includes values for medical care, productivity losses, and mortality or a cost-of-illness model enhanced to include pain and suffering values. By including a value for pain and suffering, the enhanced model has the advantage of more fully accounting for economic costs associated with foodborne illness. This value is derived by monetizing quality-adjusted life years (QALYs) that have been designed to assess utility loss. Monetized QALY losses are the product of loss of well-being from a condition, the number of days with the condition, and the economic value of 1 day (derived from the value of statistical life). Ideally, this measure would represent the ill consumer’s willingness to pay to avoid these pain and suffering losses. In contrast, the basic model avoids the controversy over how QALYs should be used but does not provide a value for the legitimate economic costs associated with pain and suffering.
Table 4: Burden of Foodborne Illness Expressed as Annual Number of Cases in the USA  
Adapted from (Scharff, 2012)

<table>
<thead>
<tr>
<th>Disease or agent</th>
<th>No. of illness</th>
<th>No. of hospitalizations</th>
<th>No. of deaths</th>
<th>Total cost (millions of US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Basic</td>
</tr>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Bacillus cereus</em></td>
<td>63,400</td>
<td>20</td>
<td>0</td>
<td>2-28</td>
</tr>
<tr>
<td><em>Brucella spp.</em></td>
<td>839</td>
<td>55</td>
<td>1</td>
<td>8-24</td>
</tr>
<tr>
<td><em>Campylobacter jejuni</em></td>
<td>845,024</td>
<td>8,463</td>
<td>76</td>
<td>437-4,031</td>
</tr>
<tr>
<td><em>Clostridium botulinum</em></td>
<td>55</td>
<td>42</td>
<td>9</td>
<td>4 – 416</td>
</tr>
<tr>
<td><em>C. perfringens</em></td>
<td>965,958</td>
<td>438</td>
<td>26</td>
<td>45-1443</td>
</tr>
<tr>
<td><em>Shiga toxin-producing Escherichia coli O157:H7</em></td>
<td>63,153</td>
<td>2,138</td>
<td>20</td>
<td>121-1827</td>
</tr>
<tr>
<td><em>Shiga toxin-producing E. coli non-O157</em></td>
<td>112,752</td>
<td>271</td>
<td>0</td>
<td>11-273</td>
</tr>
<tr>
<td><em>Enterotoxicogenic E. coli</em></td>
<td>7,982</td>
<td>8</td>
<td>0</td>
<td>0-41</td>
</tr>
<tr>
<td><em>Other diarrheagenic E. coli</em></td>
<td>11,982</td>
<td>8</td>
<td>0</td>
<td>0-28</td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td>1,591</td>
<td>1,455</td>
<td>255</td>
<td>95-6613</td>
</tr>
<tr>
<td><em>Salmonella, nontyphoidal</em></td>
<td>1,027,561</td>
<td>19,336</td>
<td>378</td>
<td>1479-10881</td>
</tr>
<tr>
<td><em>S. enterica Typhi</em></td>
<td>1,821</td>
<td>197</td>
<td>0</td>
<td>0 – 24</td>
</tr>
<tr>
<td><em>Shigella</em></td>
<td>131,254</td>
<td>1,456</td>
<td>10</td>
<td>38 – 768</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>241,148</td>
<td>1,064</td>
<td>6</td>
<td>29-434</td>
</tr>
<tr>
<td><em>Streptococcus group A</em></td>
<td>11,217</td>
<td>1</td>
<td>0</td>
<td>0-112</td>
</tr>
<tr>
<td><em>Vibrio cholerae, toxigenic</em></td>
<td>84</td>
<td>2</td>
<td>0</td>
<td>0-0.3</td>
</tr>
<tr>
<td><em>V. vulnificus</em></td>
<td>96</td>
<td>93</td>
<td>36</td>
<td>54-538</td>
</tr>
<tr>
<td><em>V. parahaemolyticus</em></td>
<td>34,664</td>
<td>100</td>
<td>4</td>
<td>29-169</td>
</tr>
<tr>
<td><em>Other Vibrio</em></td>
<td>17,564</td>
<td>83</td>
<td>8</td>
<td>28-179</td>
</tr>
<tr>
<td><em>Yersinia enterocolitica</em></td>
<td>97,656</td>
<td>533</td>
<td>29</td>
<td>69-1662</td>
</tr>
<tr>
<td><strong>Parasite</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cryptosporidium spp.</td>
<td>57,616</td>
<td>210</td>
<td>4</td>
<td>21-394</td>
</tr>
<tr>
<td><em>Cyclospora cayetanensis</em></td>
<td>11,407</td>
<td>11</td>
<td>0</td>
<td>0-39</td>
</tr>
<tr>
<td>Giardia intestinalis</td>
<td>76,840</td>
<td>225</td>
<td>2</td>
<td>128-267</td>
</tr>
<tr>
<td><em>Toxoplasma gondii</em></td>
<td>86,686</td>
<td>4,428</td>
<td>327</td>
<td>1,112-5,726</td>
</tr>
<tr>
<td><em>Trichinella spp.</em></td>
<td>156</td>
<td>6</td>
<td>0</td>
<td>0-4</td>
</tr>
<tr>
<td><strong>Virus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrovirus</td>
<td>15,433</td>
<td>87</td>
<td>0</td>
<td>5-22</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>1,566</td>
<td>99</td>
<td>7</td>
<td>13 – 125</td>
</tr>
<tr>
<td>Norovirus</td>
<td>5,461,731</td>
<td>14,663</td>
<td>149</td>
<td>1,545 – 4,728</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>15,433</td>
<td>348</td>
<td>0</td>
<td>4 – 21</td>
</tr>
<tr>
<td>Sapovirus</td>
<td>15,433</td>
<td>87</td>
<td>0</td>
<td>4 – 18</td>
</tr>
<tr>
<td><strong>Total known</strong></td>
<td>9,388,074</td>
<td>55,962</td>
<td>1,350</td>
<td>8,436-29,230</td>
</tr>
<tr>
<td><strong>Total unknown</strong></td>
<td>38,392,704</td>
<td>127,839</td>
<td>1,686</td>
<td>21,047-51,404</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>47,780,778</td>
<td>183,801</td>
<td>3,036</td>
<td>31,214-76,142</td>
</tr>
</tbody>
</table>

The estimated cost of foodborne illness was substantial: $51.0 billion in annual health-related costs in the basic model and $77.7 billion in the enhanced model. Whether a potential food safety program improves social welfare is dependent on three factors: the cost per case of foodborne illness, the number of cases expected to be averted by the program, and the cost of the program to government, consumers, and industry. When examining a particular program,
social welfare will only be improved when the product of the cost per case and the number of cases averted exceeds the expected cost of implementing the program for society as a whole.

Underlying the discussions of Food Politics are several recurrent themes:

1. The increasing concentration of food producers and distributors into larger and larger units
2. The overproduction and overabundance of food in the United States
3. The competitiveness among food companies to encourage people to eat more food or to substitute their products for those of competing companies
4. The relentless pressures exerted by food companies on government agencies to make favourable regulatory decisions
5. The invocation of science by food companies as a means to achieve commercial goals
6. The clash in values among stakeholders in the food system: industry, government, and consumers
7. The ways in which such themes demonstrate that food is political

D. Food Sources and Virulence

Regardless of the accuracy of cost and case estimates, one trend is clear: an increasingly broad range of foods is contaminated with harmful bacteria. Cases refers to the number of individuals who become ill—whether or not they report the disease. In contrast, outbreaks always are reported; authorities discover them when more than one person gets sick from the same food source and doctors report the illnesses to health officials. It is easier to identify cases—and, therefore, report them—when an illness occurs right after the food is eaten. With these distinctions in mind, the tracking information indicates a change in the food sources of outbreaks: seafood ranks first, followed by eggs, fruits and vegetables (sprouts, lettuce, berries, cantaloupe), beef, poultry, and foods such as salads and sandwiches made with multiple ingredients. In part because so many more meals are consumed outside the home, foods other than those prepared by home cooks now account for 80% of the outbreaks (although not necessarily 80% of the cases of food-borne illness).

E. Government Oversight in Food Safety

Government oversight in food safety is often spread among many institutions. Food safety politics involves diverse stakeholders with highly divergent goals. Food producers must compete for shares of the consumer’s food money. One way to do this is by taking advantage of a divided, inconsistent, and illogical government regulatory system. Food companies owe their primary allegiance to stockholders, and their principal goal must be profit, not public health. Whenever safety measures raise costs or intrude on autonomy, the affected industries mobilize their considerable political power to block actions perceived as unfavourable—even when such measures are strongly supported by science (example: antibiotics). Government regulatory agencies also engage in competition, in this case among themselves for scarce resources and territorial mandates. They often appear to be more concerned about protecting their own turf—or that of the industries they regulate—than about protecting the health of consumers. The public, unaware of such disputes, simply wants food to be safe and assumes that both industry and government share that goal and are doing everything possible to achieve it.
In this environment, the various participants in the food system blame one another (but never themselves) when outbreaks occur. The costs of foodborne illness to individuals, to society, and to food companies should encourage everyone to collaborate in efforts to ensure safe food. That the groups do not collaborate is a curious consequence of food safety politics.

Spriggs et al. (2001) argue that for international competitiveness, a food safety system must be designed consisting of a set of (governmental and non-governmental) institutional arrangements or a ‘governance structure’ providing formal and informal rules to ensure food safety. Institutional arrangements on food safety are important and it is crucial they evolve, as needed, in order to remain consistent with new technological innovations and changing consumer preferences.

Nestle (2010) posits that as citizens, we need to understand that producing safe food is not impossibly difficult. She argues that Sweden, Denmark, and the Netherlands have reduced foodborne illnesses by instituting control systems at every stage of production, starting on the farm. They set testing standards to reduce pathogens, limit antibiotics in animal feed, prevent infections in transported animals, test for microbes at slaughterhouses and supermarkets, and provide incentives to the industry to comply with safety rules.

F. Relevance of Food Safety Systems in Developing Countries to International Food Trade

The importance of developing countries as providers of an increasing percentage of the food being consumed globally is receiving growing recognition. This is because these countries remain an undeniably important source of key food items for developed-country consumers, including increasingly sophisticated food product offerings. Consequently, the status of the food safety and quality systems in these countries is no longer a matter of local interest only; a food safety challenge in Asia or Africa can have repercussions as well in developed countries (Gordon, 2015). As examined in the foregoing sections, governments and their regulatory agencies use standards and technical regulations as a means of assuring consumer demands for improved product safety, increased environmental protection, and greater product information (Sheldon, 2013).

Sheldon (2013) reports that there has been considerable discussion of the problems of regulatory compliance faced by developing countries in accessing developed country markets, given the latter typically have higher levels of regulatory intensity than the former. The growing movement of people, live animals, and food products across borders, rapid urbanization in developing countries, changes in food handling, and the emergence of new pathogens or antibiotic resistance in pathogens all contribute to increasing food safety risks. These issues are recognized in international trade negotiations under the WTO and in the FAO’s Committee on World Food Security. Managing food safety risks is a prerequisite for participation in international trade, and taking advantage of trade opportunities is an important strategy to reduce poverty. There is an increasing realization that exports are a critical component in rural economic growth. Thus, food safety has a dual role in poverty alleviation, as it is important to public health and to market development. At the same time, several global trends lead to increased complexity in food systems, including increased trade in fresh and processed foods, growing urbanization and increased demand for foods of animal origin, and associated changes in the way that food is produced, processed, and distributed.

Current understanding of food safety management and the desire of most industrial countries to be responsive to consumers and efficient in the use of public resources has brought about changes in food safety regulatory systems. The development of modern food safety systems: their structure, practices and functioning, depends on a number of principles and trends including (Unnevehr et al., 2000; Mwamakamba et al., 2012):
Emphasis on development of integrated and holistic food safety systems with a farm-to-table approach using a well-resourced consolidated authority. There is a shift from sectoral approaches to managing food safety risks to more holistic and multi-faceted strategies. The farm-to-table approach to food safety is based on the premise that foodborne disease is commonly caused by multiple factors arising at dispersed points along the farm-to-table continuum. It addresses the notion that quality needs to be managed along the entire food supply chain, from the initial stages of raw material production to the final stages of food preparation to consumption.

The globalization of the food supply chain and obligations under trade agreements as well as advances in the control of foodborne hazards. Greater scientific understanding of food safety risks and means to assess their impact on public health as well as the development of international food standards by the Codex Alimentarius Commission are some of the factors that have influenced proactive approaches to food safety control over the years.

Increased recognition of the roles of stakeholders and cooperation with industry and consumers to provide information and education. There is a general shift in thinking about the roles of stakeholders from the farm-to-table, with responsibilities for food control shifting from the government to producers, processors, food manufacturers, transport operators, retailers and consumers that operate along the food chain. Food producers at all levels have a responsibility for the production of safe food. At the farm level, farmers and workers must control pesticide and other chemical inputs and recognize potential sources of microbial contaminants from water, soil, animals and humans. Fishermen must understand that the safety and quality of their catch is linked to the levels of contaminants in the harvest waters. The food processing and transportation industries must assess where food safety may be jeopardized at critical points in food production and transport and take appropriate measures to control these potential hazards. Retail establishments, restaurants and other food vendors must also understand how to ensure proper sanitary practices and temperature controls. The role of the consumer may be the most important since at that level food safety is assured at the point closest to food consumption. It is the last safety check on the road from the farm to table.

Reorientation of quality assurance protocols. There is a shift from the traditional focus on end-product testing toward quality management of the production process. There has been a renewed emphasis on preventive measures to food safety. A widely recognized preventive system, Hazard Analysis Critical Control Point (HACCP) is geared on sound science and focuses on identifying and preventing hazards from contaminating food.

An open decision making process that allows stakeholder participation.

Evaluation of public health outcomes from regulation.

G. Components of a National Food Control System

Food policy, law and regulations: Containing the necessary statutory powers to ensure jurisdiction over food safety from farm to table and allow competent food authorities to take immediate preventive and enforcement measures using updates food laws, regulations and updated food standards. They must tailor available information, concepts and requirements to the national context, so as to develop a regulatory framework that will both satisfy national needs and meet
international obligations and trading partners' demands.

(b) **Food control management:** Effective food control systems require operational coordination at the national level including an institutional structure which responds to the needs of food safety management. Where food control responsibilities lie among different government agencies, the roles and responsibilities of these agencies should be clearly defined and efforts made to establish a more integrated system, in order to provide increased consistency in assuring the safety of food.

(c) **Inspection services:** An effective food safety management system requires clear inspection policy and procedures that are applied by inspectors who are well trained not only to apply these procedures but also to act as quality assurance advisors and extension officers to the food industry.

(d) **Laboratory services:** Laboratories underpin decisions of food control services. It has been noted that limited resources to maintaining and equipping laboratories are often cited as major constraints to enhancing national laboratories. It has been pointed out, though, that while laboratory capabilities are expensive resources, it is essential, at least at the national level, that good laboratory facilities and competent personnel be adequately supported.

(e) **Information, education, communication and training:** Assuring food safety along the entire food chain requires partnerships and education at all levels. Stakeholder participation and empowerment grounded on sound knowledge of food safety is paramount. All should recognize their individual role to enhancing and minimizing food-related risks. Emphasis of food safety information, education and communication programmes should be in providing the different stakeholders with the information and motivation necessary to make informed decisions on food safety.

H. **Export Challenges Facing Food and Agriculture from Developing Countries**

Food export markets present a somewhat different set of challenges from domestic food safety regulation. Fresh food products are more likely to encounter sanitary and phytosanitary barriers to trade. Delivering safe food to distant markets requires process controls throughout the production process and mechanisms to certify to buyers that such controls are effective. Developing-country exporters need to know how to meet standards in different markets and how to meet the increasing demand for product trace-back and certification of production methods.

The SPS agreement of 1994 provides a framework for resolving disputes about SPS measures under the WTO. There is evidence that this agreement has stimulated activity to reduce SPS barriers to trade, but there remains significant disagreement at the international level over the role of science and consumer choice in regulating risk. Controversies at the global level influence the ability of countries to compete in export markets. They create uncertainties about the potential acceptability of production methods and products in different potential markets.

For Africa, the major challenges faced by countries include (Mwamakamba et al., 2012):

(i) **Limited awareness about food safety.** Information, education, health promotion and training programmes for the food industry and consumers are limited in a number of countries. There has been a drastic increase in countries of small-scale food industries, ever-growing number of food vendors and household level
production. This change, however, in the increase of small-scale food industries has not been accompanied by the improvement of food safety patterns in most countries. Personnel engaged in food production and processing have insufficient knowledge to comply with food safety assurance schemes including the Hazard Analysis Critical Control Point (HACCP) system.

(ii) *Inadequate coordination.* The administration of food safety is complicated by the fact that food safety has many facets. National food safety control systems within the Region often have a sectoral or fragmented structure. Typically, under such arrangements the food control responsibilities are shared between several government ministries such as health, agriculture, commerce, environment, trade and tourism. The roles and responsibilities of each of these agencies are specified but remain quite different. While multiple food control agencies may be the norm, they suffer several drawbacks, including lack of coordination, and confusion over jurisdiction. To overcome the problems associated with fragmentation of food control, food control functions could be transferred to a single government department or a national food control body with inter-ministerial and inter-departmental representation.

(iii) *Inadequate enabling policy, outdated legislation and regulations.* In many cases existing legislation is outdated, incomplete and fails to adequately address current and emerging food safety problems. Even with a food act and regulations, enforcement may be undermined by the lack of effective food control infrastructure and institutional capacities to ensure compliance. Failure to clearly clarify in legislative documents the respective responsibilities of the main stakeholders involved in food safety, and the mechanisms through which they should work together results in duplication of regulatory activities and inadequate coordination in policy implementation and surveillance. The existence of several different laws each addressing various aspects of food, animals, plants, public health and trade further compound the problem.

(iv) *Insufficient and inadequate capacities for food safety.* Human resource capacity is inadequate in terms of: development and implementation of policies that affect food safety and trade, including capacity to implement relevant international agreements; capacities for food analysis and microbiological risk assessment procedures.

(v) *Inadequate resources for food safety.* One key factor affecting food control systems is the lack of financial support. This is exacerbated by the low priority accorded to food safety in national and regional planning, and the limited funding food safety receives in relation to other areas. Funds are needed to improve infrastructure, purchase equipment, train personnel and monitor food contamination.

I. **North-South Trade and Food Standards**

Sheldon (2013) reports that it is typically claimed that developing countries are hampered in their ability to meet stringent food standards due to a lack of necessary human capital and poor governance. There is empirical evidence to support the hypothesis that the capacity to satisfy standards is correlated with real GDP per capita, developing countries specializing away from industries with heavier regulatory burdens. Standards in many export destinations for African agricultural and food products are viewed as as instruments of ‘protection in disguise’ (Jaffee et al., 2004; CUTS, 2009; Otieno et al., 2009; Kareem, 2014). For example, the growing concern among policy-makers and private entities in EAC developing countries is about the
proliferation and strengthening of food safety and agricultural standards in the EU market and how this is impacting upon their competitiveness. This concern is multi-faceted, involving:

(i) the suspicion that important standards can and will be used as a trade protection measure and be applied in a discriminatory manner;

(ii) the concern that EAC governments, traders and producers lack the administrative, technical and other capacities to comply with the emerging standards requirements in the EU, or that even in the few cases where they are able to comply, the costs incurred to attain compliance certainly undermines their comparative advantage; and,

(iii) the proposition that such institutional weaknesses and rising compliance costs only serve to marginalise weaker economic players, including small countries, small enterprises, and small-scale farmers.

Jaffee et al. (2004) argue that standards reflect the feasibility of implementation, which itself is influenced by legal and industry structures as well as available technical, scientific, administrative and financial resources. Some food safety risks, for example, tend to be greater in developing countries due to weaknesses in physical infrastructure (for example standards of sanitation and access to potable water) and the higher incidence of certain infectious diseases. Further, tropical or sub-tropical climatic conditions may be more conducive to the spread of certain pests and diseases that pose risks to human, animal and/or plant health.

Over time there has been greatly increased public awareness and concern about food safety within high-income developed countries in the wake of a series of highly publicized food scandals, foodborne illnesses and food-poisoning fatalities. In some countries, these events have shaken the underlying confidence of consumers in national or regional systems of food safety regulation. In response, there have been significant institutional changes in food safety oversight and reform of pertinent laws and regulations. For long-held concerns (for example the potential environmental and health impacts of pesticides), there has been a tightening of many standards in industrialized and other countries. In addition, new standards are being applied to address previously unknown or unregulated hazards.

In parallel with these changes in official standards and public oversight, have been accelerated moves by the private sector to address food safety risks and otherwise address the concerns and preferences of consumers and civil society organizations. Much of the motivation behind this trend has been the mitigation of reputational and/or commercial risks, while in some product lines and industries these moves have also been part of commercial strategies of differentiation. The ensuing result has been a growing plethora of private ‘codes of practice’, standards and other forms of supply chain governance. While these efforts have been especially prominent amongst major food retailers, food manufacturers and restaurant chains in industrialized countries, systems of private food safety governance are also being applied more widely in middle-income and some low-income countries, in part through the investments undertaken by multinational supermarket or restaurant chains and competitive responses by local firms. In addition, new food safety standards in industrialized countries are serving to shape the expectations of developing country consumers, especially those with higher incomes and in urban areas.

The proliferation and enhanced stringency of food safety and agricultural health standards is a source of concern among many developing countries and those promoting the increased integration of these countries into the world trading system. Reflecting wider changes in the trade regime for various agricultural and food products, there is a presumption that food safety and agricultural health measures can (and will) be used as a protectionist tool, providing ‘scientific’ justifications for prohibiting imports of certain products altogether, or discriminating
against imports by applying higher standards and/or more rigorous regulatory oversight than on domestic suppliers. Even if standards are not intentionally used to discriminate against imports, there is concern that their growing complexity and lack of harmonization between countries could still impede the trading efforts of developing countries.

![Figure 2: The Standards and Regulatory Environment for Food Trade (Jaffee et al., 2004)](image)

While the process of notification under the SPS Agreement has contributed to increased transparency of official food safety and agricultural health measures, this has been accompanied by the proliferation of private standards that fall outside of the purview of the WTO. Thus, the overall picture for food safety and agricultural health requirements in trade is becoming increasingly complex and fast moving as standards are promulgated in multiple spheres at both the national and international levels. Further, the complexity of this issue stems not only from the variability of standards on paper, it is magnified by differences in the ways, means and intensities by which the standards are monitored and enforced, which themselves are changing over time.

An illustration of this complexity is depicted in Figure 2. For a developing country exporter, the operative ‘rules of the game’ are derived by a combination of factors including the prevailing standards themselves, enforcement capacities and predilections of official agencies, nature of private standards and oversight arrangements such as certification, and the prominence of particular concerns among consumers and civil society organizations at any point in time. Clearly, there are potentially significant gains from the harmonization of standards, internationally, among countries and within the private sector. Yet, complexities will inevitably persist, especially as supply chains are increasingly driven by the exacting and more dynamic demands of consumers. The challenge for developing countries is clearly immense, although (as is discussed below) the pay-off for those that succeed is potentially significant. However one thing is certain, non-compliance is not an option for those that wish to continue to export!

**J. Food Security Indicators**

According to the World Food Summit of 1996 “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets...
their dietary needs and food preferences for an active and healthy life” (FAO, 2001). This widely accepted definition points to the following dimensions of food security:

(i) **Food availability**: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).

(ii) **Food access**: Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).

(iii) **Utilization**: Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

(iv) **Stability**: To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

Food security can be assessed using the following indicators (Death, 2011; FAO, 2015):

<table>
<thead>
<tr>
<th>Availability</th>
<th>Accessibility</th>
<th>Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average dietary energy supply adequacy</td>
<td>Percent of paved roads over total roads</td>
<td>Cereal import dependency ratio</td>
</tr>
<tr>
<td>Average value of food production</td>
<td>Road density</td>
<td>Percent of arable land equipped for irrigation</td>
</tr>
<tr>
<td>Share of dietary energy supply derived from cereals, roots and tubers</td>
<td>Rail lines density</td>
<td>Value of food imports over total merchandise exports</td>
</tr>
<tr>
<td>Average protein supply</td>
<td>Gross domestic product per capita (in purchasing power equivalent)</td>
<td>Political stability and absence of violence/terrorism</td>
</tr>
<tr>
<td>Average supply of protein of animal origin</td>
<td>Domestic food price index</td>
<td>Domestic food price volatility</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of undernourishment</td>
</tr>
<tr>
<td>Share of food expenditure of the poor</td>
</tr>
<tr>
<td>Depth of the food deficit</td>
</tr>
<tr>
<td>Prevalence of food inadequacy</td>
</tr>
<tr>
<td>Depth of the food supply variability</td>
</tr>
</tbody>
</table>
Access to improved water sources
- Access to improved sanitation facilities
- Percentage of children under 5 years of age who are stunted
- Percentage of children under 5 years of age who are underweight
- Percentage of adults who are underweight
- Prevalence of anaemia among pregnant women
- Prevalence of anaemia among children under 5 years of age
- Prevalence of vitamin A deficiency in the population
- Prevalence of school-age children (6-12 years) with insufficient iodine intake

Additional Useful Statistics
- Total population
- Number of people undernourished
- Minimum Dietary Energy Requirement (MDER)
- Average Dietary Energy Requirement (ADER)
- Minimum Dietary Energy Requirement (MDER) - PAL=1.75
- Coefficient of variation of habitual caloric consumption distribution
- Skewness of habitual caloric consumption distribution
- Incidence of caloric losses at retail distribution level
- Dietary Energy Supply (DES)
- Average fat supply
- Prevalence of food over-acquisition
- Maximum Dietary Energy Requirement (XDER)

References
Safe Food: The Politics of Food Safety (Nestle, 2010)
The Oxford Handbook of Food, Politics, and Society (Herring, 2015)
Food Security and Marine Capture Fisheries: Characteristics, Trends, Drivers and Future Perspectives (Garcia et al., 2010)
Food Security Indicators 2015 (FAO, 2015)
Food Security: Issues and Trends in International Politics (Death, 2011)

3.3.6 The Political Economy of Undernutrition/Malnutrition

A. Concepts in Malnutrition (WFP, 2012)
Malnutrition occurs when the nutrient and energy intake does not meet or exceeds an individual’s requirements to maintain growth, immunity and organ function. Malnutrition is a general term and covers both undernutrition and over-nutrition (overweight/obesity).

Undernutrition is the consequence of an insufficient intake of energy, protein and/or micronutrients, poor absorption or rapid loss of nutrients due to illness or increased energy expenditure. Undernutrition encompasses low birth weight, stunting, wasting, underweight and micronutrient deficiencies.
**Undernourishment** indicates food intake that is insufficient to meet dietary energy requirements continuously. Undernourishment is not assessed at the individual level.

**Nutrient gap** is the difference between nutrient requirements and nutrient intake. While diets may be adequate in terms of energy (kcal), they may still be inadequate in terms of nutrients, leaving individuals at risk of undernutrition.

**Micronutrient deficiency** is a lack or shortage of a micronutrient (also called vitamins or minerals). Micronutrients are essential components of enzymes and hormones and are therefore key in bodily processes, immunity, proper growth and metabolism of an individual. Micronutrient deficiencies often occur simultaneously and can arise due to lack of intake, absorption, or utilization of one or more vitamins or minerals. It is referred to as hidden hunger because a large percentage of the population may be deficient without showing any clinical symptoms or signs of deficiency.

**Growth failure** is the condition where an individual is shorter and/or thinner than their well-nourished counterparts and where the individual does not meet her/his growth potential. Growth may fail due to deficiencies of various micronutrients, energy, protein and/or macro-minerals.

**Acute malnutrition**, also known as wasting, develops as a result of recent rapid weight loss or a failure to gain weight. In children, it is assessed through the nutritional index of weight-for-height (WFH) or mid-upper arm circumference (MUAC). Acute malnutrition is also assessed using the clinical signs of visible wasting and nutritional oedema. In adults, wasting is assessed through MUAC or Body Mass Index (BMI). In pregnant and lactating women (PLW), wasting can be assessed through MUAC. The degree of acute malnutrition of an individual is classified as either moderate (MAM) or severe (SAM) according to specific cut-offs and reference standards. At the population level, acute malnutrition is categorized in three ways:

(i) **Global acute malnutrition (GAM)** represents the proportion of children 6-59 months in the population classified with MAM + SAM according to their weight-for-height (WFH) (Z-score), and/or nutritional oedema. GAM is an indicator of acute malnutrition in a population, and is used to assess the severity of the situation.

(ii) **Moderate acute malnutrition (MAM)** represents the proportion of children 6-59 months in the population who are classified with WFH ≥ -3 and < -2 (Z-score).

(iii) **Severe acute malnutrition (SAM)** represents the proportion of children 6-59 months in the population who are classified WFH <-3 (Z-score) and/or presence of nutritional oedema.

**Nutritional oedema** indicates a serious type of acute malnutrition in which nutritional deficiencies lead to swelling of limbs (feet, hands) due to retention of fluids. Children with nutritional oedema are automatically classified with severe acute malnutrition (SAM), and often require therapeutic feeding and medical treatment to recover. Also known as bilateral oedema.

**Chronic malnutrition**: Chronic malnutrition is also referred to as stunting and develops as a result of inadequate nutrition or repeated infections or both; typically, during the critical window of opportunity of the first 1,000 days from conception to two years of age. It is measured by the nutritional index of height-for-age (HAZ) and is manifested by a child being too short for his or her age. Unlike wasting, the development of stunting is a slow cumulative process that may not be evident immediately. Chronic malnutrition cannot generally be reversed, only prevented.
B. The Problem of Undernutrition/Malnutrition

According to IFPRI (2015) good nutrition signals the realization of people’s rights to food and health. Without good nutrition, human beings cannot achieve their full potential. When people’s nutrition status improves, it helps break the intergenerational cycle of poverty, generates broad-based economic growth, and leads to a host of benefits for individuals, families, communities, and countries. Good nutrition provides both a foundation for human development and the scaffolding needed to ensure it reaches its full potential. Good nutrition, in short, is an essential driver of sustainable development.

Malnutrition, though, is a problem of staggering size—large enough to threaten the world’s sustainable development ambitions. Malnutrition takes many forms: children and adults who are skin and bone, children who do not grow properly, people who suffer because their diets are imbalanced, and people who are obese or suffer from nutrition-related non-communicable diseases. Malnutrition affects all countries and one in three people on the planet. Nearly half of all countries face multiple serious burdens of malnutrition such as poor child growth, micronutrient deficiency, and adult overweight.

C. Burden and Causes of Malnutrition in Africa

![Figure 3: The Causes of Undernutrition (AUC et al., 2014)](image_url)

The main factors associated with undernutrition as a public health problem can be grouped into the following: environmental (natural or entropic causes), sociocultural-economic (linked to poverty and inequality) and political-institutional. Together, these factors increase or decrease biomedical access and productivity abilities, through which they determine the quantity and quality of dietary intake and the absorption capacity, which constitute the elements of undernutrition. Each of these factors increases or decreases the likelihood of a person to suffer from undernutrition (see Figure 3). Further, the importance of each of these factors depends on the level of the country’s demographic and epidemiological transition as well as on the person’s current stage in the life cycle. Together these factors determine the intensity of the resulting level of undernutrition.

Poor environmental conditions may increase insect and protozoan infections and also contribute to environmental deficiencies in micronutrients. These include the risks stemming from the natural environment itself and its cycles (floods, droughts, frosts, earthquakes and other phenomena), as well as those produced by humans themselves (such as water and air pollution, contamination of food, expansion of agriculture, etc.). Overpopulation, more
commonly seen in developing countries, can reduce food adequacy, leading to inadequate food intake or intake of foods of poor nutritional quality and quantity. The sociocultural-economic determinants include elements associated with poverty and inequality, education and cultural norms, employment and wages, access to social security and coverage of aid programmes. The political-institutional factors encompass government policies and programmes aimed specifically at solving the population’s food and nutritional problems.

Production factors include those directly associated with the production and access to food by the population at risk. The availability and autonomy of each country’s dietary energy supply depend directly on the characteristics of production processes, the degree to which they utilize natural resources, and the extent to which these processes mitigate or aggravate environmental risks.

Finally, biomedical factors take into account the individual’s susceptibility to undernutrition, insofar as deficiencies in certain elements limit the capacity to make biological use of the food consumed (regardless of quantity and quality).

**D. Consequences of Undernutrition in Africa**

![Diagram of COHA Framework](image)

*Bain et al. (2013)* reports that malnutrition is estimated to contribute to more than one third of all child deaths, although it is rarely listed as the direct cause. Contributing to more than half of deaths in children worldwide; child malnutrition was associated with 54% of deaths in children in developing countries in 2001. Protein-energy malnutrition (PEM), first described in the 1920s, is observed most frequently in developing countries but has been described with increasing frequency in hospitalized and chronically ill children in the United States. Child undernutrition has long-term negative effects on a person’s life, most notably in the aspects of health, education, and productivity (see Figure 4). These elements are quantifiable as costs and expenditures to both the public sector and to individuals. Consequently, these effects
exacerbate problems in social integration and increase or intensify poverty. A vicious cycle is perpetuated as vulnerability to undernutrition grows.

Kwashiorkor and marasmus are two forms of Protein Energy Malnutrition (PEM) that have been described. The distinction between the two forms of PEM is based on the presence of edema (kwashiorkor) or absence of edema (marasmus). Marasmus involves inadequate intake of protein and calories, whereas a child with kwashiorkor has fair-to-normal calorie intake with inadequate protein intake. Although significant clinical differences between kwashiorkor and marasmus are noted, some studies suggest that marasmus represents an adaptation to starvation whereas kwashiorkor represents a dys-adaptation to starvation.

In addition to PEM, children may be affected by micronutrient deficiencies, which also have a detrimental effect on growth and development. The most common and clinically significant micronutrient deficiencies in children and childbearing women throughout the world include deficiencies of iron, iodine, zinc, and vitamin A and are estimated to affect as many as two billion people. Although fortification programs have helped diminish deficiencies of iodine and vitamin A in individuals in the United States, these deficiencies remain a significant cause of morbidity in developing countries, whereas deficiencies of vitamin C, B, and D have improved in recent years. Micronutrient deficiencies and protein and calorie deficiencies must be addressed for optimal growth and development to be attained in these individuals.

Undernutrition may have immediate or evolving impacts throughout a person’s lifetime; individuals who suffered from undernutrition during early years of their life cycle (including intrauterine) are more likely to be undernourished later in life. Health studies have shown that undernutrition leads to increased appearance or intensified severity of specific pathologies and increases the chance of death during specific stages of the life cycle. The nature and intensity of the impact of undernutrition on pathologies depends, in part, on the epidemiological profile of a given country.

In education, undernutrition affects student performance through disease-related weaknesses and results in limited learning capacity associated with deficient cognitive development. This translates into a greater probability of starting school at a later age, repeating grades, dropping out of school and ultimately obtaining a lower level of education. Later in life, individuals may experience lower physical capacity as a result of stunting. Stunting, which is caused by food deprivation and nutrient deficiencies, is established by low height-for-age measurements during childhood. In adulthood, it leads to an overall reduced body mass when compared to the full adult potential.

E. The Political Economy of Malnutrition: The Cost of Hunger in Africa

Africa has experienced a recent period of economic growth that has positioned the region as a key area for global investment and trade. The pace of real GDP growth on the continent has doubled in the last decade and six of the world’s fastest growing economies are in Africa. All this has occurred despite some of the highest rates of child undernutrition in the world. Globally, there has been progress in reducing both stunting (low height-for-age) rates and the number of stunted children in the last 20 years. In Africa, the proportion of stunted children reported has decreased from 41.6 percent (1990) to 35.6 percent (2011) (see Table 5). Nevertheless, for that same period, the number of stunted children has increased from 45.7 million to 56.3 million, evidencing that stronger efforts must be put in place to have a decisive impact. The biggest proportion of these children are located in East Africa, where 22.8 million represent more than 40 percent of all stunted children on the continent. Together with West Africa, they account for three out of every four stunted children on the continent.

Child undernutrition is one of the most critical negative effects of hunger. When a child is undernourished before the age of five, his or her body and brain cannot develop at its potential,
and they are at risk for cognitive delays. Figure 5 illustrates the rates of stunting in Africa. According to this data, 17 countries on the continent have stunting rates above 40% and 36 countries have rates above 30%. Furthermore, a large proportion of Africa’s population often does not access diets containing the essential vitamins and minerals required for optimum health and productivity.

Figure 5: Stunting Rates by Country (AUC et al., 2014)

Table 5: Estimated Prevalence and Number of Stunted Children Under Five Years of Age (Moderate or Severe), by UN Region: 1990, 2010, 2011 (AUC et al., 2014)

<table>
<thead>
<tr>
<th>Region</th>
<th>Prevalence estimate (%)</th>
<th>Number (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>41.6</td>
<td>35.9</td>
</tr>
<tr>
<td>Eastern</td>
<td>50.6</td>
<td>42.5</td>
</tr>
<tr>
<td>Middle</td>
<td>47.2</td>
<td>35.6</td>
</tr>
<tr>
<td>Northern</td>
<td>28.6</td>
<td>21.3</td>
</tr>
<tr>
<td>Southern</td>
<td>36.2</td>
<td>31.1</td>
</tr>
<tr>
<td>Western</td>
<td>39.1</td>
<td>36.5</td>
</tr>
</tbody>
</table>
Table 6: Number of Undernourished People, by Region (FAO et al., 2012)

<table>
<thead>
<tr>
<th>Region</th>
<th>1990-1992</th>
<th>Proportion</th>
<th>2010-2012</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>175</td>
<td>18%</td>
<td>239</td>
<td>28%</td>
</tr>
<tr>
<td>Asia</td>
<td>739</td>
<td>74%</td>
<td>563</td>
<td>65%</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>65</td>
<td>7%</td>
<td>49</td>
<td>6%</td>
</tr>
<tr>
<td>Oceania</td>
<td>1</td>
<td>0%</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>World</td>
<td>1000</td>
<td></td>
<td>868</td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Effects of Child Undernourishment through Life (AUC et al., 2014)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 years</td>
<td>Undernourished children are at higher risk of anaemia, diarrhoea, fever and respiratory infections. These additional cases of illness are costly to the health system and to families. Undernourished children are at a higher risk of dying.</td>
</tr>
<tr>
<td>6-18 years</td>
<td>Stunted children are at a higher risk of repeating grades in school and dropping out of school. Grade repetitions are costly to the education system and to families.</td>
</tr>
<tr>
<td>15-64 years</td>
<td>If a child has dropped out of school early and has entered the workforce, he or she may be less productive, particularly in the non-manual labour market. If engaged in manual labour, he or she is likely to have reduced physical capacity and will tend to be less productive. People who are absent from the workforce as a result of undernutrition-related child mortality represent lost economic productivity.</td>
</tr>
</tbody>
</table>

Table 8: Summary of Costs of Child Undernutrition (AUC et al., 2014)

<table>
<thead>
<tr>
<th>Country</th>
<th>Losses National Currency</th>
<th>Losses US$</th>
<th>Equivalent % of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>EGP20.3 billion</td>
<td>3.7 billion</td>
<td>1.9</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>ETB55.5 billion</td>
<td>4.7 billion</td>
<td>16.5</td>
</tr>
<tr>
<td>Malawi</td>
<td>MKW147 billion</td>
<td>597 million</td>
<td>10.3</td>
</tr>
<tr>
<td>Rwanda</td>
<td>RWF503.6 billion</td>
<td>820 million</td>
<td>11.5</td>
</tr>
<tr>
<td>Swaziland</td>
<td>SZL783 million</td>
<td>92 million</td>
<td>3.1</td>
</tr>
<tr>
<td>Uganda</td>
<td>UGX1.8 trillion</td>
<td>899 million</td>
<td>5.6</td>
</tr>
</tbody>
</table>

F. The Contribution of Fish Intake, Aquaculture and Fisheries to Improving Nutrition

F.1 The health benefits of fish and seafood have been well documented and widely promoted in recent years. Fish is low in saturated fat and is a healthy alternative to red meat. It provides the body with essential vitamins and minerals, including iron; zinc (from shellfish); vitamins A, B and D; and, of course, protein. Omega-3 fatty acids found in fish are also beneficial, particularly in terms of cardiovascular health. Preliminary evidence suggests that early exposure to omega-3 fats may enhance brain development as well (ARHP/PSR, 2004).
F.2 Tacon et al. (2013) reports that despite the fact that the African region has the lowest per capita supply of aquatic animal food products of any region (9.50 kg/year, with the bulk of this supply coming from capture fisheries), aquatic food products represent over 18.5% of total animal protein supply within the region, and only second to the Asian region at 22.6% in 2009. Moreover, 18 sub-Saharan countries derive the bulk of their very limited animal protein supply from aquatic animal food products, including: Sierra Leone (64.8% total animal protein supply), Gambia (56.6%), Comoros (55.6%), Ghana (54.5%), Cameroon (49.3%), Congo Republic (48.0%), Sao Tome and Principe (46.4%), Equatorial Guinea (42.6%), Nigeria (41.1%), Congo DPR (39.6%), Senegal (38.6%), Mozambique (37.6%), Benin (35.7%), Guinea (33.3%), Uganda (33.3%), Cote d’Ivoire (31.8%), and Malawi (27.1%).

F.3 In terms of nutrient composition, aquatic animal food products represent one of the world’s most healthy and nutritious food sources. Thus, compared with terrestrial farmed meat products, aquatic animal foods (whether captured or cultured) generally have the following nutritional and health attributes:

(a) Aquatic animal foods have a higher protein content on an edible fresh weight basis (mean 17.3%) than most terrestrial meats (mean 13.8%), despite having a higher moisture content than most terrestrial meats.

(b) Aquatic animal food proteins are highly digestible and have a high biological value, as evident by their excellent essential amino acid (EAA) profile, the latter closely approximating to the recommended human dietary EAA requirement pattern. In particular, aquatic animal proteins are rich dietary sources of methionine and lysine. Since these EAA are usually limiting within most edible plant proteins consumed by humans, aquatic food products constitute a perfect addition to the typical plant-based diets consumed by the rural poor.

(c) Aquatic animal foods are generally leaner on an edible fresh weight basis (average of fat = 2.7%) compared with terrestrial meats (average of fat = 16.6%), have a lower saturated fat content (average of 0.16% in crustaceans, 0.32% in molluscs, 1.19% in fish, and 4.97% in terrestrial meats), have a lower calorific density (average of 101.3 kcal/100g) than terrestrial meats (average of 209 kcal/100g).

(d) Aquatic animal food products contain the highest concentration of long-chain omega-3 [(n-3)] polyunsaturated fatty acids of any foodstuffs, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) of terrestrial meat. Highest levels of EPA/DHA were reported within small pelagic fish species, and farmed and wild salmonid fish respectively. Although not analyzed or presented here, it is important to mention that filter feeding freshwater fish species (such as silver carp Hypophthalmichthys molitrix and bighead carp Hypophthalmichthys nobilis) are also rich sources of EPA/DHA, which they derive from freshwater plankton. As a general rule, the tissue levels of EPA/DHA within farmed fish and crustacean species are usually derived from the level of fish oil used within their formulated feeds, with higher levels usually reported with feeds containing higher dietary fish oil levels. In health terms, fish-derived omega-3 [(n-3)] fatty acids EPA and DHA have been shown to have a positive role in infant development (including neuronal, retinal, and immune function), cardiovascular diseases (including reduced incidence of heart disease in adults), cancer, and various mental illnesses (including depression, attention-deficit hyperactivity disorder, and dementia).

(e) Aquatic animal food products are a richer source of most essential minerals and trace elements than most terrestrial meats, including: Calcium; Phosphorus; Magnesium; Iron; Potassium; Sodium; Zinc; Copper; Manganese; Selenium.
As with the long-chain omega-3 fatty acids EPA and DHA, higher levels of mineral elements were observed in small pelagic fish species (includes European anchovy, Atlantic and Pacific herring, Atlantic mackerel and Spanish mackerel), compared to other fish species, including calcium, iron, magnesium, potassium, zinc, copper, manganese, and selenium. Aquatic animal food products are also rich dietary sources of other important essential trace elements that are generally lacking in terrestrial meat products, including iodine, fluorine, and trivalent chromium.

Aquatic animal food products are a richer source of several key water soluble and fat soluble vitamins than most terrestrial meats, including: Vitamin A; Vitamin C; Vitamin B12; Folic acid; Vitamin E; Vitamin D; Choline.

As with the omega-3 fatty acids and minerals, higher vitamin levels were observed in small pelagic fish species (includes European anchovy, Atlantic and Pacific herring and Atlantic mackerel), compared to other fish species, including riboflavin, niacin, vitamin B12, and vitamin D.

Last, but not least, edible aquatic plants or seaweeds also play an important role as a valuable source of essential nutrients in global food supply, including:

- Depending upon the species, season, and or culture conditions, edible seaweeds may contain considerable amounts of protein, with the red seaweeds such as Porphyra spp. (Nori) usually having the highest levels of protein (up to 47% on a dry weight basis), followed by green seaweeds such as Enteromorpha lactuca (former Ulva; sea lettuce) with protein levels ranging between 10 to 25%, and lastly by brown seaweeds such as Laminaria japonica with the lowest protein levels of between 5 and 12%, on a dry weight basis. Aspartic acid and glutamic acids constitute a large part of the amino acid make-up of edible seaweed proteins, with these amino acids being highest within brown seaweed proteins. Moreover, edible seaweeds such Palmaria palmata (Dillisk/Dulse) and Enteromorpha spp. (sea lettuce) are good sources of essential amino acids such as histidine, leucine, isoleucine, methionine and valine, with the levels of isoleucine and threonine in Palmaria palmata being similar to the levels found in legumes, and histidine levels is in Enteromorpha pertusa being similar to the levels found in egg proteins.

- Although the lipid fraction of marine edible seaweeds is usually low (typically ranging between 1.5 and 3.5%, on a dry weight basis), the lipids present are rich in omega-3 polyunsaturated fatty acids, and in particular EPA and to a lesser extent DHA, which are important to human health.

- Edible seaweeds are a good source of dietary fibre, including insoluble fibre and soluble fibre. The main component of the fiber component in marine seaweeds are xylans, alginates, carageenans and/or agar.

- Edible seaweeds are a rich dietary source of biologically available minerals and trace elements (compared with most other terrestrial plant food sources), including: iodine; iron; zinc; copper; magnesium; potassium; and calcium.

- Edible seaweeds are a rich source of many water-soluble and fat soluble vitamins, including vitamin C, vitamin E, vitamin B12, thiamin, riboflavin, niacin, pyridoxine, inositol, folic acid.

Lastly, edible seaweeds may contain a variety of different species specific bioactive chemicals with potential pharmaceutical and health enhancing properties, including
bromophenols, phytosterols, photosynthetic pigments, and immune enhancing polysaccharides.

Kawarazuka (2010) explains that aquaculture interventions can contribute to improving nutritional status of households through people consuming fish produced from their own ponds, selling fish for household income to enhance their purchasing power, and by expanding wider accessibility to fish by lowering market prices. Fish sold for cash income contribute to purchasing sufficient staple foods, and can also be used for consumption or purchase of non-staple foods which directly improve dietary intake beyond energy intake.

![Figure 6: The Pathways through Which Aquaculture Can Contribute to Improving Nutritional Status (Kawarazuka, 2010)](image)

Kawarazuka (2010) reports on studies which indicate that fish is a major animal protein source and own catches are kept for household consumption although the proportion of catches consumed at household varies from around 10% to 70% of total catches. In the areas where fish are abundant year-round or seasonally, people consume fish caught by household members, and hardly buy them in the markets. The species consumed at household level are low market-value fish and other aquatic animals. Invertebrate and other aquatic animals are more likely to be kept for household consumption while high market-value finfish are exclusively sold at market.

Furthermore, fish supplied from common-pool resources are widely traded in the local markets and therefore fish sold in the local markets can nutritionally contribute to not only households
that engage in fishing for household consumption, but also large populations including those who do not engage in small-scale fisheries but purchase fish from local markets.

**Figure 7: The Pathways through Which Small-Scale Fisheries Can Contribute to Nutritional Status (Kawarazuka, 2010)**

**F.8** Fish supplied by common-pool resources are also an important source of household income for the poor. The pathway is very similar to that of aquaculture, where cash from fish is primarily used to purchase staple foods in some studies. The proportions of fish catches sold varied from 30% to 90% among different countries. Many case studies showed the important role of small-scale fisheries as a seasonal part-time income source, contributing to diversifying livelihoods, especially during lean seasons when incomes from farming or labour wages are low. Furthermore, unlike fish produced by aquaculture which are mostly traded as fresh fish, fish supplied by small-scale fisheries are often seasonal and therefore many fish are processed during high production season. Hence, processing is also an important income source in seasonal small-scale fisheries, in particular, the areas where marketing network for locally processed fish (smoked and dried) to urban markets are well developed.
Improving dietary intake through diversifying the diet is one way to improve nutritional status. Adding small fish into the starch-based diet, as characteristic of the poor, increases micronutrient intakes effectively, with a high bioavailability, and fish carry other vegetables and some oil through a cooking process, contributing also to enhancing the bioavailability of the micronutrients in these foods. In this direct pathway, small-scale fisheries and aquaculture of nutrient-dense fish played an important role, while the nutritional effect of adding large fish into the diet was not fully analysed although it provided animal protein and PUFAs to some extent. Most nutrient-dense fish come from small-scale fisheries, and therefore conservation of these species and integrating them into already existing aquaculture systems is recommended. Food-based strategies which include the promotion and nutritional education of nutrient-dense fish have potential to strengthen this direct pathway.

Increasing purchasing power through the sale of fish for cash income which can be used to ensure household food security is an indirect pathway to improve overall dietary intake. Cash income from fish enabled households to add various food items into the diet, besides fish. Some studies reported that household income was used for purchasing animal-source foods or...
other food items. However there is a challenge that households with insufficient staple foods exchange fish for staple foods, but did not make enough cash from their fish sales to purchase other food items. In this case, households remain with starch-based diets, thereby their quality of diet is not improved.

Another pathway linking small-scale fishery and aquaculture activities with household nutritional outcomes was through women’s involvement in production, processing or sale of fish. Women often engage in fishing activities for household consumption, contributing to strengthen the direct pathway, while trading and processing contribute to empowering women which indirectly improves care for and diet of children.

This review analysed the role of aquaculture and small-scale fisheries separately. The pathways appeared however, to be basically the same. Aquaculture contributed to increasing household income with its high profitability and productivity. However owning a fish pond is an essential condition to initiate aquaculture, except in some cases where common-pool resources and seasonal fish ponds are abundant. On the other hand, fish supplied by small-scale fisheries were not only caught and consumed by household members, but also widely traded in the local markets, providing various livelihood opportunities for the poor, landless and women. Supporting small-scale fisheries through increasing capacity of sustainable resource management is required to keep fish supply from common-pool resources for the poor, as current aquaculture technologies and production systems cannot exactly replace the role played by small-scale fisheries. Nevertheless, aquaculture using common-pool resources such as river channels and floodplains, near shore, marine and lake waters, and seasonal water bodies, has potential for the sustainable supply of fish and household income for the poor, especially the landless and women.

Other linkages, such as health service and health environment of communities, and diseases were not examined as the data were scarce. To fully understand the determinants of nutritional status, integrated research and interventions are required.

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3.3.7 The Politics of International Food Standards

A. Food Politics

*Food politics* are the political aspects of the production, control, regulation, inspection, distribution and consumption of food. The politics can be affected by the ethical, cultural, medical and environmental disputes concerning proper farming, agricultural and retailing methods and regulations. Government policies around food production, distribution, and consumption influence the cost, availability, and safety of the food supply domestically and internationally. On a national scale, food policy work affects farmers, food processors, wholesalers, retailers and consumers. Commodity crops, such as corn, rice, wheat, and soy are most often at the heart of agricultural policy-making. While most food policy is initiated domestically, there are international ramifications. Globally, protectionist trade policies, international trade agreements, famine, political instability, and development aid are among the primary influences on food policy. Increasingly, climate change concerns and predictions are gaining the attention of those most concerned with ensuring an adequate worldwide food supply.

Herring (2015) explains that simultaneously, the numbers and causes of people asserting political interests in food and agriculture beyond their own grain pile have likewise shifted out and up. Europeans have used a variety of policy and social-movement tactics to influence what Africans can grow and eat. American diplomats apply pressure to alter European political choices about what not to grow and eat. An international organization of People for the Ethical Treatment of Animals challenges traditional practices confining and slaughtering animals—and thus livestock as livelihood and meat as market. Trade conflicts over whether or not phyto-safety regulations constitute another form of agricultural protectionism or an expression of democratic sovereignty cross powerful currents of science and culture: if Americans and Chinese can eat transgenic virus-resistant papayas, how can Japanese legally regulate them out of their markets? In theory, the *Codex Alimentarius* represents species-wide knowledge of standards for food safety, which should allow deliberation within the World Trade Organization to set lines between agricultural protectionism and justifiable precaution in regulating novel foods. In practice, there are trade conflicts, ineffectual rulings, and intermittent rejection of WTO rulings. Bans on whale slaughter pit Japan against international political coalitions. Bans on eating companion animals such as horses and dogs, or intelligent animals such as dolphins, raise persistent politics in some places but not others, with consequences for international trade. Shark fin is a valued and traditional food in some cultures, but restaurants are routinely raided for surreptitiously serving it in many jurisdictions. Demands for a ban on cow slaughter have raised intermittently powerful politics in India but not in Pakistan or Texas. Signs on bridges in Europe declare “GMOs Kill.” If true, such a claim would justify, perhaps morally compel, political mobilization to ban GMOs, create GMO-free zones, attack biotech research facilities, and restrict international trade in genetically engineered foods.

Food politics thus depends fundamentally—and increasingly—on ideas, not simply the material interests that have dominated political economy as an approach. Conventional food politics was answerable in a context of classical political economy: the dynamic of interests within social systems. Major interests were fairly clear: control of surplus from the land. The landless fought for land that produced food, the landed resisted. Tenants mobilized around securing their interests; landlords mobilized around defending theirs. The hungry demanded food as traditional obligation or political right. Farmers demanded better deals from traders and moneylenders and state intervention to protect their livelihoods. These demands on the state for protection from the market continue today, and have become globalized with international allies with less direct material interests in outcomes. The new world of food politics thus adds distinctly different dimensions. Contention exists not only around the expertise of agricultural and nutritional sciences, but also around what have been called, since the mid-20th century, alternative paths to “development.” Not only are distal populations recognizing a political imperative to alleviate hunger in societies our moms probably knew little about, but
justifications differ, as do contending development theories advocating proper roles for states and markets.

B. Standards and Regulatory Capitalism

Food safety standards are among the most long-standing public health regulations and were also among the first to “go global,” as a way of harmonizing national standards and reducing frictions in trade (Post, 2005). Moreover, the World Trade Organization (WTO) relies on international food standards in resolving trade disputes among countries over potentially protectionist policies. Although there has not been the same innovation in regulatory instruments experienced in other fields, such as the environment, the case of food safety provides a strong argument for both the existence of regulatory capitalism and its diffusion via horizontal agents. At the same time, it highlights the resilience of national differences in the face of common global structural forces.

Food safety presents a complex challenge. On one hand, in the United States alone, an estimated 76 million people become ill from foodborne illnesses each year, and 5,000 die. Clearly, monitoring and regulation are needed to prevent such occurrences. On the other hand, trade in food and agriculture is a huge global business, estimated at over $1,486 billion and US$1,765 billion per year respectively (WTO, 2015). At a minimum, differing national food safety standards hinder food trade, increasing costs to the consumer. More of a concern is that national standards are frequently accused of serving as non-tariff barriers to trade, that is, having protectionist purposes with no actual public health effect. Indeed, conflicts over food safety standards have emerged as one of the most controversial international trade issues in recent years, as indicated by U.S. and European Union (EU) tussles in the WTO over beef hormones and genetically modified foods.

To help address these twin concerns of safety and protectionism, an international governmental organization called the Codex Alimentarius Commission (CAC) sets food standards that in turn are used by the WTO in dispute resolution.

Two contradictory expectations arise with respect to how international standards affect domestic policies:

(i) From international relations and international law, whether soft law such as international norms influence the actions of countries or whether only “hard” or binding law and force matter

(ii) Whether, on one hand, international standards will be the result of a least common denominator and subsequently push domestic standards lower or, on the other hand, international standards will help raise domestic standards because large companies can use the higher standards to squeeze out competition. Do international norms matter at all, and if so, in which direction do they push national standards?

There is also need to consider how international standards influence domestic regulations, in particular: (i) how dominant states—primarily the United States, the EU and other Organisation for Economic Co-Operation and Development (OECD) countries—are shaping the global order of food safety, in particular how they are using the international arena to project their own domestic ideas of what regulation should be; and (ii) regional integration initiatives as both horizontal and top-down forces of diffusion best explain the degree of convergence that has happened thus far.

C. The Codex Alimentarius Commission and Food Safety

The CAC is an international governmental organization created more than forty years ago by the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO). Its purpose is to develop international food standards that ensure
consumer safety and fair practices in food trade. As a highly technical organization, its work went mainly unnoticed by the broader international community up until 1994, when the establishment of the WTO cast Codex standards in a more prominent light. Under the terms of the WTO Sanitary and Phytosanitary (SPS) Agreement, which governs disputes related to food safety standards among others, Codex food standards serve as a benchmark in resolving disputes between nations related to trade in food commodities. This development has prompted a massive increase in attention to and participation in Codex activities. One of the key criticisms of the CAC is that despite its dual mandate to protect public health and promote fair trade practices, in fact public health protection takes a back seat to trade interests (Post, 2005).

The relation between the CAC and the WTO is emblematic of the transformation of governance that is embodied in regulatory capitalism. Although the WTO aims to remove barriers to trade among all member countries, it does not advocate complete deregulation. Rather, it seeks to walk a fine line between liberalizing trade and maintaining national regulations. In signing the SPS Agreement, WTO member states acknowledged that safety standards for human, animal, and plant health remain in the domain of states to decide. Yet these domestic measures must either rely on international standards or be based on a risk assessment. Thus, as states agree to free their markets to trade, at the same time they reassert their rights to determine their own safety standards.

The importance accorded to international standards in the WTO SPS agreement, coupled with the failure so far of any national SPS regulations to pass through the WTO dispute resolution process unscathed, has contributed to a tremendous increase in the perceived importance of developing Codex standards. The number of countries participating in Codex Commission meetings jumped from 77 in 1991 to 188 in 2016, a 244 percent increase. Yet although Codex membership is currently composed of more than 188 member states¹, as well as numerous nonvoting international governmental and nongovernmental organizations, in practice the development of standards is done by a fraction of the membership, mostly developed countries.

What this means is that although Codex standards are international, in fact they reflect bargaining and negotiation mostly among a set of well-known countries. Although initial drafts of standards are often issued from the Codex secretariat, in fact the drafts are usually written by individual countries. Most of the actual drafting work is done by working groups. Once a carefully tailored draft reaches the full committee for discussion, it is in theory open for discussion, but in fact the working group members are often extremely reluctant to reopen debate on the draft. They argue that the draft reflects a well-thought-out consensus on the part of working group members. In part, this reflects the difficulty of trying to negotiate international standards by committee. But regardless of whether the intention is to exclude opinions, the result is that a handful of countries, usually those that can afford to devote staff time to drafting Codex standards in between committee meetings, dominate the framing of the standard.

D. Perspectives on Diffusion of Standards

There are three overarching types of explanations for the diffusion of regulatory capitalism: top-down, bottom-up, and horizontal as summarized in Table 5. The main source of top-down diffusion involves producers in the major exporting countries. These producers are interested in having similar legal standards across the markets that they export to. Two kinds of effects can result. A race to the bottom of lax regulatory standards occurs when producers press for the lowest common denominator of standard across the range of countries. A race to the top,  

¹ 188 Codex Members - 187 Member Countries and 1 Member Organization (EU) 234 Codex Observers - 54 IGOs, 164 NGOs, 16 UN.
on the other hand, occurs when dominant producers press for a ratcheting up of standards because they already have to meet a high standard in one country. Thus, under the international explanation, producers in powerful exporting countries (in this case, the United States and countries in the European Union) would work to develop Codex standards that reflect their interests and then work to have countries adopt those standards. Depending upon their interests, standards would vary in stringency.

**Table 9: Perspectives on Diffusion of Standards**

<table>
<thead>
<tr>
<th>Forces of Diffusion</th>
<th>Direction of Diffusion</th>
<th>Promote Convergence and/or Stringency?</th>
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<tbody>
<tr>
<td>International producers</td>
<td>Top-down</td>
<td>Yes on convergence, probably on stringency. Will lobby for convergence of standards because it is easier to meet one standard across markets. May lobby for more stringent standards, since they are more capable of meeting higher standards than small producers and will therefore derive a competitive advantage from higher standards.</td>
</tr>
<tr>
<td>Domestic trade groups</td>
<td>Bottom-up</td>
<td>Depends. Will lobby for convergence with international standards depending on whether they will benefit from adoption of the standard. Similarly, will lobby for stringency if they can derive competitive advantage from it.</td>
</tr>
<tr>
<td>Government officials</td>
<td>Bottom-up</td>
<td>Depends. Will lobby for convergence if they are persuaded by international organizations that this is important. No expectations regarding stringency.</td>
</tr>
<tr>
<td>Regional associations</td>
<td>Horizontal or top-down</td>
<td>Possibly on convergence, probably not on stringency. Member states are supposed to converge on the standards set by the association, so convergence toward international standards depends on whether the association has adopted the international standards already. Increased stringency is unlikely in most regional associations because the primary goal is trade facilitation, and the negotiators generally have that as their main goal.</td>
</tr>
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</table>

The second and third perspectives on diffusion incorporate bottom-up actors. The first is industry, such as particular domestic trade associations within the country of interest. Within a country, who wins and who loses from the adoption of a Codex standard? At the national level, if the domestic interests explanation dominates, one would expect that domestic producers or trade associations would be involved in promoting or opposing specific standards depending on whether they win or lose from those standards. The second category of bottom-up domestic interests are actors in government. From this point of view, international standards are not promoted by particular actors; rather, they help domestic actors in government to identify problems and solutions in food safety. Here, the main causal force lies with government actors in the countries that learn from the international system. Rather than seeing governments as adopting standards purely by assessing costs and benefits of doing so, the international standards shape the perceived interests of government actors and help set government agendas. If this explanation dominates, one would expect that what government actors consider as important is to some degree contingent upon what the CAC is considering. This explanation may be particularly important for areas involving scientific and technical knowledge, where epistemic communities may form to push for particular policy changes.
A fourth perspective on diffusion can be found in regional integration initiatives. These can be either a horizontal or a top-down force for diffusion, depending on whether they can be viewed as an interdependent decision of multiple countries or an unchanging exogenous force. Government actors in regional economic communities (for example, EAC, SADC, ECOWAS or COMESA) discuss their standard-setting activities in the context of what the regional integration initiatives require them to do. Because regional trade bodies have explicitly acknowledged Codex standards as at least one basis for harmonization, this pathway of influence is a very important one. Thus, variation in national adoption of Codex standards in this view would depend on the degree to which countries are integrated with regional integration initiatives. This approach views regional initiatives as conduits for policy transfer.

E. The Political Perspectives of Standards

It is evident that under certain conditions—in particular, when a country participates in and perceives as important a regional integration initiative that upholds Codex standards, and when there is little prior regulatory history—international standards do influence countries’ policies. In the case of food additives, the result has been to drive standards to more stringent levels than they otherwise might have been, due to the successful efforts of European states to impose their preferences on the Codex standard.

Regional integration initiatives are key to understanding the pattern of convergence since the participation of policy makers in them, can be viewed as part of a policy transfer process. Alternatively, the process can be considered one of institutional isomorphism, where institutions come to resemble those in their immediate environment. This is complementary to the world society approach. Depending on the degree to which regional integration initiatives take decisions apart from their member states, these can be either horizontal or top-down forces for diffusion.

Regulatory capitalism in the form of Codex standards is not a disinterested, objective form of regulation. Rather, it is shaped by powerful countries and actors. In this case, the European Union shaped the standard for food additives. In other areas, other countries have similarly influenced the Codex outcome. The role of politics and power in forming highly technical standards often goes unnoticed. Yet how and by whom the standards are shaped—and for what purposes—has ethical and distributive consequences. “Once clothed in technical language, such [technical] decisions lose their transparency and acquire a look of impartial credibility that resists criticism by actors lacking the necessary expertise”. Wealthy countries are shaping the international food safety regime and then encouraging poorer countries to adopt elements of it, and there are potential problems with this, similar to conclusions others have drawn regarding the global financial system. Thus, as regulatory capitalism continues to spread, conclusions about whether this is a normatively good or bad phenomenon will be highly case-specific, and power in addition to expertise should continue to be a subject of investigation.

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3.3.8 Poverty Reduction and Rural Development: Fisheries and Aquaculture as Strong Contenders

A. Introduction

Fisheries and aquaculture have an important role to play in global efforts to eliminate hunger and malnutrition through supplying fish and other aquatic products rich in protein, essential fatty acids, vitamins and minerals. Fisheries and aquaculture can also make significant contributions to development by improving incomes, providing employment opportunities and increasing returns on resource use.

Despite the significant contributions that fisheries and aquaculture make to employment, nutrition, and trade in the developing world, they are rarely included in national development policy and donor priorities. This is largely due to problems with valuation of small-scale fisheries, as policy makers often do not have access to data which reflect the importance of fisheries and aquaculture to development. The stagnation or decline of capture fishery production in many parts of the world underscores the importance of fisheries policy, however, as the current state of stocks can be at least partially attributed to the difficulties of regulating fisheries and preventing their overexploitation. Even with improvements in regulation, however, pressures on capture fisheries will remain, due to continued population growth. Further development of sustainable aquaculture and improvements in the post-harvest sector to reduce losses could help to maintain fish supply and the contribution of fish to development.

B. Employment, production and trade

While data on fisheries in developing countries are often patchy, it is nevertheless possible to identify trends in the importance of fisheries and aquaculture for developing countries, particularly in the areas of employment, consumption, and trade.

B.1 Employment

Employment in fishing and aquaculture has grown rapidly over the past few decades, increasing more than threefold from 13 million people in 1970 to over 41 million in 2004. Employment in the fisheries sector has grown more rapidly than both world population and employment in agriculture. Most of this growth is in Asia, where over 85 percent of the world’s fisherfolk live, and is largely due to the expansion of aquaculture in this period (FAO, 2006).

While the number of people employed in fisheries and aquaculture in developing countries has been growing steadily, it has been stagnant or declining in most industrialised countries. This decline has been most pronounced in capture fisheries, while employment in aquaculture has increased in some industrialised countries.

Millions of women in developing countries are employed in fisheries and aquaculture, participating at all stages in both commercial and artisanal fisheries, though most heavily in fish processing and marketing. In capture fisheries, women are commonly involved in making and repairing nets, baskets and pots, baiting hooks, setting traps and nets, fishing from small boats and canoes, and collecting seaweed, bivalves, molluscs and pearls. They are rarely involved in commercial offshore and deep-water fishing. In aquaculture, women feed and harvest fish, attend to fish ponds, and collect fingerlings and prawn larvae. Women play a major role in fish processing in many parts of the world, both using traditional preservation methods and working in commercial processing plants.

In addition to affecting food supply, the status of fish stocks in capture fisheries is likely to threaten the livelihoods of small-scale fisherfolk and traditional fish processors as competition for limited resources increases. Larger-scale operators with greater access to capital and gear are already emerging in many areas, leading to changes in the structure and location of post-harvest activities and concentrating ownership and control of resources. In India, for example,
fishing practices are changing with rising investment, and higher levels of mechanisation and motorisation are leading to greater centralisation of landings and competition over the catch. In the past, small-scale traders were able to purchase fish from local fishers at decentralised beach-based landings, sometimes accessing fish through husbands or taking the fish on credit and paying once they had sold it. The increasing centralisation of landings, however, has led to fierce competition at landing sites, favouring those with greater access to credit and infrastructure and marginalising traditional fish processors and petty traders (Béné et al., 2007).

**B.2 Production and consumption**

Data on fisheries in developing countries often do not fully account for artisanal and subsistence production, as the magnitude of the landings of these fisheries is not generally known by the responsible fisheries administration. It seems clear, however, that capture fisheries worldwide are currently being fished at or near capacity, and that further growth in fish production will come primarily from aquaculture. FAO (2006) estimates that marine capture fisheries production will remain between 80 and 90 million tons per year, and freshwater fisheries, which face environmental degradation and competition for use of freshwater resources from other sectors such as hydropower and agriculture, are unlikely to expand significantly either.

Per capita fish supply in low-income food-deficit countries (LIFDCs) (excluding China) has increased from 5.0 to 8.3 kg since 1960, due primarily to the growth of aquaculture and to increased production from inland capture fisheries in developing countries (Béné et al., 2007). In Sub-Saharan Africa, however, per capita fish supply is declining, dropping from a peak of 9.9 kg in 1982 to 7.6 kg in 2003. This is due to rapid population growth, stagnant capture fishery production, and the slow expansion of aquaculture in the region (FAO, 2006).

Demand for fish continues to increase in most of the world – in line with population growth as well as increases in consumption of animal protein associated with urbanisation and rising incomes. In developed countries, demand for high-value carnivorous species such as salmon and shrimp has also increased, largely due to income growth and urbanisation, as well as a shift in preferences away from red meat and towards fisheries products (Delgado et al., 2003).

**B.3 Trade**

A large portion of fish production is destined for export, around 40 percent of global production being traded internationally, and exports from developing countries accounting for some 60 percent of this (see Ababouch, this volume). They are now net exporters of fish to developed countries, having shifted dramatically from being net importers (over 1.2 million metric tons in 1985) over the past two decades (Delgado et al., 2003).

Over 30 percent of fishery commodity production in developing countries is destined for export, and it is an important source of foreign exchange for many countries. While industrial fishing activity continues to produce a significant portion of fisheries exports in some countries, much of the recent increase in exports from developing countries has come from small-scale fisheries. Much of this is driven by rising demand for high-quality demersal fish in developed countries. The rapid growth in contribution of fish to total export earnings in Uganda (from less than one percent in 1990 to 17 percent in 2002), for example, was based largely on artisanal fishing of Nile perch in Lake Victoria (Béné et al., 2007).

An increasing amount of trade in fish products is between developing countries, however, rather than from developing to developed countries. Demand for fish in developing countries continues to grow, due both to population growth and increased per capita consumption, while overall demand in developed countries has stagnated since 1985. While there is increasing demand for higher value fish in developing countries, low-value fish continue to make up the
bulk of fish consumed there, and they are projected to remain net exporters of high value finfish and importers of low-value food fish (Delgado et al., 2003).

International trade in fisheries products has been shown to have a positive effect on food security in many developing countries, stimulating increased production, generating foreign exchange which can be used for food imports, and enhancing the trade-based entitlements of people engaged in fishing and fish processing. Much of the discussion around the food security impact of international fish trade has focused on whether fish production for export reduces the amount of fish available for local consumption, presenting fish exports as a trade-off between foreign exchange earnings and domestic food security. Such a perspective, however, fails to take into account that foreign exchange from fish exports helps to finance imports of other foods, including fish products, and that production for export helps to raise the incomes of poor fisherfolk and people employed in fish processing, enabling them to achieve greater food security through enhanced purchasing power. In Thailand, for example, a decrease in rural poverty has been attributed to the export orientation of the fisheries sector and concomitant increase in the incomes of poor fishers. Fish processing for export can also generate employment, particularly among young women, though export-orientation in fisheries reduces the quantity of fish available to traditional fish processors (typically middle-aged women with little education), affecting their livelihoods.

C. Fisheries in development policy
The contribution of fisheries and aquaculture to development has consistently been underestimated both in national development and poverty reduction strategies and in international cooperation. There are two factors which influence the degree to which fisheries are included in development policy in a given country: the sector’s contribution to foreign exchange earnings and its contribution to food security and nutrition (measured by dependence on fish protein). The more reliant a country is on fisheries for its foreign exchange earnings and food security, the argument goes, the more likely that policy makers will recognise their importance and that this will be reflected in development policy. As farming and terrestrial livestock often both generate more foreign exchange and are perceived to make a larger contribution to food security than other renewable resource sectors such as forestry and fisheries, they generally receive much more attention in national development strategies and donor priorities.

When faced with resource allocation decisions, many governments prioritise water use for human consumption, agriculture, hydropower, and industry over inland fisheries and aquaculture. This is largely attributable to the perceived contribution of each sector to development, but also to the prevalence of single water-use systems. Encouraging multiple uses of water, however, can increase its productivity and allow for simultaneous development of several sectors. Use of freshwater for aquaculture and agriculture, for example, is not necessarily mutually exclusive, and integrated aquaculture-agriculture (IAA) systems have been shown to increase the productivity of agricultural activities on farms which have ponds. IAA ponds also contribute to the resilience of small farms, enabling them to maintain some degree of food production during droughts (Brummett, 2006).

The data problems identified in the first section also contribute to poor recognition of the contributions of fisheries to development. Since data on artisanal, subsistence and inland production, fish-based livelihoods and consumption patterns in developing countries tend to be fairly sketchy, they often under-represent the contribution of fisheries to development. Thus the perceived contribution of fish to foreign exchange earnings and food security is often lower than their actual contribution, further reducing the chances that fisheries and aquaculture will be adequately addressed in development policy.
D. Development aspects of health and nutrition

Even when consumed in small quantities, fish often comprises a nutritionally important part of many people’s diets in developing countries. It is a vital source of protein and micronutrients, and improves the quality of protein in largely vegetable and starch-based diets by providing essential amino acids. FAO (2006) has estimated that fish accounts for approximately 20 percent of animal protein consumption in LIFDCs. In some coastal and island countries (including Bangladesh, Indonesia, Senegal, and Sri Lanka), it provides over 50 percent of animal protein, and reaches 62 percent in Gambia and 63 percent in Sierra Leone and Ghana. It is a particularly important component of the diets of the poor, as it is often the most affordable form of animal protein.

Fish is also rich in iron, zinc, magnesium, phosphorous, calcium, vitamin A and vitamin C, and marine fish is a good source of iodine. Many of these vital nutrients are found only in small amounts, if at all, in staple foods such as maize, rice and cassava which make up the bulk of people’s diets in developing countries. Fish are an indispensable source of these nutrients for many people, and small low-value fish, which are largely consumed by the rural poor, provide more minerals than the same quantity of meat or large fish, as they are consumed whole, with the bones intact. Fish also contain fatty acids which are essential for the development of the brain and body, and are particularly crucial for the diets of babies, children, and pregnant and lactating women (Béné et al., 2005).

Consumption of omega-3 fatty acids during pregnancy reduces the risk of low birth weight, which is a key factor in both maternal and child mortality. These acids are also critical for the neurological development of infants, and are found almost exclusively in fish, making the consumption of fish during lactation and pregnancy especially important.

The nutritional benefits of fish consumption are also particularly important for people living with HIV/AIDS. Proper nutrition is essential for the effectiveness of anti-retroviral drugs, and fish has also been shown to contain combinations of nutrients which reduce susceptibility to secondary diseases.

E. Closing the supply gap

Though further increases in capture fisheries production are unlikely, demand for fish is projected to continue increasing due to population growth and urbanisation. This trend is likely to be particularly pronounced in sub-Saharan Africa where many capture fisheries have reached their limit, and aquaculture development is failing to keep pace with population growth. Per capita fish consumption in sub-Saharan Africa is lower than any other region, and it is the only part of the world where consumption is declining (Béné et al., 2005).

In order to meet growing global demand for fish, the further development of sustainable aquaculture and improvement in post-harvest processing deserve special attention. Most capture fisheries are being fished at or above their maximum sustainable yields, and are not projected to produce any further productivity gains. Therefore much of the increasing demand for fish will have to be met by increasing aquaculture production and reducing post-harvest losses.

Aquaculture is often easier to manage than capture fisheries, as aquaculture activities generally fall within national governance frameworks and do not face the same difficulties in resource management that transboundary fisheries do. Even fisheries which fall completely within national boundaries often face difficulties in managing levels of exploitation and controlling access, while property rights are much more clearly defined for aquaculture. Access to water is a key governance issue here, however, causing problems for landless wishing to farm fish in cages, for rice farmers wishing to abstract additional water for fish and for downstream users where large numbers of farmers wish to harvest rainwater for pond culture.
Coastal aquaculture is often carried out in publicly-owned water bodies for which there are competing demands.

E.1 The challenges facing African aquaculture
While much growth in fish production in recent years has been driven by the rapid expansion of aquaculture in Asia, it is developing more slowly in Africa. Asia and the Pacific accounted for 91.5 percent of world aquaculture production by quantity and 80.5 percent by value in 2004, while sub-Saharan Africa accounted for only 0.16 percent by quantity and 0.36 percent by value (FAO, 2006). An expansion of aquaculture production in sub-Saharan Africa could allow the region to better meet its rapidly increasing demand for fish, though there are many impediments which would have to be overcome for it to realise its full potential.

The vast majority of African aquaculture takes place at a very small scale, with over 90 percent of African aquaculture production coming from farms with one or a few earthen ponds, constructed and managed using family labour. While the ponds represent an important source of food and income for the families that have them, they have not yet been adopted on a scale capable of closing the “fish supply gap” in sub-Saharan Africa. Nonetheless, there is growing evidence of strong commercial interest in aquaculture in several countries.

Among the challenges facing aquaculture in Africa are limited access to quality seed and feed, underdeveloped credit markets, conflict over use of land and water resources, lack of access to information (both market information and information needed for the adoption of new technologies), and underdeveloped or inaccessible output markets.

E.2 Adopting an ecosystem approach to aquaculture
Like any food production system, aquaculture can have negative environmental impacts. Particularly when undertaken at a commercial scale, aquaculture places demands on land and water resources, often uses feed (including intensive formulated feeds) produced outside the immediate area, introduces alien species, may increase sedimentation or produce anoxia of local bottom sediments, and can involve the use of chemicals for disease control.

Aquaculture interacts with capture fisheries in several important ways, due both to the inputs it requires and its potential effects on the surrounding environment. Harvesting of rainwater or abstraction of river water can affect environmental flows and aquatic habitats. Fishmeal and fish oil are key components of formulated feeds used for carnivorous and omnivorous species, placing further demands on marine capture fisheries. Cage culture in coastal areas competes for space with small-scale fisherfolk, often restricting their access to the fishery, and can affect the coastal zone or lake in which it is based through the escape of farmed fish, and through sedimentation and eutrophication from uneaten feed, fertiliser, and fish waste products.

It is worth pointing out that aquaculture can also provide environmental services. For example, integrated pond-based aquaculture increases access to water for irrigation during drought periods. Seaweed, oyster and mussel farming removes anthropogenically derived nutrients released into coastal waters.

While many countries now carry out environmental impact assessments and routine environmental monitoring on aquaculture developments, these often do not take into account cumulative effects in association with other sectors such as agriculture, industrial development, tourism or hydropower. An ecosystem approach to aquaculture (EAA) could provide a more holistic approach to managing the interactions of a wide range of human activities with the natural environment. Building upon the ecosystem approach to fisheries, FAO (2006) define EAA as follows:

An ecosystem approach to aquaculture (EAA) strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and...
**human components of ecosystems including their interactions, flows and processes and applying an integrated approach to aquaculture within ecologically and operationally meaningful boundaries. The purpose of EAA should be to plan develop and manage the sector in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by aquatic ecosystems.**

This also allows for greater consideration of the social impacts of aquaculture, which are often overlooked when using a purely environmental approach. There is still a need, however, for any environmental planning approach to take into account the demands and impacts of all sectors, rather than taking an exclusively sectoral perspective, possibly through an integration of EAA with Integrated Watershed or Coastal Zone Management.

### E.3 Social impacts of aquaculture development

The expansion of aquaculture production has profound implications for labour relations, rural poverty, and class formation. While fishing is often an employment of last resort for landless poor or an activity undertaken as one component of diversified rural livelihood strategies, aquaculture requires access to capital for start-up and running costs, and thus has much higher barriers to entry than fishing in capture fisheries does. Even at a very small scale, as in the case of IAA, there is a need to buy simple tools such as shovels and buckets, as well as seed, feed, and fertiliser. Russell *et al.* (forthcoming) found that smallholder households adopting fish farming are often those who have start-up capital, raising concerns about equity. Aquaculture is also generally more profitable at higher levels of capital intensity, as larger commercial enterprises benefit from economies of scale, and compliance with often expensive environmental and documentation requirements allow greater access to lucrative export markets (Delgado *et al.*, 2003). Furthermore, aquaculture is less labour intensive than, for example, rice production, and changing from rice cultivation to fish farming can affect rural labour markets and limit employment opportunities for the landless poor.

Despite the challenges, however, aquaculture holds significant potential for pro-poor rural development. Agricultural incomes of IAA households in Malawi, for example, are 60 percent higher than non-IAA households, and their income per hectare is 133 percent higher (Dey *et al.*, 2006). Adoption of IAA by poor smallholders could therefore enable them to increase their income several times over. Aquaculture development at a larger scale could also generate increased employment opportunities for the landless poor, if undertaken alongside continued or expanded agricultural activities rather than as a replacement for them. Most importantly, however, aquaculture can play a major role in terms of food security. As discussed above, fish comprises a nutritionally key part of the diets of the poor in many parts of the world, providing essential micronutrients and relatively affordable animal protein. As global population continues to grow with little prospect of further growth in capture fishery production, increased aquaculture production could help to keep fish affordable for the poor. In many parts of Asia, for example, there is significant aquaculture production of low-value freshwater fish, primarily for domestic consumption.

### E.4 Improvements in the post-harvest sector

The post-harvest sector also provides an opportunity for both enhancing the livelihoods of the rural poor and meeting ever-increasing food needs. Post-harvest losses due to lack of adequate infrastructure, inadequate preservation technologies, and poor market access reduce revenues of fishers and traders and the overall food fish supply. In some countries in sub-Saharan Africa, an average of 30 percent of the catch is lost to bacterial and fungal infections or eaten by pests. Use of improved processing technologies such as screens against insects, improved ‘chorkor’ smoking kilns and mesh trays to elevate the fish off the ground can reduce these losses significantly, resulting in greater food security for consumers and increased incomes for processors and traders.
The post-harvest sector is also important for the poor in terms of employment, with the ratio of fishers to people employed in the post-harvest sector generally estimated at approximately 1:3. Small-scale, labour-intensive processing of fish products can greatly increase the contribution of fish production to the local economy, particularly where processing and trading facilities are locally-owned and labour rights are strong. There is also a strong gender aspect to fish-based livelihood activities, with women heavily involved in post-harvest processing and marketing, making the post-harvest sector an important one for strengthening women’s livelihoods.

F. Conclusion
Throughout the developing world, the fisheries sector provides the basis for the livelihoods and nutrition of millions of people, and constitutes a significant source of foreign exchange for many developing economies. Despite its considerable contributions to development, however, it is often not seen as a priority sector by policy makers or donor agencies, and activities such as aquaculture are frequently seen as relatively low-priority for the allocation of scarce resources such as water. This lack of attention to the sector is particularly problematic given that capture fisheries are currently being fished at capacity, and that further increases in production will have to come from expansion of aquaculture. There is, therefore, an important role for developing country governments to play, both in managing capture fisheries to prevent further stock depletion, and in regulating the development of aquaculture to ensure that it is both environmentally sustainable and pro-poor. Under such conditions, fisheries and aquaculture can realise their potential as an important and growing source of economic development in rural areas.

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Improving Governance of Aquaculture Employment: A Global Assessment (Hishamunda et al., 2014)

Aquaculture, Fisheries, Poverty and Food Security (WorldFish, 2011)

Fisheries and Aquaculture and Their Potential Roles in Development: An Assessment of the Current Evidence (Arthur et al., 2013)

Global Change in African Fish Trade: Engine of Development or Threat to Local Food Security? (Béné, 2008)

3.3.9 The Case for an Enhanced Regional Fish Trade Framework

A. Introduction

Cocker (2014) reports that fish and fishery products are important to Africa in dietary terms and also add substantially to national and regional economies through employment (Africa has 4 million fishers) and generate much needed foreign revenue through exports streams. The exports are mainly to developed nations (high value fish exports from Africa generated USD$5 billion in 2009, 5% of the global total). Fish are Africa’s leading agricultural export commodity above those such as coffee and bananas. Currently, the continent is a net importer of fish and fish products in order to supply the demand from rising populations, increasing urbanization and the continued economic growth Africa has seen over the past decade. Recent estimates for the continent put intra-African fish trade at approximately US$615million (a significant underestimate as a major factor is the high level of informal, often illegal fish trade within Africa). Aquaculture in Africa, particularly sub-Saharan Africa (SSA), has been viewed with renewed interest in recent years as a means of alleviating the supply gap which is currently filled by imports.
Aquaculture in SSA has been viewed with renewed interest in recent years and in some regions is expanding rapidly. Over time, it is therefore expected to develop and supply a substantial proportion of national/regional markets, thus reducing pressures on capture fisheries and SSAs reliance on imports. There is now a real drive to steer efforts away from earlier subsistence and production-led strategies and focus on best strategies for meeting market demand. Issues such as the minimization of post-harvest losses and ensuring the quality of product for consumers are equally important for growing an effective production sector. SSA also has the potential to supply inter-continental markets with high value, quality and safe aquaculture products (as it does now with capture fishery exports), complying with the phytosanitary, traceability and certification demands insisted upon by developed markets such as the EU.

B. Opportunities for Growth of Aquaculture and Fisheries Trade

Future fish production must be able to supply a quality product to the market in a timely manner, whether these are local, regional or international. As markets for fish farmers could be dualistic i.e. to supply local, community markets for instance and/or larger, more demanding foreign, importing customers such as supermarkets (demanding in terms of food hygiene standards, traceability and often certification requests), this could either be achieved through larger ventures or cooperative assemblages of small producers or a combination of both, instigating codes of practice and standards that ensure compliance with phytosanitary and traceability issues.

![Figure 9: Dualities in Fish Supply Chains in Developing Countries (Cocker, 2014)](image)

Increased supply and quality would enable the establishment of new fish market chains, with aquaculture products that by their very nature can be differentiated from wild caught counterparts in terms of freshness and availability. Improvements in distribution expand the market for producers and enable production volumes to be increased without immediately impacting on local prices. Conversely, up-scaling production results in economies which can allow prices to fall and the market to expand even further as the product becomes affordable to a larger proportion of the population. The more affordable aquaculture products become, the greater the health benefits for poorer consumers who have to spend proportionately more of their available income on food according to Engels Law. For example lower retail prices due to increased aquaculture production have seen per capita fish consumption double in Egypt since 1995.
Factors to be considered for growth of demand for fisheries and aquaculture products in Africa include the following (Cocker, 2014):

(a) Rising domestic and intra-African demand due to growing economies, rising populations, increasing urbanization and depleting wild fish stocks

(b) Dualities in fish quality between fish for domestic consumption and fish destined for export

(c) Fish species familiarity, availability, taste and price are very important marketing issues and paramount purchasing priorities for domestic consumers

(d) Aquaculture products are competing with domestic capture fisheries and foreign imports. There is little or no differentiation between farmed and wild caught fish

(e) Current traditional market chain traders deal with both wild caught and aquaculture production

(f) Domination of small traditional traders dictating prices and distribution particularly for small aquaculture producers who often have no option but to sell their product low down in the market/value chain

(g) Large presence of women as small-scale traders in the traditional fish marketing chains

(h) Large presence of women as small-scale processors in the traditional fish marketing chain

(i) Predominance of traditional retail/open air markets for domestic fish sales

(j) Supermarkets are establishing themselves

(k) Little/limited information dissemination and communication occurs between stakeholders throughout the current traditional fish marketing chains and producers themselves are often ignorant of current market prices and consumer demand trends

(m) Predominance of small-scale aquaculture producers

(n) Current lack of access to formal credit/finance particularly by small-scale producers

(o) Growing presence of medium/large scale aquaculture producers

(q) Little or no direct marketing is undertaken by producers, particularly small producers

(r) Little processing and/or value addition is undertaken by producers, particularly small-scale producers

(s) Poor infrastructure continues to hamper aquaculture production and marketing, including unreliable electricity supplies, cold-chain issues, poor storage facilities and lack of transportation which can all lead to potentially high post-harvest losses in quantity and quality and undermines distribution channel efficiency

(t) Opportunities to satisfy growing market demands in-country in high fish consumption areas for example via urban and peri-urban fish farms and expansion opportunities into geographic areas with lower fish consumption levels

(u) Opportunities for integrating aquaculture with agricultural systems, particularly in small-scale ventures
(v) Opportunities to expand aqua-product distribution to adjacent countries and/or export intra-Africa and/or inter-continentally

C. Fish Trade and Sustainable Development

For many developing countries, the fisheries sector represents a major source of foreign exchange revenue through trade with developed countries and through foreign fishing licence agreements. Fish exports can strengthen income and employment opportunities for local people in domestic fisheries in coastal and inland regions. However, in many countries, policy related to fish trade cannot keep pace with this rapidly growing and evolving sector. Inappropriate policy frameworks put at risk the benefits of increased trade for national development and local communities. Weak governance in the presence of expanding fish trade could aggravate overexploitation of vulnerable fish stocks and diminish access of local markets through traditional trading links and market chains.

Table 10: Factors that Influence the Contribution of Fish Trade to Development in West and Central Africa (FAO, 2007)

<table>
<thead>
<tr>
<th>Historical Context</th>
<th>Risks</th>
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<tbody>
<tr>
<td>• well-established local, national and international fish producing areas, markets and trade routes</td>
<td>• production sources and markets at all levels are subject to unpredictable changes and shocks (e.g. weather, fish stock productivity, market changes)</td>
</tr>
<tr>
<td>• increasing demand for fish across most markets</td>
<td>• risks can be reduced in more diverse trading conditions – e.g. multiple suppliers, stocks, markets, transport options</td>
</tr>
<tr>
<td>• traditional trade between Africa and Europe</td>
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<tr>
<td>• Africa now a key supplier; Europe a key market but changing patterns</td>
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<tr>
<th>Actors</th>
<th>Impacts</th>
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<tr>
<td>• wide range of stakeholders with evolving linkages and market power; usually highly competitive</td>
<td>• contribution to gross domestic product (GDP) and to wider trading options</td>
</tr>
<tr>
<td>• fish trade requires specific business skills and knowledge to deal with changes and manage risk</td>
<td>• local 'winners' and 'losers' through effects of competition, power and economic redistribution</td>
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<table>
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<tr>
<th>Supply Factors</th>
<th>Regulation</th>
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<tbody>
<tr>
<td>• raw material access, post-harvest quality and careful handling of perishable products</td>
<td>• national and international laws; challenges of compliance</td>
</tr>
<tr>
<td>• basic infrastructure: roads, shipping, air transport</td>
<td>• leading role of the World Trade Organization (WTO)</td>
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<td>• adequate and timely flow of information on supply, demand and prices</td>
<td>• erosion of trade preferences for developing countries</td>
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<td></td>
<td>• quality and certification are increasingly important</td>
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<tr>
<th>Trade Mechanisms</th>
<th>Change</th>
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</thead>
<tbody>
<tr>
<td>• selling and buying goods (fish products) and services (fishing services) and adding value to them</td>
<td>• rapidly changing trade patterns: new products, markets,</td>
</tr>
<tr>
<td>• direct and indirect contribution to income, employment, food supply and distribution</td>
<td>• participants and regulations with different impacts on different countries</td>
</tr>
<tr>
<td>• need effective and reliable financial and regulatory mechanisms</td>
<td>• unknown impact of trade expansion on fish resource sustainability in conditions of weak fisheries management</td>
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<th>Wealth/Profit</th>
<th>Policy</th>
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<tr>
<td>• attracts entrepreneurial activity and diverse investment at all operational levels</td>
<td>• vital for harnessing fish trade for development by encouraging wealth generation and widening opportunities (e.g. enabling trade and market access)</td>
</tr>
<tr>
<td>• reinvestment of generated income and profit can take place in the sector and the wider economy</td>
<td>• opportunities to use wealth generated for positive development investments in and outside sector</td>
</tr>
<tr>
<td>• potential redistribution benefits through taxation and government investment</td>
<td>• limit negative impacts, manage risks and ensure future opportunity and equitable benefit sharing</td>
</tr>
<tr>
<td>• negative aspects include rent-seeking by individuals/groups; asymmetric information and access to capital</td>
<td></td>
</tr>
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</table>
D. Establishing an Enhanced Regional Fish Trade Framework

Within this overall context, there are three major areas in which to identify issues and prioritize policy interventions to maximize the contribution of fish trade to development and minimize potentially negative distributional and sustainability impacts. These cover trade mechanisms, economic and livelihood impacts and trade policy and change management.

![Diagram: Establishing an Enhanced Regional Fish Trade Framework](image)

Figure 10: Establishing an Enhanced Regional Fish Trade Framework

D.1 Trade Mechanisms: Intra-African Trade

Consumer issues which need to be addressed for trade to take place include:

**Food safety**: primarily based on recognized standards for products, hygiene and processes
The ‘SPS’ and ‘TBT’ Agreements: Forming the basis for nations to establish food and safety regulation for plant and animal products intended for trade.

HACCP: Sanitary control systems are now applied by many importing countries to the whole supply chain, such as the HACCP system.

Traceability: A traceable ‘chain of custody’ is vital in applying SPS and related standards and another major issue to exports.

Certification and Branding: In addition to public regulations of food safety and quality, a range of related standards have been introduced by the private sector. Branding is the independent process through which a company promotes certain quality attributes in order to differentiate a product, process or service from others in the marketplace and generate a preferential purchasing attitude towards that brand/logo, thus create loyalty and premium prices and/or stronger access to specific markets.

BMPs and GAPs: Adoption of Better Management Practices (BMPs) – focusing on environmental and social issues, and Good Aquaculture Practices (GAP) – focusing on food safety aspects.

Numerous barriers exist to intra-African trade including cumbersome import and export procedures, border crossing delays, corruption, limited Information and Communication Technology (ICT) usage, inconsistent electricity supply, lack of storage facilities and infrastructure. Major exporters such as Mauritania and Senegal have overcome some constraints, i.e. domestic supply, by investing in infrastructure and fishing fleets. Other countries still have unrealized fish trade potential (Guinea, Liberia, Sierra Leone).

D.2 Economic and Livelihood Impacts

Fish trade policy in African countries must cope with the dynamic nature of global market opportunities and trade patterns. Declining domestic supplies, rising incomes and changing consumer preferences increase the gap in fish supplies in developed countries. This situation generates new opportunities for developing countries to successfully engage in international fish trade. Studies project an increase in demand in developing countries triggered by increased purchasing power and urbanization. Despite the guidance of international trade theory – indicating that any trade is better than no trade – concerns about increased trade persist, especially in situations where domestic food supplies are potentially threatened. The key question is whether emerging trade in fish with Asia is a threat to local people in Africa or an opportunity for benefits from free-trade and the globalization of fish markets.

The impact of foreign competition on regional and local fish trade in Africa is growing. Small pelagics (sardinellas) — an important fish for human consumption in the region, are traded through three routes: local, national and regional trade based on small-scale fisheries, regional trade from industrial fisheries and international trade based on distant water fleets under fishing agreements. Trade with Asia – particularly China – is increasing. This could affect fish supplies in local markets by reducing the supply of inexpensive fish in local markets. There are concerns that this would have negative impacts on the food security of poor people.

D.3 Trade Policy and Change Management

Fish trade can contribute to development, primarily through the trade mechanism for wealth generation. In turn, wealth contributes to economic growth, for example, through reinvestment in other parts of the economy. In order for this mechanism to function properly, an appropriate policy framework and policy process is required. Policy-making processes for economic development and poverty reduction have often overlooked the fisheries sector and fish trade,
indicating a general weakness in the policy process. Fisheries and trade-related government institutions often lack capacity, finances and support from central government to develop strong policy processes to support the contribution of fish trade to development, evaluate investment options and make appropriate decisions, including investments in new forms of trade.

Trade policy and development-related policies often lack coherence. For instance, while free trade is promoted as a mechanism to generate wealth and economic growth based on empirical evidence from countries such as the ‘Asian Tigers’, there is also concern on the impact of liberalized trade in other countries. Free trade can have a negative impact on the livelihoods of marginalized and poor groups. The key question is whether liberalized trade can be pro-poor under conditions of weak governance and lack of policy coherence. A strategic long-term vision on the role of fish trade, supported by effective fisheries management systems, is needed.

A conflict exists between fish trade policy and fisheries management policy due to trade-offs and limitations of unilateral actions. Often there is a case for limiting fish trade development unless adequate fisheries management systems are in place to offset trade-driven overexploitation. In the short-term, it will be necessary to prioritize certain actions such as limiting trade in overexploited or vulnerable fish stocks.

To fully exploit the potential of fish trade to contribute to development in Africa at all levels, effective implementation of trade and fishery management policies will be decisive. If governance is weak, the ‘losers’ in fish trade are likely to be the poor and marginalized. Fish trade policies and actions which ignore this problem, e.g. by capitalizing on trade liberalization but failing to compensate with other livelihood inputs or opportunities, do not add effectively to pro-poor growth.

Faced with limited information on the fish trade and its economic and social impacts, specific policy prescriptions are inappropriate to the highly varied sectoral and national contexts in West Africa. Given these current information constraints, appropriate policy actions by governments, public and private-sector actors in trade, development and fisheries management can include:

**D.4 Roadmap for Regional Fisheries and Aquaculture**

Priorities include the following:

- Developing sector-wide strategies at national level for expansion and intensification of aquaculture
- Harnessing the opportunities for SME development provided by expanding domestic markets for fish, including growing urban demand
- Harnessing the opportunity of expanding export markets for high-value products to increase investment in African aquaculture production and processing
- Encourage formation of national, sub-regional, regional and international networks for information exchange
- Strengthen producers’ understanding of aquaculture socio-economic aspects (business plan, record keeping, etc.) and assist them with business plans for aquaculture
- Provide public sector support to private entrepreneurs in setting up the technological infrastructure required for aquaculture (e.g. cold chains, storage facilities, etc)
The removal of market barriers through policy reviews, support to small and medium scale aquaculture enterprises to meet market demand and standards, and improving market information systems are crucial. There is now a clear trend towards the establishment of various types of standards that can be measured, monitored and certificated by independent bodies to provide producers with clear guidelines and consumers and market chain participants with confidence in the environmental or social provenance of the product. Certification and quality assurance schemes are needed with brand development and marketing favourable to aquaculture products from smaller producers.

**Figure 11: Aquaculture Markets and Marketing: A Roadmap (Cocker, 2014)**

When it comes to actually aiding and encouraging the marketing of aquaculture production governments should:

- Make available information to producers and consumers through newspapers, newsletters, radio or other ICT media

- Protect local producers against unfair foreign competition (via imports) provided that protective measures are permissible within the international trade conventions/agreements

- Provide basic marketing infrastructure, such as roads and communication channels

- Assist producers in promoting aquaculture products in order to stimulate demand through agricultural fairs and other such opportunities

- Encourage commercial producers to develop market channels which can be accessed by smaller producers
- Prepare, publish and regularly monitor guidelines on quality standards of aquatic products to protect public health as well as to improve the acceptability of aqua-products

Aquaculture growth has been (and will continue to be) driven by rising demand from growing and urbanizing populations, stagnating supplies from capture fisheries, investment in education and technology research, a dynamic private sector and high levels of public investment in infrastructure to support agricultural development. By improving production, processing and access to regional and global markets through improved policies and investments infrastructure, quality control, capacity, MISs, and sector management, SSA aquaculture, will see substantial growth and sustainable production.

References
Making Fish Trade Work for Development and Livelihoods in West and Central Africa: Policies Linking Trade to Fisheries Management (FAO, 2007)


3.3.10 Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa

The overall purpose of the Policy Framework and Reform Strategy for Fisheries and Aquaculture is to facilitate transformation of Africa’s fisheries and aquaculture for food, livelihoods and wealth. Accordingly, the Policy Framework and Reform Strategy is intended to:

1. elaborate and make explicit essential guiding principles for good governance of Africa’s fisheries for increased coherence and coordination of the sector
2. assist AU Member States, RECs and RFBs to develop realistic fisheries and aquaculture policies by suggesting standards and best practices to the sector’s benefits to AU member states, in terms of food security, employment and income
3. help facilitate regional collaboration and integration in shared fisheries and aquaculture resources management
4. provide appropriate guidance on how to implement reforms for fisheries and aquaculture development
5. facilitate ratification and/or adoption of appropriate provisions in international fisheries management instruments
6. facilitate advocacy for increased investment in the fisheries and aquaculture sector

The key references to sustainability are those which address (i) Legal institutional framework; (ii) Social wellbeing; (iii) Economic and livelihood sustainability; and (iv) Environmental sustainability

Institutional Reforms
The PFRS recognizes that the regulatory and governance framework is characterized as ineffective and of need for reform in many countries. The PFRS seeks to establish national and sub-national governance and institutional arrangements that ensure that the societal contribution generated by Africa’s sectors have the greatest impacts at the most appropriate level.
Social Aspect
The PFRS envisions Member States moving from open access fisheries to user rights-based fisheries as a key element in increasing societal benefits from the sector while ensuring ecological sustainability of the resource. Member States are invited to define and design various suites of user rights-based fisheries management that take into account the geographical scope, socio-cultural context and nature of the fisheries, and minimize negative impacts to vulnerable groups and ecosystems.

Economic and Livelihood Sustainability
The PFRS recognizes the abundance in Africa of rich and diverse fisheries resources, both marine and inland which together generate significant economic benefits to the continent in terms of revenues, food and livelihoods. Part of the policy objectives of the PFRS include the following economic and livelihood sustainability aspects:

(i) Development of sustainable small-scale fisheries by improving and strengthening the contribution of small-scale fisheries to poverty alleviation, food and nutrition security and socio-economic benefits of fishing communities and beyond.

(ii) Realizing the full potential of the aquaculture sector to generate wealth, social benefits and contribute to the development of the African economy by jumpstarting market-led sustainable development strategies.

(iii) Promoting responsible and equitable fish trade and marketing by significantly harnessing the benefits of Africa’s fisheries and aquaculture endowments through accelerated trade and marketing.

Environmental Sustainability
The PFRS expresses concern on the current unsustainable exploitation of fisheries resources, noting that many resources are in a critical state for a number of reasons, including overcapacity and effort, uncontrolled use of illegal practices, over-exploitation and environmental degradation including mechanized trawling in inshore and protected areas and pollution. The PFRS also notes that fisheries policies are expansionary with emphasis on tonnage landed rather than extracting higher values by processing and value addition. Coastal resources are under growing fishing pressure by both mechanized trawling and small-scale fisheries operators. Thus the PFRS advocates the adoption of policies and measures which promote conservation and sustainable resource use.

References

Regional Assessment of Fisheries Issues, Challenges and Opportunities for Eastern Africa Region: Toward the Formulation of the Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa (Mwima, 2012)

The Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa: Creating a Conducive and Enabling Environment for the Fish Sector to Create Equitable, Social and Economic Development in Africa (AUC-NEPAD, 2014)


Limits of Governability: Institutional Implications for Fisheries and Coastal Governance (Jentoft, 2007)
3.3.11 Securing Africa’s Fisheries Resources for Development: Marine and Shared Water Resources (Stopping the Looting)

A. Introduction
Many African States with fisheries resources have demonstrated unmitigated abilities to manage these resources on a sustainable basis. Major problems experienced in African fisheries arise from: illegal, unreported and unregulated (IUU) fishing; overfishing and degradation of the fisheries resources.

This section is intended to highlight the IUU problem and its effects as a means of creating a strong background to inform the development of good practices and credible sustainability criteria for sustainable fisheries. Experiences from the past standardization initiatives have indicated that many standardization experts underestimate the IUU problem, sometimes considering as constituting a barrier to fisheries trade. Examples of the current problems are intended to reinforce the section and provide avenues for sustainability principles, criteria, indicators and verifiers.

B. Illegal, Unreported and Unregulated (IUU) Fishing
The threat posed by illegal, unreported and unregulated (IUU) fishing is widely recognized by the international community (RoNam, 2007; OECD, 2004). The IUU fishing problem affects both domestic waters and the high seas, and all types of fishing vessels, regardless of their size or gear.

But a fundamental question is – why does IUU fishing happen at all? We all know the answer, unless we like to pretend not to! There exists a plethora of excellent and fully available legal and institutional instruments such as the UN Fish Stocks Agreement, the Compliance Agreement, as well as voluntary instruments such as FAO’s Code of Conduct and the various International Plans of Action. Many other States, spent precious time and resources developing these! So then, why does this rape of the sea continue? Why are IUU vessels still able to offload at ports under the noses of certain port states and find lucrative markets for their illicit cargoes? The answer is simple – it is because fishermen, vessel owners, governments and international bodies have to date failed to stop it. In particular, it is because of a lack of political will to tackle the problem. We should control our vessels and nationals. IUU fishing is not an accident – it is carefully planned and, unfortunately, tolerated. Those who finance it make great profits. Some may have high contacts in the right places. As a result, some States continue to offer ports of convenience. Again, there must be real political commitment to stop it.

Many states have signed up to laudable and prudently crafted international conventions, agreements and arrangements. It is however a pity that we are simply failing to meet our obligations to such instruments. But why is this? It seems that we agree on these plans and instruments just as a formality, a diplomatic nicety, but that’s all! It would appear that individual states, be they coastal, flag or port states, are the main culprits for allowing IUU fish to be landed in the first place. Why should the political leaders of this world abdicate from their responsibilities? We can talk and develop prudent and well-intended plans and instruments to our heart’s content, but if real political will is lacking for implementation, then we are all wasting our time, and the rape will continue unabated!

One might reasonable question whether States will not abuse and disrespect voluntary instruments such as the FAO IPOA on IUU fishing, given that so many are after all failing to abide to their legally-binding duties under international instruments.

C. Defining and Categorizing IUU
IUU or illegal, unreported and unregulated fishing is fishing that is conducted contradictory to legal conservation and management measures currently in place around the world. The FAO
International Plan of Action to prevent, deter and eliminate illegal unreported and unregulated fishing FAO IPOA-IUU (FAO, 2002) contains the accepted definitions:

**C.1 Illegal fishing refers to activities:**

(i) conducted by national or foreign vessels in waters under the jurisdiction of a state, without the permission of that state, or in contravention of its laws and regulations;

(ii) conducted by vessels flying the flag of states that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the states are bound, or relevant provisions of the applicable international law; or

(iii) in violation of national laws or international obligations, including those undertaken by cooperating states to a relevant regional fisheries management organization.

**C.2 Unreported fishing refers to fishing activities:**

(i) which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations; or

(ii) undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.

**C.3 Unregulated fishing refers to fishing activities:**

(i) in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, or by those flying the flag of a state not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or

(ii) in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with state responsibilities for the conservation of living marine resources under international law.

**D. Dimensions of IUU**

(1) unregulated fishing takes place in nations that lack the resources to establish fisheries laws or monitoring, including the monitoring and supervision of foreign ships licensed under unfavourable agreements;

(2) some unreported fishing stems from a lack of scientific data collection; and

(3) while other unreported catches conceal illegal activity.

These three dimensions of illegal fishing are a major threat to the oceans, consumers and seafood businesses around the world.

**E. Contributing Factors to IUU**

**E.1 Too many fishers chasing too few fish:** Overcapacity in fishing — The fishing industry has too much capital invested in vessels that it must operate to realize a return. More and more boats remove more and more fish, not allowing for their reproductive needs.
Fish are being caught younger, some being harvested before they can reproduce. Some commercially targeted fish require only a few years to reach a reproductive age while others may take more than 30 years. The result of this is the catch per unit effort (CPUE) has gone up, meaning more effort is being expended to catch fewer available fish. Therefore, in an era of overfished fish stocks and substantial excess fishing capacity, IUU fishing is recognized as a major threat to the long term sustainability of the world’s oceans.

E.2 **High and growing demand for seafood:** As world populations continue to soar, the demand for seafood, an attainable protein resource, increases, and fisheries stocks are harvested beyond their ability to sustainably reproduce. “Fishing down the food chain” is the result. Fish that were previously discarded as “trash fish” are now fisheries targets. While aquaculture is one potential measure to meeting high consumer demand and reducing soaring wild harvest levels in the future, the gap between supply and demand continues to widen.

E.3 **Highly profitable:** IUU fishing is highly profitable so a strong economic incentive exists to participate. It is simply more “expensive” to be a responsible fisher in the global market. The complexity of the fishing industry and the many levels of organization involved leave it vulnerable to the influence of organized crime and corruption. Fishing vessels may also be used in activities such as drug or human trafficking.

E.4 **Weak Enforcement:** Many countries do not dedicate sufficient enforcement resources to fight illegal fishing and lack capacity to prevent trade of stolen fish. Even vessels that have been blacklisted for illegal fishing activities by international organizations are intercepted at port only 25 percent of the time. Lack of government oversight and resources, poor enforcement and corruption all contribute to the failure of fisheries enforcement. Reviewers of illegal fishing and compliance reform in South Africa specifically noted budget cuts, including a two-thirds decline in natural resources agency staff over the course of a decade, which prevented South African officials from conducting any visible policing.

E.5 **Few Laws:** Some fisheries are not bound by any law at all. Authorities can only carry out enforcement when their nation provides regulatory and legal backing, including adoption of international conventions. Unregulated fishing may also include fishing in remote locations or by seasonal participants who are not part of a local community. Remote locations include the majority of the ocean’s waters that are beyond national boundaries, known as the high seas. There is no designated police force responsible for the high seas, and the laws binding fishing and other activities in international waters are minimal. In a notorious chase, an Australian patrol boat pursued a Chilean sea bass fishing vessel across the high seas for 4,000 miles – yet this kind of enforcement is the exception rather than the rule. Sections of the ocean are managed with varied success by “regional fisheries management organizations (RFMOs)” which include Antarctica’s Commission for the Conservation of Antarctic Marine Living Resources. In one study, half of ports visited by known illegal vessels were located in nations that belong to a regional fisheries management organization, though these visits did not always lead to enforcement action. The effectiveness of RFMOs is limited by the political will, regulations and capacity of participating nations, suffering the same weaknesses as the United Nations.

E.6 **The Shell Game:** Illegal fishing is a shell game, with constantly moving vessels that change names to stay ahead of enforcement authorities. When the ship returns to port, fraud, bribery, false documentation and money laundering facilitate the sale of stolen seafood. Finally, some of the most valuable illicit catches tap into organized crime networks for international distribution. Fraud, crime networks and the lack of
government controls or traceability systems make it easy to distribute stolen seafood around the globe.

**E.6.1 Fake IDs for Fish:** Flags of convenience are notoriously used to cover up crimes committed at sea. The United Nations Law of the Sea requires that all vessels fly their national flag while on the high seas. Every vessel is required to be registered in its home country and issued an identification number and documents for the purposes of law enforcement and safety at sea. The state of registry is known as the “flag state” and linked to the vessel through its owner, manager or nationality. Pirate vessels deliberately evade policing efforts by hiding their flag, identity and ownership. This deception can be as simple as not flying a flag, or covering its name and registration while conducting illegal activity. Panama and other countries began allowing non-nationals to fly their flags for a fee in the early 1900s in response to U.S. Prohibition laws against alcohol. Ever since then, countries in need of foreign income compete for ship registration fees and have neither the incentive nor capacity to enforce regulations that ensure safety at sea, environmental, labour and other standards. Illegal fishing vessels use flags of convenience like a fake ID to conceal stolen fish and reduce liability for the owners if the vessel is captured. Illegal vessels also register in international tax havens, through front companies or joint ventures and frequently change their registration to new countries. Vessels registered under flags of convenience do not necessarily have nationals from that country as owners or crew and may never visit the country issuing the flag. During the 1990s and 2000s, long-standing flags of convenience from Panama and Belize were joined by flags from Togo, Equatorial Guinea, Mongolia (landlocked), Russia, China and North Korea among others, as suspected criminals continually sought new places to hide. Fraudulent identities also extend to shipping manifests and catch documents.

**E.6.2 Mixing Fish at Sea:** One of the most common ways that stolen fish enter mainstream seafood trade is by mixing legal and stolen catches together at different steps along the supply chain. Some countries require fishing vessels to report how much fish they catch, where it is caught and other details to monitor compliance with fishing laws. By mixing in stolen fish, they then take on all of the documentation of the legal fish and are effectively laundered. Transfer of fish at sea, known as trans-shipment, is one of the ways that legal and stolen fish are combined. Refrigerated cargo vessels collect catches from many different fishing vessels. Because they do not catch fish, cargo vessels are exempt from catch documentation and monitoring and provide a gap in the chain of custody.

**E.6.3 Mixing Fish in Aquaculture Pens:** Transfer through aquaculture facilities provides another way to mix stolen fish in with legal fish. Bluefin tuna ranches in particular have been identified as a place where undersized fish are accepted from fishing vessels and exact numbers of fish are not reviewed by inspectors, facilitating misreporting of catches. Tuna ranches are aquaculture facilities where wild-caught tuna, often juveniles, are kept in pens until they reach a marketable size.

**E.6.4 Corruption and Bribery:** Corruption and bribery of authorities can happen anywhere seafood is being inspected. When government observers are on-board fishing vessels, they are vulnerable to attacks, harassment and bribery. Individual relationships between fishing businesses and local officials can develop over time, leading to tolerance of illegal activity, bribery and collusion. Stolen fish can move with the assistance of fees paid to local officials or through gangster-controlled transportation networks. Institutionalized corruption can trickle through an agency or corporation. Pirate fishing operations forge or alter paper catch documents, bribing inspectors to accept entry of stolen fish as legal product. Customs and border patrols are also
vulnerable and have in some cases have accepted bribes, signed off on blatantly false catch documents or allowed stolen seafood to enter without proper documentation.

F. Effects of IUU

IUU fishing can have far reaching consequences. Some effects include the following:

(i) **Unsustainable harvest of fish stocks and other marine wildlife**: IUU products often come from fisheries lacking the strong and effective official conservation and management measures. IUU fishing most often violates conservation and management measures, such as quotas or bycatch limits, established under international agreements. By adversely impacting fisheries, marine ecosystems, food security and coastal communities around the world, IUU fishing undermines domestic and international conservation and management efforts. Furthermore, IUU fishing risks the sustainability of the official industry.

(ii) **Destruction of marine habitats and loss of fish for future harvest**: IUU fishing often raids officially designated marine parks hosting vulnerable species. Stiles *et al.* (2013) states that pirate fishermen often target the richest and most vulnerable ecosystems in spite of efforts to protect them and cites cases from Australia, Thailand and Guinea Bissau.

(iii) **Loss of nutrition and food safety**: The conditions on ships engaged in IUU fishing often do not meet safety standards and pose food safety and health hazards. IUU fishing also deprives coastal communities of access to fish proteins from their diets.

(iv) **Loss of income and employment for legitimate fishers**: IUU fishing activities reduce the available stocks to local communities and negatively impact incomes and employment opportunities.

(v) **Deplete local, and potentially global, fish stocks** to the point where they become commercially unviable or even push them to the brink of extinction.

(vi) **Undermine labour and safety standards**: Use of unsafe vessels prone to sinking in the seas; unsafe working environments compared to onshore regulations and practices with some akin to medieval era (Stiles *et al.*., 2013);

(vii) **Distort markets of legally harvested fish**: IUU products are routinely low priced since the illegal operators do not meet the same environmental or sanitary standards. This undercuts bottom-lines for legitimate operators by as much as 10 to 15 %. The targeting of overfished species reduces the chances of recovery and can lead to fisheries industry collapse. Cracking down on illegal fishing can boost the economy, restoring profitability to the fishery. By eliminating illegal small-mesh nets in Guinea-Bissau, profits for other fishermen could increase between 50 and 100 percent.

(viii) **Contribute to the loss of economic stability in developing coastal nations**: Foreign vessels often perpetrate illegal fishing in the waters of developing countries. Plundering this critical food supply can bankrupt local fishing businesses and stall long-term economic growth. In Somalia alone, illegal, unreported and unregulated fishing removes $300 million from the national economy each year. West Africa is especially vulnerable to illegal fishing by foreign fleets, in addition to heavy fishing pressure from officially sanctioned foreign vessels. Fishermen in Cameroon report wanton destruction to artisanal
fishing gear by illegal trawlers from China and the EU (Belhabib et al., 2015; GreenPeace, 2015), who also overexploit coastal fisheries. The combined losses for artisanal fishermen in West Africa due to poachers represent nearly 35 percent of their total catch.

G. Stopping the Looting of African Fisheries

G.1 How can the problem of illegal fishing be stopped? Effective at-sea enforcement will require much greater investment by individual nations in their detection and patrolling capacity, prosecution and penalties against poachers. In China’s fisheries, the number of violations dropped from the 1990s to the 2000s after modest increases in both penalties and enforcement for illegal fishing. Another enforcement study predicted that an increase in the chance of being caught is even more likely to prevent fishing crime than a similar increase in fines. In addition to at-sea enforcement, more systemic concerns must also be addressed to stop illegal fishing. Pirate fishing happens quickly, sometimes in a few hours, making detection by law enforcement even more difficult. The actual fishing is then followed by days to months of elaborate transactions designed to disguise the origins of stolen fish. Each fish is shuffled and relabelled many times in the black market to break any obvious links to the scene of the crime. By the time stolen fish arrives on consumers’ plates, its true identity is a mystery. The global problem of pirate fishing involves the “entire range of economic transactions associated with catching fish and bringing them to market” and will require a suite of reforms in fisheries management. Harmful government subsidies currently distort the fishing fleet, propping up corrupt businesses involved in illegal fishing and inflating the total number of vessels beyond what can be sustained by the world’s fish populations. These subsidies must be redirected to transition the fleet toward a sustainable future.

There is a wide range of possible measures that can be undertaken to address the problem of IUU fishing. These will need to cover legal, institutional, economic and social dimensions and will require the involvement of multiple players in the national, regional and international fisheries sectors. Determining the cost-effectiveness of alternate approaches to addressing IUU fishing problems should be undertaken to help identify priorities amongst the possible options so that the best results can be obtained from the limited resources that are available to national governments and international organisations.

G.2 Seafood Traceability Deters Illegal Fishing: Industry and government initiatives to stop illegal fishing are increasingly focused on traceability — tracking seafood from boat to plate. Despite increased at-sea enforcement, it will always remain a challenge to catch poachers in the act of illegal fishing. However, traceability provides an opportunity to catch poachers each time stolen seafood is sold or transported. It may be intercepted at the dock, in the warehouse for processing and freezing, at the airport customs desk and all along the distribution channels for seafood. The European Union is currently implementing regulations to ensure that seafood imports are fully documented and legally caught. Similar catch documentation is already in place elsewhere and being refined for the fisheries with the most illicit activity, including bluefin tuna and Chilean sea bass. Experience from the Chilean sea bass traceability system emphasizes how important it is for traceability to include the entire supply chain across all fishing gears, products and jurisdictions. This includes the need to ban any imports that do not participate in traceability. Additional lessons learned include the need for centralized data and surveillance systems, online documents and advance notification of landings to allow inspectors to verify the catch. The U.S. has no traceability requirements for domestic or imported seafood and few regulations for imports or catch documentation. Additionally, the majority of U.S. seafood imports are
neither inspected nor labelled with basic information as to when, where and how the fish was caught.

(1) **Full chain traceability of seafood:** Tracking seafood from boat to plate is essential to keep illegally caught fish from entering the U.S. market. Traceability requires documentation to follow the fish through the entire supply chain. In order to stop flow of illegal seafood products, a traceability system must be transparent and verifiable. Frequent inspections confirming the identity of seafood products is critical to the success of any documentation scheme.

(2) **Global information systems:** A global fishing vessel database is needed to connect existing vessel registers maintained separately by different governments and regional fishery management organizations. Though global vessel identifier numbers are issued by the International Maritime Organization, these numbers focus on shipping and are not currently required for fishing vessels. The High Seas Task Force identified information-sharing between agencies as a critical gap in intelligence currently exploited by illegal operators to evade enforcement. A minimum standard must be established for vessel and catch documentation to facilitate information sharing across jurisdictions and through the supply chain.

(3) **Trade flow analysis:** Patterns in trade and financial flows that indicate suspicious activity could be applied to identify pirate fishing, similar to their use in anti-terrorism efforts. Identifying critical points in the supply chain where trade flow analysis will help will assist in directing enforcement interventions.

(4) **Cooperation between authorities:** Pirate fishing sometimes escapes detection due to overlapping jurisdictions within the U.S. government and between member countries of regional fishery management organizations. As recommended by the Government Accountability Office report on seafood fraud, fighting fraudulent fish requires increased sharing of information and inspection resources between the Food and Drug Administration, Customs and Border Patrol and the National Oceanic and Atmospheric Administration. Most cases where pirate vessels are apprehended on the high seas have involved cooperation between authorities from several different countries.

G.3 **Flag State Actions:** Links between flags of convenience and tax havens have been established and a more concerted approach towards both could be undertaken. There is a need to improve transparency on the procedures and conditions for re-flagging and de-flagging. More countries could usefully investigate the possibilities for applying extra-territorial rules for their nationals. The penalties for IUU fishing offences should be significantly increased and harmonised between jurisdictions.

G.4 **Port State Actions:** The development of minimum guidelines for port state controls and actions against IUU fishers, particularly with respect to the use of prior notice and inspection requirements (including health and safety conditions), should be encouraged. The harmonisation of these controls and actions should be a priority. There is a need to ensure a broader use of port state control measures including inspections, preventing access to services and goods of IUU vessels. There needs to be an agreement to make it illegal to tranship, land and trade in IUU fish. There is also a need to improve the monitoring of the provision of at-sea services and transhipment of fish and fish products.

G.5 **Coastal State Actions and International Trade Responses:** It is necessary to augment monitoring, control and surveillance capacities and improve fisheries management across the board, but in particular in developing countries. Improving and
extending the use of catch and trade documentation schemes could help provide additional information on IUU fishing activities. Fair, transparent and non-discriminatory countermeasures should be adopted, consistent with international law, against countries that do not comply with the conservation and management measures adopted by RFMOs, or fail to effectively control the vessels flying their flag, in order to ensure they comply with the conservation and management measures adopted by RFMOs. Countries should identify the area of catch, name of fishing vessels and their past history (of name and flag) in order to collect information necessary for better fisheries management and elimination of IUU fishing.

G.6 **RFMO Actions:** Strengthening the mandate and role of RFMOs and RFBs, in particular their possibilities for tracking IUU fishing, is an important requirement. There is a need to improve information sharing and co-operation among RFMOs, particularly in terms of linking and integrating their data on IUU fishing activities. More RFMOs should consider publishing lists of companies and vessels engaged in high seas IUU fishing activities and lists of vessels that are authorized to fish. The use of positive and negative lists of IUU fishing vessels and companies is strongly encouraged in this regard. The creation of a global record/register of authorised fishing vessels that are technically capable of engaging in high seas fishing should be considered.

G.7 **International Co-ordination:** Resources matter: more technical and financial resources are needed for capacity building, in particular in the developing states, for monitoring, control and surveillance, and in all activities to combat IUU activities. The international community should move to ratify relevant international treaties on labour and working conditions in the maritime sector in order to strengthen international hard and soft laws to protect fishing crews in general. Improved monitoring of foreign direct investments (out-going and in-coming) in the fishing sector will assist in tracking potential IUU fishing operations. Work should be undertaken nationally and multilaterally to lift the veil of corporate secrecy surrounding the companies undertaking IUU fishing activities and related services. Partnerships between public authorities and businesses offer important scope in the fight against IUU fishing. In this regard, the OECD Guidelines for Multinationals offer some possibilities that could be followed-up by national regulatory authorities. A major effort is required, in particular by regional fisheries management organisations and market countries, to collect and disseminate relevant information. The efforts already underway to improve information at all levels and mechanisms to share information need to be supported and strengthened.

G.8 **NGO and Private Sector Actions:** Whenever possible, governments should consider bilateral consultation with businesses engaged in IUU activities to determine if alternative means of getting IUU vessels out of the business can be found. There should be continued efforts to communicate the IUU problem, for example through promotional/educational campaigns with the market, including intermediate buyers, processors, distributors and consumers. Such activities will help raise awareness of the problem and improve the knowledge of the social, economic and environmental consequences of IUU activities. Industry and NGOs should be encouraged to continue to self-organise their response to IUU fishing and information collection.

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*Euros vs. Yuan: Comparing European and Chinese Fishing Access in West Africa* (Belhabib et al., 2015)

*Fish Piracy: Combatting Illegal, Unreported and Unregulated Fishing* (OECD, 2004)
3.3.12 Ecosystems for Water and Food Security: Security of Watersheds

A. Introduction

Fisheries and aquaculture activities take place within the aquatic environment which is a dynamic ecosystem hosting a large number of live forms. Gradual natural weathering of watershed rocks and soils are carried by runoff into the aquatic environment and their accumulation can impact the quality of the water and the aquatic environment in which the fish grows. Anthropogenic activities can accelerate the flow of materials into the aquatic environment, creating conditions for multiplication of toxins and accumulation of heavy metals to unsafe levels. Anthropogenic activities contribute elevated levels of heavy metals such as mercury, copper, cobalt, chrome, iron, manganese, lead, zinc, arsenic and cadmium. Additional water pollution activities result from agricultural and human settlement activities in the form of agro-chemicals and wastewater systems.

Trash, especially plastic and litter cause adverse effect on fish. Plastics do not degrade easily in environment and therefore remain in the same stable / undegraded form in water bodies. Fish mistakenly confuse plastics as food materials and ingest them which causes blockage in the digestive system and kill the fish. There is also probability that fish and other marine life often get stuck in plastic items. Plastic often cause fish to starve to death by getting stuck around their mouth making them unable to eat. Plastic items can also cause slow choking of marine life to death by getting stuck around the neck of marine life. Apart from plastic, metal, rope,
nets and ‘styrofoam’ are among other human made trash items which are disposed off in water bodies and harm marine life.

Tannery effluents contain both organic and inorganic solids in high concentration in either suspended or dissolved forms which results to high oxygen demand in water including admixture of harmful elements like toxic metal salts and chromium metal ion in the water. Without proper treatment and discharge of untreated wastes in water bodies causes serious harm to both environment and life threatening for the aquatic flora and fauna. It has deleterious effect on the soil also adjacent to the water bodies are characterized by high contents of dissolved, suspended organic and inorganic solids giving rise to high oxygen demand and potentially toxic metal salts and chromium metal ion. The tannery effluent, if not treated properly, can cause serious damage to soil and water bodies resulting to increase in soil salinity, reduced fertility and soil infertility and reduces potentiality for growth of crops. In many underdeveloped countries, the harmful and climatic unfriendly effluents from the tanneries are discharged directly into large water bodies even without proper treatment which is a grave and serious issue of concern for the environmental, climatic and public health. Oil spills from industrial sources runoff into the water sources which coat the skin of fish and kill them. Oil provides a source of toxins for fish that can cause disease, genetic defects/alterations and death. The oil damages the surface protective activity of skin which keeps the marine mammal warm. Some sewage feed algae that also flow off in the ocean. These algae grow at a rapid rate and have a high nutrient concentration producing red tides. They are called red tides because of the red appearance of the foam of the ocean waves. Red tides kill fishes by releasing toxins.

Excessive noise production from boats and drilling causes stress on fish and other marine life which make them sick and lethargic. This affects their mating behavior adversely. Fluctuations in water temperature from power plants and factories kill off coral and cause marine life to migrate for relocation in an attempt to find waters with a more sustainable thermal condition. Radioactive waste generated from industrial and military wastes enter the water bodies and are absorbed by fish and can cause genetic, mutagenic and teratogenic defects in them.

B. Purpose
The purpose of this section is to highlight how direct and indirect human activity affect the availability, safety and quality of capture and aquaculture fisheries. Standardization focus for fisheries and aquaculture should take into account parameters which are likely to affect the quality and safety of fisheries and aquaculture products arising from environmental degradation in the immediate aquatic environment and the upstream sources of the water.

This section outlines the possible health and safety hazards arising from environmental degradation.

C. Possible Health and Safety Hazards

(1) Quality of Seafood from Aquaculture
(2) Safety Aspects of Seafood
(3) Abiotic Environmental Factors Affecting Seafood Safety and Properties
(4) Biotic Environmental Factors Affecting Seafood Quality
(5) Seafood Quality Assurance for Algal Toxins
(6) Fish and Shellfish Diseases and Seafood Quality
D. Best Environmental Management for Healthy Fisheries and Aquaculture

The link between the health and safety of the environment and the fisheries and aquaculture resources calls for drastic action on the part of the environmental protection and fisheries authorities in order to assure the quality, safety and health of the fisheries and aquaculture products.

The securing of the watersheds and the strict observance of non-discharge of wastewater into water courses should be enforced without reservation since the consequences of not taking this kind of action seriously compromises the safety and health of fisheries and aquaculture products with assured deleterious impacts on human health and safety.

Lax regulations along watersheds, waterways and water bodies should be reviewed if Africa is to safeguard its fisheries and aquaculture resources availability, quality and safety. The reaction to clean up the environment only on account of export requirements should desist as it implies that national populations are of less concern while in effect the political economy of a healthy population demonstrates the converse.

Notorious discharge of industrial waste into water systems on account of industrialization and job creation excuses is not to be accepted under any circumstances since the costs cannot be justified. Infringements into watersheds on account of population increases should be reviewed and mitigated to offset the costly impacts such infringements would manifest on fisheries and aquaculture resources downstream.

References

_Environmental Effects on Seafood Availability, Safety, and Quality_ (Daczkowska-Kozon et al., 2011)

_Environmental Regulation and Food Safety: Studies of Protection and Protectionism_ (Jha, 2005)

_Infectious Disease in Aquaculture: Prevention and Control_ (Austin, 2012)

_Environmental Best Management Practices for Aquaculture_ (Tucker et al., 2008)
4. Fisheries Managers (from Ministries / Departments of Fisheries)

4.1 Methodology of Delivery

The methodology is proposed to be a three-five days seminar designed to create a high level of understanding of the fisheries and aquaculture standards, conformity assessment, SPS measures and technical regulations which affect fish trade. The fisheries managers should be equipped to identify standardization needs as they are responsible for product development and diversification.

The mode of delivery is expected to be PowerPoint presentations with substantive papers prepared and bound for ease of reference. Additional materials will be provided in electronic format.

4.2 Institutional Coordination

ARSO will be primarily responsible for ensuring effective delivery of the workshop. Coordination with the departments of fisheries, national WTO TBT and SPS coordinators, national standards coordinators, PAQI and individual consultants will be considered.

4.3 Content Outlines: Fisheries Managers

The following provides the framework of the content to be delivered for fisheries managers in the fisheries and aquaculture sector. The orientation should emphasize the operational and management responsibilities for this cadre of officials. This level of officials form not only the technocratic core of the fisheries and aquaculture functions, but they are also the group that experiences various challenges originating from inadequate policies, static legal frameworks, inadequate or unavailable standards, inadequate conformity assessment facilitation and human and capital resource issues, among a long list of deficiencies. Formulation of policies and negotiation positions originate from this group and hence an exposure to the political states of play is considered necessary. The outlines below are expected to guide the content development and presentations in the direction which ARSO considers to be relevant in creating a good understanding of the crucial role of standards and conformity assessment in fish trade.

4.3.1 Fisheries and Aquaculture Resource Endowments of Africa: A Review

A. Introduction

The fisheries resources in Member States include the following depending on the geographical positioning:

(a) Marine capture fisheries

(b) Inland capture fisheries and

(c) Aquaculture

B. Marine Capture Fisheries

This is practiced both at artisanal and industrial scales. Key fish species include:

(1) Hake
(2) Horse mackerel
(3) Anchovy
(4) Pilchards
(6) Lobsters
(7) Tunas: Bluefin tuna; Southern albacore; Yellowfin; Bigeye; Skipjack
(8) Shrimps and prawns
(9) Demersal fish: breams; Groupers, and Snappers
(10) Octopuses
(11) Scallops and clams

C. Inland Capture Fisheries

This is practiced both at artisanal and industrial scales. Key fish species include:

(1) Nile perch: *Lates niloticus* and *L. macrophthalmus*
(2) Tilapias:
(3) Small pelagic fishes: *Rastrineobola argentea* (Dagaa/Omena/Mukene), *Stolothrissa tanganicae* and *Limnothrissa moidon* (Kapenta), *Poecilothrissa muerusensis* and *Bangweliusensis* (Engraulicypris moerusensis) (Chisense) *Neobola bredoi* (Muziri) and *Brycinus nurse* (Ragoogi)
(4) African Lungfish
(5) African catfish: *Clarias gariepinus*
(6) Common Shrimp: *Caridina nilotica*
(7) *Stolothrissa tanganicae*: Lake Tanganyika sprat — Chilwe, Kapenta, Nsembe (Zambia); Ndagala (Burundi); Dagaa, Ndagala, Ndakala (Tanzania); Ndagala (DR Congo).

Table 11: Some Common Fish Species in African Water Bodies

<table>
<thead>
<tr>
<th>Lakes</th>
<th>Coverage (km²)/Countries</th>
<th>Production</th>
<th>Main species</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>68.800 km² Kenya, Tanzania and Uganda</td>
<td>900000 (2010)</td>
<td><em>Lates niloticus</em> (Nile Perch) <em>Rastrineobola argentea</em> (Dagaa), <em>Oreochromis niloticus</em> (Tilapia) <em>Haplochronis</em>, <em>Bagrus</em>, <em>Clarias</em> <em>Synodontis</em>, <em>Protopterus</em></td>
<td>Dagaa (60%), Lates (30%) and Oreochromis (7%) 194,172 fishers and 65758 fishing crafts (2010)</td>
</tr>
<tr>
<td>Tanganyika</td>
<td>32.900 km² Burundi, DRC (45%), Tanzania (41%), Zambia</td>
<td>200,000 tons in (2011)</td>
<td><em>Stolothrissa tanganicae</em> and <em>Limnothrissa moidon</em> (Kapenta) <em>Lates stappersii</em> (Bukabuka Mukeke) <em>Lates angustifrons</em> (Capitaine) <em>lates Marie</em> (Ngonzi, Sangala) <em>Lates microlepis</em> (Nonzi/Nyunvi) Tilapiine</td>
<td>About 94,800 active fishers (2011). Kapenta contributes 60% to total catch and lates stappersii 30%</td>
</tr>
<tr>
<td>Malawi/Nyasa</td>
<td>29600 km² Malawi, Tanzania and Mozambique</td>
<td>50,600 (2007)</td>
<td><em>Haplochronis spp.</em> (Mbuna). <em>Copadichromis spp.</em> (Utaka), <em>Preochromis spp.</em> (Chambo), <em>Rhamphochromis spp.</em> (Ncheni). <em>Engraulicypris sandella</em> (Usipa), <em>Barbus paludinosus</em> (Matemba). <em>Bagrus meridionalis</em> (Kapango) and <em>Clarias, gariepinus</em> (Mlamba)</td>
<td>About 50,000 fishers and over 350000 fish processors, traders etc in Malawi</td>
</tr>
<tr>
<td>Turkana (Rudolf)</td>
<td>7200(7570) km² Kenya and Ethiopia</td>
<td>2.493 (2005)</td>
<td>Nile perch, Tilapia, Labeo, bagrus, Barbus, Citharinus, Distichodus, Clusius, Symodontis, Hydrocymus forskalii</td>
<td>New Supplier to regional trade for DRC</td>
</tr>
</tbody>
</table>
### D. Aquaculture Fisheries

African aquaculture can broadly be divided into two: community based aquaculture which is promoted by international organizations, aid agencies and governments as part of their efforts to alleviate poverty, create livelihoods and improve the food supply situation; and commercial aquaculture, which is mainly privately financed and export oriented. Key fish species include:

1. African catfish (*Clarias gariepinus*)
2. Trouts
3. Tilapias (*Oreochromis niloticus*, *O. andersonii*, *O. macrochir*, and *Tilapia rendalli* especially)
4. Common carp (*Cyprinus carpio*)
5. Freshwater prawns (*Machrobraccium rosenbergii*)
6. Marine species include the Black Tiger prawn (*Penaeus monodon*)
7. Oysters (primarily the Pacific Oyster *Crassostria gigas*)
8. Abalone

### E. Non-Fish Aquatic Resources

There is a markedly significant farming of the Nile crocodile (*Crocodylus niloticus*) in some African countries for skin and meat.

### F. Economic Contribution of African Fisheries and Aquaculture

A recent study by de Graaf *et al.* (2014) estimates the value added by the fisheries sector as a whole in 2011 to be more than US$24 billion, 1.26 percent of the GDP of all African countries. Detailed figures by subsector highlight the relevance of marine artisanal fisheries and related processing, and also of inland fisheries, which contribute one-third of the total catches in African countries. Aquaculture is still developing in Africa and is mostly concentrated in a few countries but it already produces an estimated value of almost US$3 billion per year. As data on licence fees paid by foreign fleets were not easily available to the national experts...
participating in this study, an attempt was also made to estimate the value of fisheries agreements with Distant Water Fishing Nations (DWFNs) fishing in the exclusive economic zones of African States. Considering that 25 percent of all marine catches around Africa are still by non-African countries, if also these catches were caught by African States in theory they could generate an additional value of US$3.3 billion, which is eight times higher than the current US$0.4 billion African countries earn from fisheries agreements.

According to the new estimates produced by the study, the fisheries sector as a whole employs 12.3 million people as full-time fishers or full-time and part-time processors, representing 2.1 percent of Africa’s population of between 15 and 64 years old. Fishers represent half of all people engaged in the sector, 42.4 percent are processors and 7.5 percent work in aquaculture. About 27.3 percent of the people engaged in fisheries and aquaculture are women, with marked differences in their share among fishers (3.6 percent), processors (58 percent), and aquaculture workers (4 percent).

In West Africa fishing activities, mostly in the marine artisanal subsector, are a major contributor to GDP with high overall contributions in Ghana, Mauritania and Sierra Leone. In Central Africa, inland fisheries is the major contributor to GDP with high overall contributions by the Democratic Republic of the Congo and Uganda. In Southern Africa, marine industrial fisheries is the major contributor to GDP.

The total GDPA is compiled by the national statistical offices according to the International Standard Industrial Classification (ISIC). It includes “Agriculture, livestock, hunting, forestry, and fishing” but excludes processing, which is covered under “Manufacture of Food Products”. Therefore, the contribution of fisheries to GDPA can be only calculated as the share of fishing

<table>
<thead>
<tr>
<th>Total GDPs African countries</th>
<th>Gross Value Added (US$ millions)</th>
<th>Contribution to GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fisheries and Aquaculture</td>
<td>24,030</td>
<td>1.26</td>
</tr>
<tr>
<td>Total Inland Fisheries</td>
<td>6,275</td>
<td>0.33</td>
</tr>
<tr>
<td>Inland fishing</td>
<td>4,676</td>
<td>0.24</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>1,590</td>
<td>0.08</td>
</tr>
<tr>
<td>Local licences</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>Total Marine Artisanal Fisheries</td>
<td>8,130</td>
<td>0.43</td>
</tr>
<tr>
<td>Marine artisanal fishing</td>
<td>5,246</td>
<td>0.27</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>2,870</td>
<td>0.15</td>
</tr>
<tr>
<td>Local licences</td>
<td>13</td>
<td>0.00</td>
</tr>
<tr>
<td>Total Marine Industrial Fisheries</td>
<td>6,849</td>
<td>0.36</td>
</tr>
<tr>
<td>Marine industrial fishing</td>
<td>4,670</td>
<td>0.24</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>1,878</td>
<td>0.10</td>
</tr>
<tr>
<td>Local licences</td>
<td>302</td>
<td>0.02</td>
</tr>
<tr>
<td>Total Aquaculture</td>
<td>2,776</td>
<td>0.15</td>
</tr>
</tbody>
</table>

(de Graaf et al., 2014)
and aquaculture economic activities in the agriculture production but excluding the value generated by post-harvest.

Total value added of fishing and aquaculture in Africa is US$17.4 billion. With a total GDPA of US$288.4 billion, the fisheries sector contributes 6 percent of the GDPA for the whole of Africa. The highest contribution is from marine artisanal fishing contributing 1.82 percent of total GDPA, whereas inland fishing and marine industrial fishing have the same contribution of 1.62 percent, and aquaculture contributes almost 1 percent.

References
The Value of African Fisheries (de Graaf et al., 2014)

A Fishery Manager's Guidebook (Cochrane et al., 2009)


Harnessing Fishery Resources: Swimming the Tide to Africa’s Development (UNECA, 2012)

Mariculture in the WIO Region: Challenges and Prospects (Troell et al., 2011)


A Complete Guide to the Freshwater Fishes of Southern Africa (Skelton, 2001)

A Guide to the Common Sea Fishes of Southern Africa (Van der Elst, 1993)

Field Identification Guide to the Living Marine Resources of Kenya (Anam et al., 2012)

Maximizing Utilization of Pelagic Fish Resources (Hariono et al., 2006)

4.3.2 The Role of the Quality Infrastructure in Facilitating Industrialization, Trade and Development

A. Regional integration essentially refers to the process in which countries enter into a regional agreement in order to enhance regional cooperation through regional institutions and rules in various sectors. Many of the regional integration initiatives are driven by political, economic and security considerations leading to a wide range of forms of integration involving many African countries. The following are the common forms and characteristics of regional integration:

(a) Preferential Trade Area (PTA): Agreement of preferential conditions, such as lower customs duties or higher import quotas for certain goods.

(b) Free Trade Area (FTA): Extensive reduction of trade restrictions between the member states, usually covering the overall trade in goods.

(c) Customs Union (CU): Elimination of internal trade restrictions and introduction of common external tariffs, often in connection with the reduction of additional impediments, such as administrative barriers.
(d) **Common Market (CM):** Expansion of the freedom of movement of goods to the elimination of obstacles in other areas, such as free movement of capital, services and labour.

(e) **Economic Union:** Establishment of a uniform internal market, including the harmonization of national policies and of the economic framework.

**B.** Miesner (2009) reports that FTAs dominate regional integration schemes with 139 of the 152 WTO notified Regional Trade Agreements (RTAs) being defined as Free Trade Agreements (FTAs) whereas Customs Unions only account for 13 cases. Moreover, the establishment of regional economic communities is influenced by a range of economic, political and security-related considerations which may be summarized as follows (Crawford *et al.*, 2005):

(i) Exploiting economies of scale and benefits from specialization by expanding the domestic market and developing new markets

(ii) Attracting foreign direct investments, particularly for countries with low labour costs and a preferential access to larger markets

(iii) Enhancing integration processes in areas that are currently only insufficiently covered by multilateral agreements, such as investments, competition, environment or labour standards

(iv) Supporting the negotiating power in multilateral agreements by forming regional blocks and strengthening geopolitical alliances

(v) Consolidating peace processes and promoting violent-free solutions to conflicts by a regional cooperation on security issues

**C.** The elimination of technical barriers to trade (TBTs) constitutes one of the fundamental requirements of any regional integration. These TBTs arise due to the discrepancy of national standards of trading partners from international standards and they have the following consequences for international trade:

(i) products, processes and systems are subject to different mandatory requirements and may therefore violate legal regulations of the trading partner,

(ii) testing procedures that assess the conformity of products, processes and systems against defined requirements may not be recognized,

(iii) conformity assessment bodies of the trading partner which cannot prove their competence against agreed standards may not be trusted.

**D.** WTO (2005) highlights the importance of standards in trade by stating that it is through sharing a common standard that anonymous partners in a market can communicate, can have common expectations on the performance of each other’s product, and can trust the compatibility of their joint production. Thus, standards are necessary for the smooth functioning of anonymous exchanges – and therefore, for the efficient functioning of the market. It is for this reason that the issue of a quality infrastructure has always been a key part of regional trade agreements. Recent reports indicate that over 80% of the global trade is already affected by standards and technical regulations (Gonçalves *et al.*, 2011). This means that for a regional integration agreement to function smoothly, there must be a robust quality infrastructure to underpin it. Miesner (2009) explains that the contributions of the quality infrastructure to regional economic integration depends on the selected form of integration and include:
(1) **Removal of technical barriers to trade:** Regional economic integration aims at reducing trade barriers between the member states. A quality infrastructure is fundamental to the harmonization and mutual recognition of standards, technical regulations and conformity assessments, thus providing the basis to overcome non-tariff trade barriers.

(2) **Improvement of competitiveness of enterprises:** Regional economic integration creates larger domestic markets and promotes the establishment of transnational value chains. A quality infrastructure increases the compatibility between suppliers and customers, reduces transaction costs, provides developing countries with an easier access to international good practices and improves the competitiveness of small and medium-sized enterprises in particular.

(3) **Strengthening of socio-economic coherence:** Regional economic integration is often characterized by cooperation in the field of individual sector policies, such as environmental and health policies. A quality infrastructure provides the technical framework for establishing common limiting values and other regulatory requirements and provides capacities for the effective implementation of those requirements.

(4) **Safeguarding of interests from other regional economic blocks:** Regional economic integration leads to the creation of economic blocks that significantly shape the global economic framework. A quality infrastructure combines the available technical know-how of its member states and channels the input into multilateral negotiation processes in order to safeguard regional interests.

(5) **Strengthening the negotiating position in trade disputes:** Regional economic integration requires a common position in trade disputes with other economic blocks that will often involve the interpretation of TBT-related facts and findings (such as bans on the import of contaminated food products). A quality infrastructure supports trade policy dialogues with the aid of scientific-technical insights based on recognized test results.

(6) **Consolidating the regional technological autonomy:** Regional economic integration facilitates the bundling of regional resources in order to establish competitive institutions for research and development. A quality infrastructure helps to utilize existing national know-how, to develop specialized networks, and to enhance the technological emancipation of the region.

**E.** The degree of contributions of the quality infrastructure to regional integration must be coupled with the other fundamental structures such as the condition of regional transport and communications networks and the development stage of local production facilities as well as the quality of technical, administrative and political institutions in general.

**References**

*The Answer to the Global Challenge: A National Quality Infrastructure* (Sanetra et al., 2007)

*Contributions of Quality Infrastructure to Regional Economic Integration: Insights and Experiences Gained from Technical Cooperation of PTB* (Miesner, 2009)

*Non-Tariff Measures and Regional Integration in the Southern African Development Community* (UNCTAD, 2015)
4.3.3 Standards for Fisheries and Aquaculture: Identification of Standardization Needs, Stakeholders and Networks

A. Sample Types of Standards and Standards-Type Deliverables

(i) **Terminology /Glossary:** standard listing definitions of terms used in a particular sector, field or discipline serving to make communication uniformly understood.

(ii) **Codes of Practice:** standard comprising recommendations for accepted good practice as followed by competent and conscientious practitioners, and which brings together the results of practical experience and acquired knowledge for ease of access and use of the information.

(iii) **Specifications:** standard that sets out detailed requirements, to be satisfied by a product, material, process, service or system, and the procedures for checking conformity to these requirements. Quality, safety and health characteristics of fish products, equipment and systems, e.g., tuna loins, smoked fish, fishing nets and gears, etc.

(iv) **Methods of conformity assessment:** standard that gives a complete account of the way in which an activity is performed (and, where appropriate, of the equipment or tools required to perform it) and conclusions are reached, to a degree of precision appropriate to the stated purpose. Test methods for parameters such as heavy metals, pesticide residues, organoleptic properties, freshness, phycotoxins, presence of diseases through microbiological, virological indicators; and inspection methods.

(v) **Metrological characteristics:** Confirming the actual weights of the products to avoid fraud.

(vi) **Water and environmental quality, health and safety** parameters for aquaculture and capture fisheries.

(vii) **Guide:** standard that gives broad and general information about a subject, with background information where appropriate.

(viii) **Classification:** standard comprising designations and descriptions of different grades of a product and that identifies and arranges data in hierarchical order.

(ix) **Publicly Available Specification (PAS):** provisional document, developed under broadly the same processes as a formal standard and published when standardization of a particular subject is urgently required, but further research or development is required before it can be published as a formal standard.
Technical Specifications: these are normative documents prepared and published when the subject in question is still under development or where for any other reason there is the future but not immediate possibility of an agreement to publish an ordinary standard. A Technical Specification may be established with a view to serving for instance the purpose of:

(a) publishing aspects of a subject which may support the development and progress of the market but where an ordinary Standard is not feasible or not yet feasible;

(b) giving guidance to the market on or by specifications and related test methods;

(c) providing specifications in experimental circumstances and/or evolving technologies.

The decision to publish a technical specification may be necessary where:

(d) there had been insufficient support at the enquiry stage for the work item to progress to an ordinary standard;

(e) no consensus can be reached on the submission of the work item within the given target date.

The maximum lifetime of a Technical Specification is 6 years (i.e. one three-year period and one confirmation).

Technical Reports: When a technical committee has collected data of a different kind from that which is normally published as a Standard (this may include, for example, data obtained from a survey carried out among the national bodies, data on work in international organizations or data on the "state of the art" in relation to standards of national bodies on a particular subject), the technical committee may decide, by consensus, to publish such data in the form of a Technical Report. The document shall be entirely informative in nature and shall not contain matter implying that it is normative. It shall clearly explain its relationship to normative aspects of the subject which are, or will be, dealt with in standards related to the subject.

Crucially, the development of a TR cannot conflict with, or contradict, existing or draft work within the formal standards arena and must complement, not conflict with, any legislation in the subject area.

No time limit is specified for the lifetime of Technical Reports, but it is recommended that Technical Reports be regularly reviewed by the responsible technical body to ensure that they remain valid.

B. Rationale for Preparing a Standard

B.1 Problem Statement
Many products fail to achieve their expected performance commercially and/or technically with disastrous results for the producer and dissatisfaction or worse for the customer. Key problems encountered by producers include:

(i) insufficient knowledge of the market/target customer;
(ii) inadequate understanding between customer and producer;
(iii) inadequate profit margins;
(iv) the product being too expensive;
(v) failure to meet regulatory requirements;
(vi) failure to meet performance targets;
(vii) the time to market being too long;
(viii) development expenditure being too high;
(ix) insufficient in-house skills and knowledge to cover the process;
(x) excessive warranty, delivery or other commitments creating serious financial obligations.

The main benefit in dealing properly with these problems is a better product for which the commercial and technical risks have been assessed and eliminated or reduced to an acceptable level. The benefit to the producer can be significant both in reducing the cost of the product and/or in improving the quality, reliability and commercial viability of the product.

It is easy to become obsessed with an innovative idea, or a new technology, without looking dispassionately at its overall viability or other justification to pursue it. By gathering sufficient information to understand the potential product its viability can be properly assessed. Gathering this information in a disciplined way facilitates decision making, and also exposes conflicts or trade-offs, allowing them to be resolved at an early stage and so avoiding problems later.

The three main areas that need to be understood when making decisions about the development of a new product include:

(a) commercial considerations;
(b) attributes of product performance necessary to satisfy the customer; and
(c) regulatory requirements.

Only when all the requirements for a new product have been understood is it possible to ensure that the product is safe or to review or test it adequately. Thus the development of a specification is the precursor to assuring safety, quality and reliability.

**B.2 Principles**

A standard shall:
(a) be complete within the limits given in its scope clause;
(b) be consistent, accurate and unambiguous;
(c) take full account of the current state of technical development;
(d) provide a framework in which innovation can be accommodated and supported; and
(e) be readily comprehensible to those who might reasonably be expected to use it (i.e. its target audience).

(f) not make any requirement in respect of compliance with the law or discharge of legal obligations.

The type of standard used shall be selected as being the most appropriate for its purpose. Irrespective of its target audience, the provisions of a standard shall be drafted with due regard to the legitimate needs of the whole community, and, in particular, to those of the end users of its subject matter.

NOTE 1 With a very few exceptions, standards do not have force of law: the application of a standard is almost always voluntary, although standards are very often used in support of legislation, and compliance with a standard is sometimes quoted in legislation as offering a route to discharging legal obligations.

NOTE 2 It is a fundamental principle that standards never make requirements or recommendations for compliance with particular legislation. To do so would imply that such compliance is optional; standards users are expected to obey the law regardless of whether they comply with standards.

NOTE 3 Legislation is constantly changing and evolving, and no standard can be expected to keep pace with these changes. In order to prevent a particular standard being regarded as an authoritative statement of current legislation, it is rare for legislation to be quoted or listed extensively. However, it is good practice to draw readers’ attention to particular important pieces of legislation that might have an impact on the way in which a standard is applied.

NOTE 4 Standards are very often used as the basis for contracts and it is therefore particularly important that they are drafted sufficiently clearly and robustly as to be able to withstand legal scrutiny.

C. Nature of Standards — Specifications

Product specifications are particularly important in outlining the fit-for-use characteristics of products. They are prepared to specify requirements for performance and technical attributes of a product and to give guidance on the process of making and using a product. The preparation of standard should be preceded by gathering of the requisite information as outlined hereafter.

C.1 Overview: The information to be collected must be prioritized noting that arriving at the correct values is an iterative process throughout the initial stages of the specification.

In the case of trade-offs, conflicting requirements, or where there is a need to prioritize issues, the use of quality function deployment (QFD) can be a useful tool to aid decision making.

It is important to consider the whole life-cycle of the product and not just to concentrate on operation by the user. This means thinking about the market, product development, production, packaging, distribution, use, training, maintenance, repair, reuse, recycling, disposal and how each of these phases might affect the design (see Figure 1).

In evaluating which criteria relate to an individual product, it is recommended not only to use the checklists given in this standard, but also to think laterally about any other issues crucial to the success of the product and the satisfaction of customers. However the information is acquired it should be recorded.

C.2 Researching and Understanding Customer Needs: In the preliminary phase information about customer requirements should be acquired. The criteria that are, or need to be, established should include those that will make the product a success. These are likely to be expressed in general terms but any limits on parameters such as size, weight, noise, power, colour or appearance should be included wherever practicable. The concept of universal/accessible design should be embraced, considering the widest possible range of
users, including children, older and disabled people. A key issue is to ensure that the "voice of the customer" is heard throughout the organization in particular by those contributing to the new product design.

Conducting market research helps to identify customer needs, new market niches and customer acceptability. Initiating prototype testing, user trials, focus groups and user groups, involving consumers where appropriate, assists in achieving final model acceptance. It is important to identify the customer.

![Figure 12: Steps in identifying the criteria](image)

C.3 **Researching and Understanding the Market:** In order to assess the commercial viability of the product the size of the market, the competition, budgetary requirements, financial resources, return on investment, the window of opportunity and time to market should be understood. This information leads to conclusions about how and where to sell the product, the time-scales required, reliability and quality. All of these conclusions are criteria to be included eventually, as applicable, in the specification.

C.4 **Understanding the Potential Product:** In this phase the preferred product design begins to emerge and it becomes clear how the concept is to be implemented. Decisions are made about the final look and feel of the product and its performance. Trade-offs quite often need to be made between the customer’s perceived needs and what is feasible within technical, financial and time constraints. Trade-offs might also be necessary in order to reach the best overall solution. Any relaxation of requirements should be checked for impact on the commercial or technical viability of the product.

C.5 **Understanding which Legislation and Standards are Applicable:** For many products national legislations are applicable and it is necessary to establish which legislation and thus
which regulations and standards may have an impact on the design.

C.6 Understanding How to Manufacture the Product: Once the detailed design has emerged (realization phase) product parameters can be finalized in the specification. The product’s architecture and detailed design can now be recorded fully in the design documentation. Criteria for manufacturing should be established in as much detail as practicable including methods of manufacture and test. Manufacturing staff (including those from any major sub-contractors) should be involved in this. Any special criteria for bought-in parts or sub-assemblies should be recorded.

C.7 Understanding How to Verify, Test and Validate the Product: When establishing the process of product conformity it is important to distinguish between verification, production testing and validation.

(i) Verification establishes that the design meets its specification. This may be achieved, to a degree, during the design process through the use of design reviews, etc. This is then supported by a final record showing that the overall design meets all the requirements.

(ii) Production testing ensures that individual examples of the product function satisfactorily.

(iii) Validation in its simplest form establishes that the product meets customer needs while at the other extreme it ensures that the product is fully fit for its intended purpose.

In the verification and validation process all the attributes of the product should be considered. Production testing covers critical and/or safety-related aspects and is only a subset of the overall product performance. It is usually necessary to test examples of the product fully to acquire the data to satisfy the initial design verification. Validation will include physical testing of the complete product under operating conditions to ensure that it meets the needs of the customer. Validation will also include recording the data as evidence of the validation process. With some products, validation may only be achievable with on-site testing.

In addition to proving the design it is usually necessary to prepare a production test specification. The application of production testing ensures that in the unfortunate event that a non-conforming product is produced it is not released. A balance may have to be drawn between the cost and delay of testing and the risk of a faulty product being allowed through. It is common to concentrate on safety testing and basic functionality. For simpler products sampling inspection can be appropriate in which case an acceptable quality level (AQL) should be chosen. If sampling inspection is used there is a finite and predictable risk of a defective product reaching the customer. For this reason sampling inspection is not appropriate for some criteria or products. If it is used this should be made clear on any declaration of conformity.

C.8 Understanding How to Support the Product: Criteria for supporting the product should be established as early as practicable. The nature of the design itself and the thoroughness of any instructions for use can have a bearing on the amount of support customers need. Arrangements for dealing with warranty claims, criteria for associated costs, response times and helpdesk performance should all be established, as applicable.

D Recording the Criteria

D.1 Overview: All relevant criteria should be recorded formally to build up the product specification document. Where criteria are known to be relevant, but their values are not yet
established, they should be recorded as, for example, “TBD” (to be determined). This will reduce the likelihood of issues being overlooked later.

Figure 2 illustrates how, as criteria are acquired, they can be documented. For clarity, the process is summarized as a sequence, but it is more likely to be iterative within each step, or even between steps. The approach can be tailored to suit an individual product. Criteria should be covered to an extent that all interested parties will be satisfied.

It is useful to distinguish between the criteria to be recorded in the specification document and the associated commercial intelligence. It is vital to collect, assimilate and communicate the latter but for confidentiality reasons it may be prudent to keep it segregated from the product specification, particularly if this will be released outside the organization. Commercial intelligence can form an annex to the product specification.

All staff involved in the design process should be given ready access to all technical information and as much commercial intelligence as practicable. The specification may be in the form of handwritten text, a word-processed document, a computer database, or any other appropriate medium. Whichever method is chosen, some form of revision control should be in place (e.g. at least a date), to ensure users are working to up-to-date information as the document grows.

It is useful to adopt a formal structure for the document including numbered sections and sub-sections, or even numbered individual lines of the specification, so that references or changes to it can be made unambiguously at a later date.

D.2 Some Practical Tips for Writing a Specification: The following are some practical tips for writing a specification.

(a) Start preparing the specification document very early on.

(b) Prepare it in a form that can easily be read and used by others.

(c) For complex products with multidisciplinary design, areas of the specification may be compiled by different people or sub-groups. Each should be aware of what the other is doing and the information brought together for review.

(d) Start by writing all the obviously applicable headings even if it is not yet possible to fill in any details (see Annex F for some suggestions).

(e) Put down all salient and useable information but be concise.

(f) Where possible be quantitative rather than qualitative: put down numbers, with tolerances where practicable.

(g) Avoid being unnecessarily restrictive: this can increase eventual product cost or limit design options.

(h) Always involve all the relevant people: research has shown that people tend to put too great an emphasis on areas of their own expertise and not enough on others. Multiple inputs help to counteract this effect.
(i)  Writing a specification is an iterative process but try not to change the specification too often.

(j)  Allow changes in the specification early on in order to refine it. However, changes will eventually become disruptive, so later unnecessary changes should be discouraged.

(k)  Eventually changing the specification has to stop so that design work can proceed in a controlled way. It may be extremely wasteful to try to undertake detailed design while the specification is still changing.
Good management is necessary to know when to change the specification and when not to: it will give stability to the subsequent design process. It is important to try to minimize disruption but nevertheless to be willing to accommodate important changes if they are necessary to keep the specification on target to produce a successful product.

A good way of deciding if a change should be allowed late on is to consider the cost of the change compared with the loss in profit from leaving the design unaltered. Whilst impossible to assess accurately, prompting the person who wants the change to think about the degree of benefit compared with the cost of the disruption, helps to filter out unnecessary cosmetic or minor changes, while allowing those that affect the product's function or reliability.

E. Types of Specifications

E.1 General: Specifications are generally written for two purposes:

(a) to state unequivocally requirements concerning the performance and technical attributes of a product;

(b) to give guidance on the process of making and using a product.

The requirements and guidance needed to define and implement a product may be incorporated into one document, or exist in a whole series of inter-related documents. The approach taken is usually dictated by the size and complexity of the product and the precepts of the organization concerned. Figure 3 illustrates the relationship between the various kinds of specification used during a typical product life cycle.

E.2 Triggers: An outline of the proposed product to be specified may be given in an initial brief that states the customer's key requirements. This initial brief may be further developed into a business proposal, project brief, design brief and, if necessary, a full performance specification. These preliminary steps should be taken during the project's conception and feasibility phases, before any work on its implementation is authorized or started.

E.3 Requirements: A performance specification should state the required attributes of the product, together with any constraints, without giving a detailed technical description. This information should then be used during the implementation phase as the basis for preparing a product specification that contains a full technical description of the product.

A product specification may describe in detail a new product designed to meet a particular customer’s requirement or general market requirement, or an existing product. Such specifications may be used for contractual purposes.

The product specification needs to give all the information required to realize the product and provide objective evidence that the product conforms to its performance specification (or, in the absence of a performance specification, to the client's initial brief).

Product specifications may also describe an existing product to a prospective customer and may be supplied in the form of a brochure, catalogue entry, handbook or user manual. Such descriptive specifications, when accepted by the customer, place an onus on the supplier to provide a product that conforms to the description; thus descriptions can become firm requirements.
Figure 14 — Order of Use of Specification Types
Figure 15 — Some Types of Specifications

Primary purpose of the product that also gives essential instructions concerning such matters as style, grade, performance, appearance, characteristics, conditions of use, health and safety, packaging, conformity assessment, reliability and maintainability.

Requirements that are to be incorporated in the product design, such as compliance with standards, processes and management systems.

Process and precautions to be observed in withdrawing from service and discarding or otherwise dispensing with a product and any associated waste or redundant materials.

Requirements to ensure that the product can be moved and stored with adequate protection from damage to itself, the environment, property and people.

Process for examining the product to determine its conformity with requirements given in the product specification.

Process and detailed procedures for installing the product, including, if necessary, unpacking, preparation, assembly, commissioning, testing and hand-over to the customer.

Process and detailed procedures for the routine, preventive and corrective maintenance needed to keep the product operating in accordance with its performance specification.

Constituents of the product, including raw materials, finished components and all other items required for its construction.

Process and detailed procedures for bringing the product into use and then operating and maintaining it so that the requirements of the performance specification are fulfilled throughout its life cycle.

Methods and logistics of creating the product, including the materials, equipment, physical conditions, facilities, personnel, procedures and sequence of activities that contribute to the delivery of an end product that conforms to its specification.

Criteria that need to be met before the product is handed over to the customer.

Process and detailed procedures for testing the product, including, if necessary, the criteria for assessing the test results for compliance with the acceptance and/or performance specifications.
E.4 Processes: Process specifications (see Figure 4) should be developed where necessary to give detailed guidance on the technical and procedural aspects of product implementation. They should be concerned with the required output, invariably the delivery of a product that conforms to the performance specification.

The specification of processes should be broad and of a general nature, relying on internal and external standards without necessarily making reference to them. These specifications are often referred to simply as procedures and should describe the way in which a set of inter-related resources and activities transforms inputs into outputs.

E.5 Other Types of Specification: A small selection of commonly used kinds of specification and their purposes are described in Figure 4. These may specify products and/or processes; they may be prescriptive and/or descriptive.

F. Management of Specifications during Preparation

F.1 Related Documents, References and Duplication: Before starting to prepare a specification, it is advisable to search for existing documents that might serve the same purpose, either in part or in whole. The following types of publication may be relevant to the proposed specification:

(a) the organization’s internal specifications;
(b) general rule documents;
(c) national, RECs, African and international standards;
(d) standards issued by professional, industrial, commercial and public sector bodies;
(e) technical books, journals and product catalogues;
(f) statutory instruments, conditions of contract and other legal conditions;
(g) specifications issued by prospective purchasers or specifications of other organizations.

Even if a suitable document is not found, some of the information obtained may be relevant to the proposed specification and should be referenced or incorporated as necessary.

F.2 Drafting Procedures: The sequence of the work in drafting a specification may not correspond to the order in which the specification is presented. A six-stage procedure for drafting a typical specification is given in Figure 5. This procedure is iterative, but for clarity the feedback lines are omitted in the figure.

F.2.1 First draft: The subject for consideration should be nominated then the objectives agreed with those directly responsible before collecting the appropriate data, such as relevant regulations, standard procedures, suppliers and prices. National and trade standards need to be sought, suppliers’ catalogues collected and examined and existing applications noted.

If an initial investigation shows that an existing standard does not exist and the subject is worth pursuing, discuss the objectives between interested parties and decide on the form of standard required. Is it design, process or quality control for example?

Prepare a first draft of the standard for discussion. Some of the many points to be agreed at this stage are outlined below.
(a) **Proposed scope.** Does it conform to established standards or regulations (international, national, company)? Is it adequate for possible future development? Are there too many sizes? Do the sizes follow a logical progression?

(b) **Application.** For what applications is the scope suitable or unsuitable? Is the new standard to be applied retrospectively or for future use only?

(c) **Quality.** Is the item/procedure specified in sufficient detail to ensure consistent application?

(d) **Availability.** Can the articles be obtained at the right price, right quantities and at the right time?

(e) **Health and safety.** Are all regulations observed?

Compliance with national and/or international standards will ensure that most of the above points have been considered. The final form of the standard will then emerge to be published for comment, and when approved will be distributed to all who may have occasion to use it.

**F.2.2 Editing:** Most of the early drafts need to be edited to conform to the corporate style, particularly with regard to layout. Illustrations should be used to reduce text. Information from another standard should be cross-referred to rather than repeated from another standard. Repeated information is difficult to keep updated.

**Be brief:** Do not over-elaborate, the aim is to convey information without ambiguity.

**Avoid jargon:** Documents may have to be understood by non-specialists.

**Use illustrations:** Illustrations can be used to minimize text.

**Cross-refer:** Do not repeat information already quoted in another standard.

**Include instructions for use:** These may be quoted once rather than in every document.

**Be precise:** Avoid words such as "etcetera", "whenever possible" or "wherever practicable" “unless specified elsewhere”.

**F.2.3 Circulating for Comment:** All interested parties should be consulted about a specification and a consensus obtained before the draft is issued. This may take longer in a large business or if more than one section or department is involved. In a smaller organization it is possible to dispense with a formal structure of committees and working parties. Consensus does not mean everyone unequivocally agrees but that all reasonable arguments are withdrawn.

Draft specifications should be circulated to all interested parties and the comments considered before issuing a second draft.

An accompanying note should be circulated with the draft to explain briefly its aim and to give the reasons why it is being produced. The responders should be asked to quote the relevant clause number, indicate whether the comment is editorial or technical and each comment should be accompanied with a proposal for the changed wording plus a justification for the change. The process of circulating for comment should be repeated until consensus has been reached, then the specification should be submitted for signature to the approved signatories. The signatures make the document “legal” and it is then printed and distributed via the document control system.
F.3 Authorization for Issue: The completed specification should be checked for accuracy and suitability for issue by a person who was not involved in its preparation, but who is conversant with the subject.

The quality management system needs to specify the persons in the organization who are authorized to sign a document as approved prior to release. The authority of specifications should be clear. A document applicable to more than two departments is considered as a business standard and is signed by the managing director.

Figure 16 — Stages in the preparation of a specification

F.4 Management of Issued Specifications

F.4.1 Primary Identification: Each specification should be given an identifying code, title and issue number. The code should identify the class of subject matter or the objectives of the document, to facilitate classification in a library. It should also permit quick reference and traceability.

F.4.2 Availability and Storage: Copies of the specification should be recorded, stored and controlled so that they are directly available to all authorized users.

Most organizations use and store other organizations’ specifications. One approach to the storage of a variety of external specifications is to classify them on receipt, giving them internal codes, so that they can be traced.

F.4.3 Review: All specifications should be reviewed at regular intervals and amended as necessary. The interval between each review should not exceed 5 years.
Figure 17: Interrelationship of Product Documentation
F.4.4 Change Management and Disposal: A regularized procedure should be used to issue new documents and amendments. Holders of handbooks and individual documents need to be identified and addressed each time an amendment is made. The instruction has to state clearly whether the document being issued is new, revised or withdrawn, and the name of the holder and the location should be identified. Holders of standards documents should be asked to acknowledge receipt of amendment instructions and should be pursued if they do not. The holder of a standards handbook should similarly record who made an amendment on an amendment record sheet in the front of each volume.

A copy of each issue of the specification should be permanently archived, together with any information concerning modifications. Reference to archived specifications may be necessary at any time in the future, for example, as evidence in disputes and litigation. All obsolete specifications in circulation should be retrieved to prevent their continued use. It may also be necessary to destroy these copies for security reasons. Advance information on changes should be made using the official change channels.

G Research File and Documentation Supporting Specifications

The research process supporting the development of a product specification shall be documented in detail and clearly indicate references which support decisions to set limits for parameters and characteristics which define the quality, health, safety and environmental provisions in the standard. Standardization experts should demonstrate updated understanding of the research and technological developments in their field of standardization rather than appearing to arbitrarily fixing parameters in standards. A well-organized and referenced research file creates a crucial baseline from which reviews and product diversification can proceed as well as serving to address any legal claims and product liability issues.

Where this standard is applied to simpler products, or smaller organizations, a suggested method is to consolidate all the technical information into one product specification (as shown in the top left-hand circle in Figure 6) and confidential information into a commercial appendix or file. The consequence is that the specification becomes one or two evolutionary documents rather than the traditional series where the earliest becomes obsolete.

The design verification results and design validation results illustrated in Figure 6 are necessary in order to be able to demonstrate that the final product meets the requirements of the product specification.

H Typical Standards for Fisheries and Aquaculture

We are focusing on standards applicable through the value chains, such as:

(a) Responsible fisheries (capture fisheries
(b) Good agricultural practices
(c) Good manufacturing practices
(d) Sustainable fisheries
(e) Certification and conformity assessments
(f) Product specifications
(g) Product market presentations
(g) Traceability standards for fish products

References


*Future Society and Standards* (Kwon et al., 2007)


*Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries* (FAO, 2009)

*Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Capture Fisheries* (FAO, 2011b)

*Standards and Global Trade: A Voice for Africa* (Wilson et al., 2003)

4.3.4 Standards and Conformity-Oriented Value Addition in Fisheries and Aquaculture

A  Fresh, Frozen and Cured Fish and Aquaculture Products

- Fresh and frozen whole finfish
- Fresh and frozen whole bivalves

B  Value Added Fishery Products

B.1 Breaded and battered products (including fried)

- Shrimp breaded and battered
- Squid breaded and battered
- Cuttlefish breaded and battered
- Octopus breaded
- Clams breaded
- Breaded fish fingers
- Breaded crab cakes

B.2 Pickle, curry, meal kit. etc.,

- Shrimp prepared products
- Shrimp pickle
- Shrimp curry
- Squid prepared products
- Cuttlefish prepared products
(6) Fish pickle
(7) Fish curry
(8) Mussel / clam meat pickle

B.3 **Surimi based products**
(1) Surimi products (Analogues)

B.4 **Freeze dried products**
(1) AFD shrimp, AFD shrimp powder
(2) AFD squid
(3) AFD Cuttlefish
(4) AFD Octopus

B.5 **Shrimp IQF products and Tray/pouch packs**
(1) Shrimp IQF raw
(2) Shrimp IQF blanched / cooked
(3) Shrimp in tray / pouch packs
(4) Shrimp IQF headon
(5) Shrimp nobashi

B.6 **Squid IQF and its products and Tray/pouch packs**
(1) Squid IQF raw
(2) Squid IQF blanched cooked
(3) Squid tube / rings

B.7 **Cuttlefish IQF / IF and its products and Tray/pouch packs**
(1) Cuttlefish IQF/IF raw
(2) Cuttlefish IQF blanched / cooked
(3) Cuttlefish and its products in tray/pouch packs

B.8 **Octopus IQF / IF and its products**
(1) Octopus IQF raw / whole cleaned
(2) IQF / IF Octopus blanched / cooked

B.9 **Frozen Fish fillets / loins / steaks, chunks, portions etc. in tray / vacuum pack or in tray / pouches (except tuna)**

B.10 **Lobster whole cooked / half cut IQF / packed in tray /pouches**

B.11 **Stuffed crab, Raw crabmeat / soft shell crab**

B.12 **Tuna products and precooked loins and other such prepared products.**
(1) Frozen yellow fin tuna (sashimi grade)
(2) Frozen big eye tuna (sashimi grade)
(3) Frozen tuna fillet and other tuna meat (whether or not minced)
(4) Precooked loins and other such prepared products

B.13 **Canned seafood and canned / retort pouch products.**
(1) Canned seafood
(2) Retort pouch seafood products

C **Standards for Grades of Fishery Products**

(1) **Grades of Whole or Dressed Fish**
Whole or Dressed Fish
Frozen Headless Dressed Whiting

(2) **Grades of Fish Steaks**

- Frozen Halibut Steaks
- Frozen Salmon Steaks

(3) **Grades of Fish Fillets**

- Fish Fillets
- Cod Fillets
- Flounder & Sole Fillets
- Haddock Fillets
- Ocean and Pacific Perch Fillets

(4) **Grades of Frozen Fish Blocks and Products Made Therefrom**

- Frozen Fish Fillet Blocks
- Frozen Minced Fish Blocks
- Frozen Raw Fish Portions
- Frozen Raw Breaded Fish Sticks
- Frozen Raw Breaded Fish Portions
- Frozen Fried Fish Sticks
- Frozen Fried Fish Portions

(5) **Grades of Crustacean Shellfish**

- Fresh and Frozen Shrimp
- Frozen Raw Breaded Shrimp

(6) **Grades of Molluscan Shellfish**

- Frozen Raw Scallops
- Frozen Raw Breaded Scallops and Frozen Fried Scallops

(7) **Freshwater Catfish and Products made Therefrom**

- Catfish

**References**


Barriers to Compliance with International HACCP Regulations: A Whole Chain Approach to the National Fisheries Food Safety Management System in Sierra Leone (Sheriff, 2013)

Fish and Fishery Products Hazards and Controls Guidance (FDA, 2011b)

Handbook of Seafood and Seafood Products Analysis (Nollet et al., 2010)

**4.3.5 Sustainability Practices in Fisheries Resource Management**

A. In the standardization field, policy objectives are placed at the highest hierarchy and should inform the targets set be achieved by standards and conformity assessment. Owing to the dynamisms and imperatives of trade, it is recognized that in many situations policies are
formulated as a response to the exigent state of play. Indubitably, the exigent state of play that informed the eco-labelling standards and certification regimes operating in Africa derived their mandate exogenously and are predominantly oriented towards satisfying the requirements formulated by marketing and retail chains in Europe and North America. In their original formulation, these standards and schemes were intended to satisfy European and North American consumers that the products, predominantly food were:

(a) Safe and healthy
(b) Produced in an environmentally sustainable manner which secured future supplies

B. In response to food safety scares of the 1990s, many governments in North America and Europe established mandatory requirements for firms to introduce Hazard Analysis and Critical Control Point (HACCP) food safety management systems (Washington et al., 2011). Private standards schemes in fisheries and aquaculture have emerged in areas where there is a perception that public regulatory frameworks are failing to achieve desired outcomes, such as sustainability and responsible fisheries management, or to ensure food safety, quality and environmental sustainability in the growing aquaculture industry. The two main types of private standards which affect fish trade relate to:

(a) “Ecolabels” which focus on sustainability of fish stocks and are designed to incentivize responsible fisheries practices and to influence the procurement policies of large retailers and brand owners, as well as the purchasing decisions of consumers.
(b) Food safety and quality fish and seafood private standards which seek to offer guarantees related to quality, safety, environmental impacts, social responsibility, traceability, and transparency of production processes.

C. UNEP-TDIE (2009) recognizes that much of the interest in certification as a market-based initiative stems from the fact that certified products can be traded globally, and the value of international seafood trade has been growing rapidly in recent years. Resulting improvements in fisheries management from certification could result not just in the environmental benefits which are the main motivation for those establishing environmental certification schemes, but also potentially in significant contributions to both poverty alleviation and food security in developing countries through guaranteeing the long-term availability of fish stocks, increased long-term value-added and improved trade. Certification and ecolabelling thus have the potential to generate environmental, social, and economic benefits (UNEP-TDIE, 2009).

D. The concept of an African Ecolabelling Mechanism (AEM) was supported by UNEP under the African 10 Year Framework Programme (10YFP) on Sustainable Consumption and Production. The relevance of the AEM to African countries were highlighted in the background assessment report (Janisch, 2007) as follows:

(1) **Environmental requirements:** Increasingly being used to define commercial relationships between producers and buyers by way of eco-labels.
(2) **Market competitiveness:** Make African products competitive in destination markets and improve environmental and social aspects of production.
(3) **Rationalize and unify eco-labels:** Reduce the need for individual green claims and avoid ‘label fatigue’ and ‘label clutter’.
(4) **Locally relevant certification process with internationally-recognised standards:** Facilitate exports market for high-value sectors.
Raise awareness on mitigating environmental impact in Africa.

Communicate the message of African sustainability: Communicate the accurate message of sustainability that accounts for the African circumstances.

Emphasise that an African Eco-label assures genuine benefits: In particular that the label is part of providing institutional, environmental, social and economic wellbeing (poverty reduction) in Africa on a sustainable basis as opposed to existing eco-labels which offer partial solutions.

Expanding Africa’s market access: Evidence is strong that eco-labels have a role to play in expanding Africa’s market access and assuring customers that current issues of concern such as environmental degradation and greenhouse gas emissions are mitigated by compliance with the African eco-label.

E. These objectives helped to shape the African Ecolabelling Standards (ARS/AES). The African Eco-Labeling Mechanism (AEM) was formally established in 2010 to coordinate the development of sustainability standards and conformity assessment of the same with a view to issuing Eco-Labeling Certification for goods and services complying with these standards. A quick-win strategy was to develop a benchmarking scheme with a view to creating a mutual recognition arrangement for the various eco-labeling and sustainability schemes operating in Africa. While in the course of developing these standards there were strong voices arguing for the direct adoption of existing eco-labeling standards which already had international visibility and presence, or completely abandoning the African initiative in favour of giving recognition to existing schemes.

References

Ecolabelling and Certification in Capture Fisheries and Aquaculture (NAAS, 2012)

Ecolabelling and Fisheries Management (Gardiner et al., 2004)

Eco-Labelling and Sustainable Fisheries (Deere, 1999)

Eco-Label Conveys Reliable Information on Fish Stock Health to Seafood Consumers (Gutiérrez et al., 2012)

Fisheries and Aquaculture Certification: Implications for Southeast Asia (Wilkings, 2012)

Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Capture Fisheries (FAO, 2011b)

Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries (FAO, 2009)

Product Certification and Ecolabelling for Fisheries Sustainability (Wessells et al., 2001)

Private Standards and Certification in Fisheries and Aquaculture: Current Practice and Emerging Issues (Washington et al., 2011)

Is Certification a Viable Option for Small Producer Fish Farmers in the Global South? Insights from Vietnam (Marschke et al., 2014)
4.3.6 Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa

The overall purpose of the Policy Framework and Reform Strategy for Fisheries and Aquaculture is to facilitate transformation of Africa’s fisheries and aquaculture for food, livelihoods and wealth. Accordingly, the Policy Framework and Reform Strategy is intended to:

1. Elaborate and make explicit essential guiding principles for good governance of Africa’s fisheries for increased coherence and coordination of the sector.
2. Assist AU Member States, RECs and RFBs to develop realistic fisheries and aquaculture policies by suggesting standards and best practices to the sector’s benefits to AU member states, in terms of food security, employment and income.
3. Help facilitate regional collaboration and integration in shared fisheries and aquaculture resources management.
4. Provide appropriate guidance on how to implement reforms for fisheries and aquaculture development.
5. Facilitate ratification and/or adoption of appropriate provisions in international fisheries management instruments.
6. Facilitate advocacy for increased investment in the fisheries and aquaculture sector.

The key references to sustainability are those which address (i) Legal institutional framework; (ii) Social wellbeing; (iii) Economic and livelihood sustainability; and (iv) Environmental sustainability.

Institutional Reforms

The PFRS recognizes that the regulatory and governance framework is characterized as ineffective and of need for reform in many countries. The PFRS seeks to establish national and sub-national governance and institutional arrangements that ensure that the societal contribution generated by Africa’s sectors have the greatest impacts at the most appropriate level.

Social Aspect

The PFRS envisions Member States moving from open access fisheries to user rights-based fisheries is a key element in increasing societal benefits from the sector while ensuring ecological sustainability of the resource. Member States are invited to define and design various suites of user rights-based fisheries management that take into account the geographical scope, socio-cultural context and nature of the fisheries, and minimize negative impacts to vulnerable groups and ecosystems.

Economic and Livelihood Sustainability

The PFRS recognizes the abundance in Africa of rich and diverse fisheries resources, both marine and inland which together generate significant economic benefits to the continent in terms of revenues, food and livelihoods. Part of the policy objectives of the PFRS includes the following economic and livelihood sustainability aspects:

(i) Development of sustainable small-scale fisheries by improving and strengthening the contribution of small-scale fisheries to poverty alleviation, food and nutrition security and socio-economic benefits of fishing communities and beyond.
Realizing the full potential of the aquaculture sector to generate wealth, social benefits and contribute to the development of the African economy by jumpstarting market-led sustainable development strategies

Promoting responsible and equitable fish trade and marketing by significantly harnessing the benefits of Africa’s fisheries and aquaculture endowments through accelerated trade and marketing

**Environmental Sustainability**

The PFRS expresses concern on the current unsustainable exploitation of fisheries resources, noting that many resources are in a critical state for a number of reasons, including overcapacity and effort, uncontrolled use of illegal practices, over-exploitation and environmental degradation including mechanized trawling in inshore and protected areas and pollution. The PFRS also notes that fisheries policies are expansionary with emphasis on tonnage landed rather than extracting higher values by processing and value addition. Coastal resources are under growing fishing pressure by both mechanized trawling and small-scale fisheries operators. Thus the PFRS advocates the adoption of policies and measures which promote conservation and sustainable resource use.

**Reference**

Electronic or printed copies of the following documents to be distributed:

Regional Assessment of Fisheries Issues, Challenges and Opportunities for Eastern Africa Region: Toward the Formulation of the Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa (Mwima, 2012)

The Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa: Creating a Conducive and Enabling Environment for the Fish Sector to Create Equitable, Social and Economic Development in Africa (AUC-NEPAD, 2014)


**4.3.7 Introduction to ARS/AES 02:2014, Fisheries — Sustainability and Eco-Labelling — Requirements**

This African standard originated from the realization that existing eco-labelling schemes and standards operating in Africa and across the world had specific biases with respect to the sustainability pillars. The current standard, ARS/AES 2:2014 takes into account Africa’s circumstances with the aim of ensuring that fisheries and aquaculture operations translate to genuine benefits for African operators and host communities rather than only satisfying the perceptions of foreign customers. It is important to recognize that ARS/AES 2 was developed in parallel with the PFRS and therefore some aspects of the PFRS may not be aligned. Below are the highlights of ARS/AES 2:2014.

ARS/AES 2 employs eight key principles which together with criteria and indicators address the sustainability perspectives:

(a) Principle 1: Legal compliance
(b) Principle 2: Respect human rights
(c) Principle 3: Respect labour rights
(d) Principle 4: Maintain fisheries resources and rebuild depleted fish stocks
(e) Principle 5: Maintain ecosystems integrity
(f) Principle 6: Contribute to the mitigation and adaptation to the detrimental effects of climate change.

(g) Principle 7: Responsible waste management

(h) Principle 8: Efficient use of resources

These eight (8) principles are detailed within the following outline:

(a) Governance and policy
   (i) Legal compliance
   (ii) Management systems
   (iii) Incentives for sustainable fishing
   (iv) Fishing methods and gear
   (v) Information for research
   (vi) Customary rights

(b) Social aspect
   (i) Universal Declaration of Human Rights
   (ii) Labour rights

(c) Fisheries resources
   (i) Fish stocks status
   (ii) Reference point
   (iii) Stock rebuilding
   (iv) Harvest strategy
   (v) Harvest control rules and tools

(d) Ecosystem approach
   (i) Fishing operations
   (ii) Retained species
   (iii) Bycatch species
   (iv) Endangered, threatened and protected (ETP) species
   (v) Habitats
   (vi) Ecosystem

(e) Climate change aspect
   (i) Climate change mitigation and adaptation
   (ii) Reduction of ozone layer depleting compounds

(f) Environmental Management

(g) Waste Management

(h) Resource Management
   (i) Energy Management

The standard is structured to support large scale as well as small-scale fisheries. The standard was optimized for inland and marine capture fisheries operations.

Reference
A printed or electronic copy of ARS/AES 02:2014, *Fisheries — Sustainability and eco-labelling*
4.3.8 Public and Private Standardization Systems for Fisheries and Effective Articulation of National Position and Interests

A. Introduction to Public and Private Standards

Public standards are understood as those established by government authority and embedded in laws and regulations (Bain et al., 2013). Private standards are often referred to as voluntary because compliance is enacted through the market and not via public authority. In addition, where market signals or drivers do not exist, or are weak, companies may choose to use private standards to protect their reputation or show to the public that they are a socially and/or environmentally responsible business. There may also be overlap between the two where public regulations incorporate private standards and where private standards incorporate public standards (e.g. public food safety standards are often incorporated into private food safety certification systems, such as ISO 22000).

Formal standards are tied increasingly to a hierarchical monitoring and compliance infrastructure that includes standard setting, certification (often through third-party certifiers), and accreditation, the so-called tripartite standards regime (TSR) (Bain et al., 2013). With the expansion in standards and standard-makers, third-party certifiers (TPC) emerged to assess, evaluate and certify safety and quality claims against a particular set of standards and compliance procedures. Similarly, as the number of certifiers and certifications expanded, accreditation organizations were developed to standardize TPC and regulate their practices. This rise in the 'control of control' is intended to promote self-regulation in the management of risk as well as to help stabilize networks through the creation of trust and legitimacy.

B. The Rise of Private Standards

Within the agri-food sector, standards are part of the institutional infrastructure that coordinates the production and distribution of agricultural products. Until the 1990s, bulk commodities, such as grain, cotton and cocoa, dominated world trade. To facilitate the creation of such commodity markets, reduce transaction costs and increase market efficiency public standards were developed. Here the focus of attention was on product standards (e.g. pesticide residues, colour, moisture content), which could easily be measured and would ensure uniformity and consistency (Ransom, 2007).

In the recent past, a confluence of forces have challenged this paradigm, creating new opportunities for non-state actors, including food retailers, business associations, non-governmental organizations, and multi-stakeholder groups, to develop standards and use them, together with labels and certification systems, to accomplish a range of objectives. Some of the key drivers of these developments include

(i) greater attention consumers put on food safety and quality,

(ii) the expansion of global value chains in the wake of the establishment of the World Trade Organization (WTO)

(iii) the rise of neo-liberal economic and social policies

(iv) activist concerns about corporate social responsibility within the context of globalization

(v) a shift from public to more private market governance; partly due to lack of technical expertise and lack in financial resources to deal with ever more complex standards issues on public level.
Proponents of private standards argue that within this changing economic and political climate the nation state alone was no longer capable – or willing – to regulate the behaviour of businesses.

As the importance and promulgation of standards has increased so has scholarly interest in who develops and controls standards and for what purpose. Influenced by frameworks such as global value chain analysis (GVCA), scholars argue that power within the market has shifted from producers and manufacturers to retailers. Mammoth food retailers have benefited from the changes described above and are using their oligarchic position in the marketplace, together with their ability to source products from around the globe, to establish themselves as the primary gatekeeper to consumer markets.

Researchers utilizing a GVCA framework have been particularly concerned with understanding the distributional effects of retailer-led standards and their implications for power and inequality, especially for small-scale producers in developing countries and to a lesser degree farm workers and women. Here, a focus on governance is viewed as valuable for revealing the social relations inherent in the production of commodities. The concept of governance focuses our attention on understanding the tools, techniques and activities, such as standards and audits, that food retailers utilize to influence and coordinate production and consumption within the value chain. For example, retailers use standards to shape the division of labour within the agri-food system, which has important implications for how financial, material, and human resources, as well as costs, risks and rewards, are distributed.

NGOs have also emerged as important actors in setting standards and shaping the governance of global value chains. Media and activist exposés have drawn public attention to examples of negligent behaviour, such as the use of child labour, by suppliers to the major retailers. Recognizing that the brand name and corporate reputation of retailers is vulnerable to such negative campaigns, NGOs have pressured – or worked with – retailers to establish standards and certification systems designed to minimize the threat of liability and scandal for retailers while enhancing the social and environmental performance of actors throughout the value chain. In addition, NGOs, have sought to challenge what they perceive as the destructive environmental and social production and consumption practices inherent within the conventional agri-food market by developing alternative systems of standards and certification. Perhaps best known is the example of fair trade, which through its social and environmental standards seeks to transform inequitable North–South relations, empower producers, and encourage ethical consumption.

Agri-food scholars have also been influenced by conventions theory and the economy of qualities approach. One of the central ideas here is that competition within the food sector has shifted from a focus on price and quantity to one that emphasizes notions of quality. Retailers or NGOs are concerned with creating standards that can communicate information to the consumer about particular attributes, such as safety or production process, embedded in a product. For example, standards can be used to communicate if a banana is organic, something that a consumer cannot determine objectively for themselves. A conventions approach is focused on understanding the role of norms and values in determining how particular assessments of quality are made as well as the rules, procedures and organizational forms that coordinate exchange relations. Through an analysis of conventions, researchers can appreciate ‘the constellations of ideas, practices, and institutions’ that comprise and guide ‘relations of production, exchange, and consumption’.

In sum, private standards are no longer simply about reducing transaction costs and increasing market efficiency. Instead, private standards have emerged as tools used strategically by both businesses and NGOs to achieve a range of objectives. These objectives
include access to new markets, coordination of operations, quality and safety assurances to consumers, and the establishment of new brands, niche products and markets.

One recent area of enquiry has been to analyse the discursive and organizational mechanisms through which private standards and standard-makers achieve and maintain legitimacy. Public standards derive their authority and legitimacy from the state and the democratic decision-making process. The issue for these scholars is to understand how standard-makers convince potential standard-users to view their standards as credible and trustworthy. The legitimacy of governance mechanisms is especially relevant within the context of global trade where rules and regulations are largely voluntary and authorities policing non-compliance are largely absent. It is argued that the use of public, private or public-private hybrid TPC organizations has become de rigueur for enhancing the trust and legitimacy of claim-making related to standards, largely due to its perception as a compliance tool that is transparent, independent and objective.

Proponents assert that standards are grounded in techno-scientific practices, such as value neutrality, consistency, and transparency, as well as the objectivity of independent third-party certifiers. Influenced by science studies, especially actor-network theory, agri-food scholars of standards have sought to challenge this view. Drawing on understandings of how techno-scientific development works in practice, these scholars argue that standards are not simply an objective means to address technical compatibility issues. Rather, standards and TPC are socially mediated and are ‘examples of disciplinary power’. Standards are not absolute, universalist tools imposed on local actors and sites, instead the ongoing work of standardizing – making people and things commensurable and calculable – is a process of negotiation, revision and strategic design. From this perspective, standards inevitably embody the interests, values, and asymmetrical power relations of different actors involved in the process.

One of the useful insights that have emerged is that science, politics and ethics are not mutually exclusive. Standards are normative because the very process of creating classifications and categories involves choices over what or who to include and exclude. Standards are normative because they not only define ‘what (who) is good and what is bad’, but also discipline ‘those people and things that do not conform to the accepted definitions of good and bad’. Similarly, standards are norms through ‘which people, objects or actions (including government regulation itself) can be judged and compared’. Standards have political and moral significance because they order relationships among people by defining their rights and their exposure to the rights of others. Thus, we can understand techno-scientific practices, such as standards, as ‘politics by other means’, which play a role in (re)producing social structures and informing issues related to ethics, social justice and democracy.

C. Typology of Standards

Four distinctions of standards can be made as follows (ITC, 2011):

(i) Public nonmarket-based standards collaboration of intergovernmental organizations or cooperation among domestic regulators (e.g., ILO core labour standards)

(ii) Public market-based standards result from market-like competition between public regulatory agencies of individual states or regional and multilateral standard setting bodies (e.g., Codex standards, ARSO).

(iii) Non-market-based private regulation by private bodies dominating one or several sectors (e.g., ISO and IEC standards).
(iv) Market based private regulation by firms or any other body, such as NGOs, research institutes, multi-stakeholder coalitions/roundtables and industry associations (e.g., Fairtrade, FSC, MSC).

D. The Basics in Public Standards Setting

While tariffs and quotas have been reduced significantly since the creation of the WTO the rise in public and private standards is one element contributing to the growing amount of non-tariff measures. So as to counter a trade impeding impact of non-tariff measures, a number of agreements were developed. Key agreements include (ITC, 2011):

- **The Sanitary and Phytosanitary (SPS) Agreement**: this agreement lays out the basic rules for food safety and animal and plant health standards. Countries are allowed to develop their own standards given that these standards are based on science, and are only applied to the extent necessary to protect human, animal or plant life or health. Also, they should not arbitrarily or unjustifiably discriminate between countries where identical or similar conditions prevail. Importantly, member countries are encouraged to use international standards, guidelines and recommendations where they exist. This gives international standards setting bodies such as the Codex Alimentarius de facto mandatory status.

- **The Technical Barriers to Trade (TBT) Agreement**: this agreement aims to ensure that regulations, standards, labelling, customs forms, testing, certification procedures and other technical aspects do not create unnecessary obstacles to trade. Members still have the right to implement measures to achieve legitimate policy objectives, such as the protection of human health and safety, or the environment.

- **The Trade Related Intellectual Property Rights (TRIPS) Agreement**: this agreement introduced global minimum standards for protecting and enforcing intellectual property rights in international trade. It requires similar intellectual property regimes from all signatory nations. WTO members are obliged to adapt their laws to the minimum standards of protection and to comply with detailed obligations for the enforcement of intellectual property rights.

A key area regulated by public standards is food safety and quality and environmental protection. Food safety constitutes a public good aiming to reduce risks to human health related to food consumption. It is generally seen as a responsibility of the state as markets alone will not always provide the socially desirable level of food safety, although companies have several legal and market incentives to provide effective food safety control. Public authorities need to correct this market failure resulting in information asymmetries and consumption externalities.

This is particularly relevant for a good’s *experience* attributes, where consumers can evaluate characteristics such as quality and utility only upon consumption and *credence* attributes, which are impossible for a consumer to ascertain even after consumption or utilization of a good. In these cases, standards and certifications facilitate the functioning of the market. They define the specifications of the product and provide consumers with a guarantee concerning the product’s characteristics, such as the process of production, ingredients used or its utility impact. Certifications and labels reduce the information asymmetry between the seller and the buyer. For *search* attributes, market incentives mostly are strong enough to provide the desirable amount of food quality, because a consumer can evaluate the product before buying and consuming it.
A number of governments started requesting preventive systems of food safety control, notably the HACCP standard system. HACCP is a preventive system that allows identifying potential food safety hazards during the food production and preparation process. In combination with product traceability systems, this allows for the enforcement through inspection of production records rather than finished product inspection. This shift from regulating the product to regulating the production processes makes regular product inspection and firm plant visits redundant, which in turn reduces costs. Public authorities’ controls changed from product inspection to control whether appropriate systems are in place and function correctly. Authorities can rely on reports and work more efficiently, which results in more controls being carried out. This delegation of quality control to the sellers constitutes a major shift in the role of public authorities.

Public authorities not only set minimum requirements for food safety but also define minimum quality standards. While the majority of standards developed by governments are mandatory and also include grades, weights and measures mainly for agricultural commodities, governments are also involved in the development of voluntary standards. For example, a number of governments participate in the development of the International Organization for Standardization (ISO) standards.

In the case of the organic standards, governments took a key role in developing national or regional standards. This also provided for a harmonized definition of the term ‘organic’ and provided a legal framework for accrediting certification bodies. A national authority implements this legal framework on national level. Goods to be imported into the EU as organic must meet organic production and procedural standards as defined in EC regulation. Production, processing, documentation, inspection and certification need to be of equivalent standards to EU Regulation, meaning that regulation in the exporting country does not need to be identical, but procedure and actions need to be in place demonstrating ‘that the legislator targets of the Regulation have been met’. This allows exporting countries to develop their own organic production and certification systems. Most policy recommendations to governments are provided by voluntary accreditation schemes, with the International Federation of Organic Agriculture Movements (IFOAM) being the most influential.

In developing an EU recognized national certification system Chile improved market access for its organic producers to the EU and reduced transaction costs. Exporters no longer need to request a special import permit to import their organic products into the EU. National standards seem to lead to ‘superior export performance’. From an economic point of view, incentive based voluntary standards can be more efficient than mandatory regulation, generating lower compliance and transaction costs. This emphasizes the importance of the development of national voluntary standards and the potential impact on trade that harmonized standards could have. However, research generated mixed results as to the efficiency of voluntary standards in achieving socially and environmentally desirable outcomes (ITC, 2011).

E. Developing Private Standards

Private standards are as standards developed by private entities such as companies, non-governmental organizations or multi-stakeholder coalitions (ITC, 2011). These standards may vary in scope, ownership and objectives. Objectives range from environmental conservation, ensuring food safety, protection of social and human rights, to promoting good agricultural and manufacturing practices. Private standards can be numerical standards defining required characteristics of products such as contaminant limits or maximum residue limits, or process standards prescribing the production processes (including performance objectives) or pertaining to management system and documentation requirements.
Private standards certification schemes comprise the private standard itself and also covers the standard setting procedures, adoption and implementation practices, and conformity assessment and enforcement. Drivers for the development of private standards are numerous. They include:

(i) Increased consumer awareness of the impact of food on health,

(ii) Food quality and due diligence requirements assigned to food chain operators,

(iii) Growing societal and consumer demand for more responsibly produced goods and information about the production and processing conditions of products. The latter resulted in an increasing number of consumers and companies basing purchasing decisions on ethical criteria and a notion of corporate responsibility.

Particularly in the food sector, firms use private standards to differentiate from competitors, to build brand recognition and consumer loyalty, and to define and occupy market niches. This leads to companies establishing standards beyond public requirements for food safety. Given the high transaction costs for individual firms of establishing their own standard in supply chains, firms started to pressure industry organizations and established coalitions and consortia (national and international) for the development of collective standards. Examples include the Global Food Safety Initiative (GFSI), Global GAP, or the British Retail Consortium (BRC).

In some cases companies exceed public standards aiming (i) to build influence on private standard setting in case public authorities decide to further develop public standards and (ii) to be able to select a private standard of their choice that minimizes their costs in complying with public standards. In a survey of the Committee on Sanitary and Phytosanitary Measures of the WTO, over two thirds of respondents replied that ‘at least some of the requirements of private standards exceed those of the relevant international standards and official import requirements’. These include more detailed operational procedures, lower MRLs, among others. But pre-emptive strategies also have other reasons such as being a measure to pre-empt additional public regulation.

In addition, standards are a tool to more efficiently manage geographically wide spread supply chains by standardizing product requirements and reducing transaction costs. Companies also use standards to ensure a quantitatively and qualitatively consistent supply and build their own brand specific product attributes. Especially credence attributes of products relating to production and handling of products are guaranteed through the use of standards and certification. In addition to these standards an ‘intense dynamic has emerged around initiatives dealing with social, environmental, and sustainability concerns – pushed by international agreements and civil society pressures – giving rise to a complex and evolving landscape of voluntary standard initiatives in agricultural and agrifood markets. While standards relating to ethical concerns, sustainability issues or product quality, in most cases can be considered business-to-consumers (B2C) standards (with some using a label), food safety, traceability and GAP standards, usually are business-to-business (B2B) standards.

By implementing private standards some companies claim that their product safety is above that required by public authorities. This entails the danger of eroding public confidence in public food safety authorities. Additionally, public confidence in national food safety authorities is in the interest of all stakeholders in the food industry. According to the FAO/WHO Codex Alimentarius Commission reducing minimum residue levels below the official amount, as done by some corporations through additional private standards, does not provide additional protection of public health (ITC, 2011). The same applies to restricting the number of residues where it has not been scientifically proven that multiple residues might have a synergistic toxicological effect. Therefore, the level of detail of private food standards needs to be
scientifically proven, for example when it comes to exceeding minimum residue levels. Private standards thus risk undermining the authority of the texts adopted by the FAO/WHO Codex Alimentarius Commission (CAC). Standards going beyond CAC mainly address traceability, documentation and testing requirements.

This development also has challenging implications for producers and exporters. Private standards exceeding public requirements are more difficult to comply with. Private food standards tend to impose the same requirements to suppliers all over the world where these face very different preconditions in meeting them. Aiming to alleviate this problem, CAC standards, for example, focus on the relevant factors to be taken into account and the results to be achieved. So, they prescribe the ‘what’ and ‘why’, but do not detail the ‘how’. The reason for this is the recognition of the very different circumstances and realities in member countries. The ‘why’, the actions, procedures and provisions to be put in place are translated by national governments, producers or food business associations and individual food businesses.

Preventive food safety management resulted in the development of process standards and codes of conduct instead of end-product checks. It is argued that private food quality systems are often more flexible and agile in responding to consumer needs than national or international public standards. Nevertheless, there remains a trade-off between an efficient food quality control system operated by a business and the most efficient food quality outcome for society given the risks and transaction costs associated with expensive supply chains (e.g. traceability, or separation for composite products).

Finally, the question whether the SPS Agreement is applicable to private standards has not been settled conclusively. In a nutshell, some countries argue that Article 13 of the SPS Agreement obliges governments to ensure that product certification and labelling standards developed by private entities are consistent with WTO rules. Article 13 requires governments to ‘take such reasonable measures as may be available to them to ensure that nongovernmental entities within their territories […] comply with the relevant provisions of this Agreement’. Conversely, others argue that Article 13 is not legally binding for private certification schemes as they do not qualify as non-governmental entities. The question whether private standards could be considered as ‘non-governmental entities’ as defined in the WTO SPS Agreement remains contested. The SPS Agreement has not been effective in addressing private standards, mainly regarding two issues: (i) legal issues that relate to the multilateral agreement structure of the General Agreement on Tariffs and Trade (GATT), SPS, and TBT Agreements and (ii) practical issues over the implications of private standards.

As competition in international food markets is shifting from price based to quality based, private food standards are expected to become more important and widespread. Although firm incentives to carry out control of credence attributes are theoretically small, the contrary development is evident and retailers and food firms are found to compete on the basis of food safety and quality, increasing the number of private standards. This inevitably leads to the discussion about the legitimacy of private standards and the question what makes a legitimate standard. Legitimacy becomes particularly relevant when discussing overlaps in private and public standard setting and in cases where private standards substitute public standards and assume regulatory functions.

F. The Legitimacy of Private Standards

Private standards are governance mechanisms beyond the state that claim legitimacy, although these may not be elected mandate holders and do not have democratic internal structures. But without a certain extent of legitimacy, standards are not accepted as regulatory instruments. An independent set of indicators to measure the relative legitimacy of specific standards: the influence of value chain stakeholders on the standards-setting process, the extent to which the standard-setting process is transparent, the inclusion of developing country interests, and the
scientific foundation on which they are based. On this basis, the authors cite the lack of representation of smaller firms and marginalized groups as a challenge to the legitimacy of some standards. A key concern surrounding the legitimacy of the standards is whether they are 'science-based', questioning if private food safety standards do in fact provide appreciably higher levels of protection against food safety hazards than those under the purview of the SPS Agreement. Finally, the credibility of the standard setters is a precondition for private standards to obtain legitimacy. But credibility alone does not guarantee legitimacy.

The different notions of legitimacy revolve around the three concepts of transparency, inclusiveness and accountability and the different stages of (i) standards setting, (ii) standard implementation and the certification process, (iii) standard monitoring, and (iv) the impacts of standards. The key elements according to which these stages are scrutinized include: the assurance of a transparent process, the inclusion of diverse interests (inclusiveness), the scientific foundation of requirements, and the accountability of standard organizations. The concepts of legitimacy tend to focus on one or two stages that are analyzed according to one or several elements of legitimacy. It is important to note that concepts such as accountability, transparency and inclusiveness are overlapping as for one of them to function it requires that the other two be equally respected. For example, to achieve full accountability organizations need to be transparent; and inclusiveness is not very useful if you are not at the same time accountable to the stakeholders you are including. Figure 18 provides an overview of the key elements of legitimacy.

In summary, it is evident that a number of approaches co-exist aiming to define what makes a legitimate standard. It is important that the discussion of the legitimacy of private standards and the different elements constituting standards’ legitimacy be kept in mind, while looking at the complementarities, overlaps and conflicts of private and public standards. Legitimacy of private standards is particularly critical when private standards substitute public standards and assume regulatory functions. The same applies to cases where private standards are referenced in public norms.

The ways in which public authorities engage with private standards can decisively influence the legitimacy of private standards, e.g. through their simple use of a standard. Governments’ behavior can go from facilitating national stakeholder dialogue on private standards, through public authorities incentivizing organizations to adhere to private standards, to public authorities incorporating private standards in statutes, regulations, permits or international agreements. These governmental actions can potentially work towards public and private standards’ harmonization, complementarity or substitution.

![Figure 18: Elements of legitimacy (ITC, 2011)](image)
G. Effective Articulation of National Position and Interests in Standardization

Effective articulation of national position and interests in standardization should be informed not only on the scientific facts which should be indisputable, but also the reality of the existing trade-political environment and as well as emerging issues. The implementation of private food standards is likely to become even more widespread in terms of the types of markets to which they apply, the number of countries where use of 3rd party certification systems is important and the product groups affected. This underlines the need for private standard setters and governmental authorities to better understand the impact of private standards and to take measures to optimise the benefits of private standard certification and reduce difficulties that they pose, particularly to developing countries. *Transparency, on the part of industry and industry coalitions, in the setting and implementation of private food standards becomes increasingly important.* Other considerations that could guide discussions on approaches for moving forward to a better understanding of the issues and a shared vision of the role of private food standards in the overall architecture of food safety regulation include the following (FAO, 2010):

1. Concerned national institutions should ensure that they are well informed of the situation in their countries concerning the use and impact of private standards and can report on these to relevant international organizations.

2. Engagement between private standard setting bodies and concerned international organizations could contribute to resolving some of the concerns of developing countries. However, it must be understood that constructive dialogue depends on all parties having access to relevant information.

3. The ability of countries to *implement* Codex standards and guidelines would greatly enhance their ability to comply with private food standard requirements. Countries should consider making better use of Regional Codex Coordinating Committees for regular reporting on actions taken to implement Codex standards in their national context.

4. Stakeholder input into the development and review of private standards contributes to promoting their feasibility in each national context. Member countries and private standard setters should consider whether national technical working groups might be an effective means of providing developing country input into the processes of reviewing and revising private standard schemes.

5. Member organizations of the Standards and Trade Development Facility (STDF) and the STDF secretariat might consider increased emphasis on identifying and promoting best practices in designing and delivering technical assistance aimed at enabling food chain operators in developing countries to implement effective programmes of food safety management.

6. The ability of developing countries to demonstrate equivalence of alternative food safety management measures could contribute to overcoming the challenges posed by overly prescriptive private standards. Donor agencies and development partners should consider increasing their support for building the scientific and technical capacities in developing countries that would facilitate such approaches.

7. The use of microbiological criteria may become increasingly important in both official and private food safety standards. Member countries should be aware of the potential relevance of new work proposed by the Codex Committee on Food
Hygiene concerning the revision of the Codex “Principles for the development and application of microbiological criteria” to their expressed concerns about the stringency of private food standards.

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Private Agri-food Standards: Contestation, Hybridity and the Politics of Standards (C. Bain et al., 2013)


Private Food Safety Standards: Their Role in Food Safety Regulation and their Impact (FAO, 2010)

4.3.8 The Rules-Based Nature of Fish Trade: Implications of the WTO TBT and SPS Agreements — The national Obligations Under the OIE and WTO Fish Trade Facilitation Regimes

A. Introduction

Trade within national jurisdictions and across borders is increasingly affected by the proliferation of standards and technical regulations with increased regulatory intensity being particularly noticeable in the food and agricultural sectors covering cereals; fish, crustaceans and other aquatic vertebrates; edible preparations of meat, fish and crustaceans; edible vegetables, roots and tubers; prepared vegetables, fruit, nuts and other plant parts; and prepared cereals and flours (Sheldon, 2013). The proliferation of standards and technical regulations in both the food and agricultural sectors is typically regarded as the response of policymakers to consumer demands for improved product safety, increased environmental protection, and greater product information. Standards and technical regulations “have as their prima facie objective the correction of market inefficiencies stemming from regional, national, transnational, or global externalities associated with the production, distribution, and consumption of these products.

Standards in the food and agricultural sector can be classified under two broad categories: (i) provision of public goods such as control of pesticide use in agricultural production; and (ii) reduction of transactions costs associated with information asymmetries between producers and consumers concerning food product characteristics, e.g., the extent of pesticide residues in a product which consumers are unable to ascertain either before or after its consumption. While the theory of optimal intervention prescribes that market distortions should be targeted at source, there is also acknowledgement that they may also provide protection for domestic producers and are, therefore, subject to “regulatory capture” (Sheldon, 2013). Given the potential for standards and technical regulations to distort international trade, a key outcome of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994 was the securing of multilateral disciplines on their use through the World Trade Organization’s (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS), and the Agreement on Technical Barriers to Trade (TBT). The objective of these agreements is to ensure that standards and technical regulations, while potentially meeting legitimate economic objectives, are not disguised restrictions on international trade.
Sheldon (2013) reports that there has been considerable discussion of the problems of regulatory compliance faced by developing countries in accessing developed country markets, given the latter typically have higher levels of regulatory intensity than the former. Testing the hypothesis of “standards as barriers” has been a dominant feature of the limited amount of empirical research on the impact of food safety regulations on trade flows of specific food and agricultural commodities. A common finding of these empirical studies is that more stringent standards imposed by developed countries act as barriers to trade.

B. Basic Definitions under WTO SPS and TBT Agreements

Certification system: the set of rules for executing of works on certification, its participants and rules for operation of the certification system as a whole.

Standard: a document establishing, for the purposes of voluntary multiple use, the product performances, the rules for realization and the characteristics of processes of production, operation, storage, transportation, marketing and utilization, executing of works or rendering of services. The standard may also contain the requirements for terminology, symbology, packing, marking or labelling, and the rules for their affixing.

Standardization: the activity of establishing of rules and performances for the purpose of their voluntary multiple use, aimed at achievement of orderliness in the spheres of production and circulation of products, and at heightening of competitiveness of products, works or services.

Technical regulating: the legal regulating of relations in the field of establishing, application and executing of obligatory requirements for products, processes of production, operation, storage, transportation, marketing and utilization, and also in the field of establishing and application, on a voluntary basis, of the requirements for products, processes of production, operation, storage, transportation, marketing and utilization, executing of works or rendering of services, and legal regulating of relations in the field of conformity assessment.

Technical regulation: a directive, compliance with which is mandatory, whereby the competent authority, through an administrative action, establishes the characteristics of a product or the production processes or methods relating to the product, including applicable administrative provisions. It may also include, or exclusively address, requirements in the areas of terminology, symbols, packaging, branding or labelling applicable to products, including buildings, structures and constructions, for processes of production, operation, storage, transportation, marketing and utilization. Preparation, adoption and application shall be the responsibility of the respective Ministries or agencies duly authorized for this purpose.

C. Pivotal Provisions of the WTO SPS Agreement

SPS measures include all relevant laws, decrees, regulations, requirements and procedures including, inter alia, end product criteria; processes and product methods; testing, inspection, certification and approval procedures; quarantine treatments including relevant requirements associated with the transportation of animals and plants, or with the materials necessary for their survival during transport; provisions on relevant statistical methods, sampling procedures and methods of risk assessment; and packaging and labelling requirements directly related to food safety.

D. Key Expectations

(i) Except under very special circumstances, countries generally benefit from removal or reduction trade barriers arising from SPS measures and technical regulations.
(ii) In principle, SPS standards are introduced by government in the interest of the society, to protect public, animal and plant health, and the environment.

(iii) In theory, establishment of SPS standards (or other technical standards) could facilitate trade through reducing transaction cost, by assuring consumers that the food they consume is of an acceptable standard and reducing the cost of uncertainty that they face in assessing product quality.

(iv) Standards can serve to signal quality in foreign markets and thus contribute to increasing elasticity of substitution between similar goods produced in different countries, thereby permitting relatively more efficient producers to thrive through export expansion.

(v) Efficiency of production would be increased through standardization as it reduces information asymmetries between buyers and sellers, and promotes product commutability, thereby allowing for increased economies of scale and scope.

E. Key Impacts

Importing countries may deliberately craft SPS measures that impose a cost or other disadvantage on foreign competitors to provide protection for domestic producers.

Even when comparable SPS measures are applied in developed countries to both domestic and imported products, they can act to impede imports from developing countries because of asymmetry in compliance cost.

Food safety has the potential of mutating to a ‘luxury’ good whose demand rises as income levels rise, and greater prosperity tends to be accompanied by increased demand for more stringent SPS standards in developed countries. Many in developed countries see the much laxer SPS standards that often prevail in developing countries as a threat precipitating ‘a race to bottom’.

As traditional trade barriers such as tariff and quantitative restrictions continue to decline, protectionist interests are likely to make increasing use of food safety regulations and other technical barriers to block trade.

Among African countries, TBTs and SPS measures have been deployed on the instigation of foreign interests to hinder intra-African trade.

Institutional capacity constraints to conduct conformity assessment on fish products coupled with rapid changes in the food safety perceptions of export destination countries. Significant investments are usually required to procure equipment, materials and competent human resources which represent a major barrier to developing countries.

Discriminative technical and financial assistance and transitional periods for the application of environmental and biodiversity safeguards such as turtle excluder devices (TEDs) in shrimp trawlers to reduce sea turtle mortality (Asche et al., 2009).

The globalization of the fish trade has led to substantial product that is exported to one country, processed, and then re-exported, sometimes back to the original country. If product is processed in a country besides the one harvesting or producing it, traceability may be more difficult. Traceability requirements could then become technical barriers to trade not just for raw product but also for processed product that ostensibly originates in the importing country.

Export-oriented fisheries are subjected to legislative and regulatory pressures in the export
destinations which may demand significant costs in legislative and regulatory reforms and upgrades of processing facilities, and in some cases loss of markets and closing down of facilities unable to upgrade (Henson et al., 2004).

The WTO SPS Agreement anticipates SPS measures differ in the first instance due to significant differences in tastes, diets, income levels and perceptions that influence the tolerance of populations toward these risks. Differences in climate and in the available technology (from refrigeration through to irradiation) affect the incidence of different food safety and agricultural health hazards. Standards reflect the feasibility of implementation, which itself is influenced by legal and industry structures as well as available technical, scientific, administrative and financial resources. Some food safety risks, for example, tend to be greater in developing countries due to weaknesses in physical infrastructure (for example standards of sanitation and access to potable water) and the higher incidence of certain infectious diseases. Further, tropical or sub-tropical climatic conditions may be more conducive to the spread of certain pests and diseases that pose risks to human, animal and/or plant health (Jaffee et al., 2004).

F. Key Obligations of Member States under WTO SPS and TBT Regimes

Member States are under the following obligations whenever they anticipate developing and adopting SPS measures and technical regulations:

F.1 SPS Measures

(1) Relevant technical regulatory authorities shall prepare, adopt and enforce technical regulations establishing essential minimum SPS measures in relation to products originating from the separate countries and/or places, including the restriction of import, use, storage, transportation, marketing and utilization, providing biological safety (irrespective of the ways of safety assurance used by the manufacturer).

(2) The SPS measures may provide for the requirements for products, for methods of product processing and production, for procedures of product testing, inspection, conformity assurance, the quarantine rules, including the requirements connected with transportation of animals and plants, for materials necessary to ensure life or health of animals and plants during their transportation, and also for methods and procedure of sampling, for methods of test and evaluating of risk and other requirements contained in technical regulations.

(3) Regulatory authorities shall ensure that any SPS measure that it prepares, adopted, maintained or enforced is:

(a) based on scientific principles, taking into account relevant factors including, where appropriate, different geographic conditions;

(b) not maintained where there is no longer a scientific basis for it; and

(c) based on a risk assessment, as appropriate to the circumstances.

(4) Each regulatory authority shall ensure that an SPS measure that it adopts, maintains or applies does not arbitrarily or unjustifiably discriminate between domestic goods and like goods of another country, or between goods of another country and like goods of any other country, where identical or similar conditions prevail.
SPS Measures shall be proportionate to the appropriate level of protection, taking into account technical and economic feasibility.

Regulatory authorities shall not adopt, maintain or apply any SPS measure with a view to, or with the effect of, creating a disguised restriction on trade.

Technical regulatory authorities shall use, as a basis for preparing sanitary and phytosanitary measures, relevant international standards, guidelines or recommendations which will not be trade disruptive.

Governments shall continuously register and analyse all cases causing harm, as a result of violation of requirements of SPS measures, to life or health of people, property of natural or legal persons, state or municipal property, environment, life or health of animals and plants, taking into account the weight of this harm, and also shall organize the informing of purchasers, manufacturers and sellers on the situation in the field of observance of technical regulation requirements.

F.2 Technical Regulations

The following objectives shall constitute the legitimate purposes for the preparation, adoption and application of technical regulations in consistency with the provisions of the WTO TBT Agreement:

(a) protection of life or health of people, property of natural or legal persons, state or municipal property;

(b) protection the environment, life or health of animals and plants;

(c) prevention of actions misleading the purchasers / deceptive practices.

In pursuing the legitimate objectives, regulatory authorities may establish the levels of protection that it considers appropriate.

Regulatory authorities shall not prepare, adopt, maintain or apply any technical regulations with a view to or with the effect of creating an unnecessary obstacle to trade. An unnecessary obstacle to trade shall not be deemed to be created where:

(a) the demonstrable purpose of the measure is to achieve a legitimate objective; and

(b) the measure does not operate to exclude products of other Member States that meet that legitimate objective.

Regulatory authorities shall ensure that a technical regulation shall:

(a) serve clearly identified policy goals, and be effective in achieving those goals;

(b) have a sound legal and empirical basis;

(c) produce benefits that justify costs, considering the distribution of effects across society and taking economic, environmental and social effects into account;
(d) minimize costs and market distortions;
(e) promote innovation through market incentives and goal-based approaches;
(f) be clear, simple, and practical for users;
(g) be consistent with other regulations and policies; and
(h) be compatible as far as possible with competition, trade and investment-facilitating principles at domestic and international levels.

G. WTO Dispute Resolution Mechanism

For any state or customs territory, WTO membership implies accepting limitations on regulatory autonomy in five areas: (1) trade in goods; (2) trade in services; (3) the protection of intellectual property rights; (4) the settlement of disputes; and (5) periodic review of national trade policies (Hoekman et al., 2007).

SPS and TBT Agreements address trade in goods and services and under the WTO legal obligations, all disputes arising from the implementation of these agreements shall exclusively be addressed through the Dispute Settlement Body (DSB).

Settling disputes is the responsibility of the Dispute Settlement Body (the General Council), which consists of all WTO members. The Dispute Settlement Body has the sole authority to establish “panels” of experts to consider the case, and to accept or reject the panels’ findings or the results of an appeal. It monitors the implementation of the rulings and recommendations, and has the power to authorize retaliation when a country does not comply with a ruling.

- **First stage: consultation** (up to 60 days). Before taking any other actions the countries in dispute have to talk to each other to see if they can settle their differences by themselves. If that fails, they can also ask the WTO director-general to mediate or try to help in any other way.

- **Second stage: the panel** (up to 45 days for a panel to be appointed, plus 6 months for the panel to conclude). If consultations fail, the complaining country can ask for a panel to be appointed. The country “in the dock” can block the creation of a panel once, but when the Dispute Settlement Body meets for a second time, the appointment can no longer be blocked (unless there is a consensus against appointing the panel).

Officially, the panel is helping the Dispute Settlement Body make rulings or recommendations. But because the panel’s report can only be rejected by consensus in the Dispute Settlement Body, its conclusions are difficult to overturn. The panel’s findings have to be based on the agreements cited.

The panel’s final report should normally be given to the parties to the dispute within six months. In cases of urgency, including those concerning perishable goods, the deadline is shortened to three months.
The agreement describes in some detail how the panels are to work. The main stages are:

1. **Before the first hearing**: each side in the dispute presents its case in writing to the panel.

2. **First hearing: the case for the complaining country and defence**: the complaining country (or countries), the responding country, and those that have
announced they have an interest in the dispute, make their case at the panel’s first hearing.

(3) **Rebuttals:** the countries involved submit written rebuttals and present oral arguments at the panel’s second meeting.

(4) **Experts:** if one side raises scientific or other technical matters, the panel may consult experts or appoint an expert review group to prepare an advisory report.

(5) **First draft:** the panel submits the descriptive (factual and argument) sections of its report to the two sides, giving them two weeks to comment. This report does not include findings and conclusions.

(6) **Interim report:** The panel then submits an interim report, including its findings and conclusions, to the two sides, giving them one week to ask for a review.

(7) **Review:** The period of review must not exceed two weeks. During that time, the panel may hold additional meetings with the two sides.

(8) **Final report:** A final report is submitted to the two sides and three weeks later, it is circulated to all WTO members. If the panel decides that the disputed trade measure does break a WTO agreement or an obligation, it recommends that the measure be made to conform with WTO rules. The panel may suggest how this could be done.

(9) **The report becomes a ruling:** The report becomes the Dispute Settlement Body’s ruling or recommendation within 60 days unless a consensus rejects it. Both sides can appeal the report (and in some cases both sides do).

**Appeals**

Either side can appeal a panel’s ruling. Sometimes both sides do so. Appeals have to be based on points of law such as legal interpretation — they cannot re-examine existing evidence or examine new issues.

Each appeal is heard by three members of a permanent seven-member Appellate Body set up by the Dispute Settlement Body and broadly representing the range of WTO membership. Members of the Appellate Body have four-year terms. They have to be individuals with recognized standing in the field of law and international trade, not affiliated with any government.

The appeal can uphold, modify or reverse the panel’s legal findings and conclusions. Normally appeals should not last more than 60 days, with an absolute maximum of 90 days.

The Dispute Settlement Body has to accept or reject the appeals report within 30 days — and rejection is only possible by consensus.

**H. Scientific Evidence as Basis for WTO Engagements**

The proliferation and enhanced stringency of food safety and agricultural health standards is a source of concern among many developing countries and those promoting the increased integration of these countries into the world trading system. Reflecting wider changes in the trade regime for various agricultural and food products, there is a presumption that food safety and agricultural health measures can (and will) be used as a protectionist tool, providing ‘scientific’ justifications for prohibiting imports of certain products altogether, or discriminating
against imports by applying higher standards and/or more rigorous regulatory oversight than on domestic suppliers.

The SPS Agreement permitted measures that were ‘necessary to protect human, animal or plant life and health’, yet required regulators to: (1) base measures on a scientific risk assessment; (2) recognize that different measures can achieve equivalent safety outcomes; and (3) allow imports from distinct regions in an exporting country when presented with evidence of the absence or low incidence of pests or diseases.

Scientific justification is called for wherever standards are deemed to not be based on established international standards. Yet, complications are inevitable given the wide range of areas for which no agreed international standards exist and given broad (and emerging) areas for which the state of scientific knowledge is incomplete. Hence, many of the controversies which have occurred surround the legitimacy and appropriateness of measures in the context of scientific uncertainty.

I. Capacity of African Member States to Engage in WTO

Most African countries have not developed the capacity to demonstrate compliance of their fish products to international or regional standards. The imposition of scientifically unproven limits or disproportionate requirements on products originating from African countries has not been scientifically challenged due to low capacity of Member States in carrying out comparative research.

To establish and enforce appropriate standards requires building expertise and devoting additional resources to applied science and public management. To a great extent this effort can be left to private firms wishing to expand domestic and international sales, but there remains a role for government in light of the public-good nature of effective standards. In defining and implementing more effective standards, however, many poor countries will need technical assistance from international organizations and specialists with expertise (Hoekman et al., 2002).

The SPS and TBT agreements have set a bar that must be met by exporting firms in developing countries. These agreements strongly encourage importing nations to adopt product standards that are at least as rigorous as those developed by international standards-setting bodies. Over time, all WTO members can be expected to adopt such regulations, with the richer members choosing even stronger rules. Thus, developing economies have no choice but to meet recognized international standards, at least for exports. It is likely, however, that such standards would have to be applied to all production within each country simply to inspire confidence in importing markets that goods are produced safely by all potential supply sources.

In this context, problems relating to the implementation of obligations under the TBT and SPS agreements rank high among developing country concerns. Lack of modern technical infrastructure and capacity to engage in international standards development activities and to provide internationally recognized testing and certification procedures for products is a common constraint. Without the resources necessary for building and maintaining modern standards and conformity assessment systems, it is difficult either to ensure rights or to exercise responsibilities under existing WTO rules. If developing countries lack resources to access information on international standards or to participate in their development, a key link between the rule of law as specified in the WTO system and developing countries’ ability to fulfill their obligations and defend their rights is called into question.

Many countries are also concerned to clarify provisions regarding special and differential treatment in the TBT and SPS agreements. India, for example, has recommended extending the timeframe for compliance by developing country members with the existing provisions of WTO
agreements referencing standards. In a related vein, a number of developing countries have
cited problems with their ability to react to notifications of new TBT and SPS measures. A
notification of intent to promulgate a new regulation, with a 60-day open comment rule, is of
questionable value to developing countries that have no capacity to respond.

Concern over the use of environmental standards to restrict imports is also prevalent among
developing countries. The use of trade measures to enforce environmental standards is viewed
with serious alarm by many countries with regard to both manufactures and agricultural
products. Among other issues, the lack of clear rules on the appropriate use of labels to
indicate environmental impact and the rise in the use of standards for process and production
measures in industrial countries have been noted in developing country submissions to the
WTO.

Questions of how and under what circumstances mutual recognition agreements (MRAs) are
best implemented to facilitate trade have also been raised. Such agreements are used to reduce
the trade-impeding effect of technical barriers through mutual recognition of national product
testing and certification procedures. To date, they have only been negotiated between industrial
countries, although both the TBT and SPS agreements encourage all WTO members to enter
into MRAs.

Developing countries may use the WTO dispute resolution mechanism to raise concerns about
whether particular standards in import partners meet SPS and WTO rules. This situation likely
means that WTO panels must give greater voice to scientific evidence and representations by
members of civil society. Developing countries need to monitor the development of dispute
settlement in this regard and assert their own interests. It must be recognized, however, that
the WTO itself is not a standards-setting body; it has neither the expertise nor the resources for
this purpose. Ultimately, the real concern of developing countries must be to influence the
development of global standards in ways that at least pay attention to their concerns.

J. WTO and the North-South Politics

There are arguments that since SPS standards have the latitude of protecting the health and
safety of human, plant and animal life, their adoption and enforcement tend to be less
transparent, allowing ample room for tweaking them to make them stronger than necessary for
achieving optimal levels of social protection and to twist the related testing and certification
(conformity assessment) procedures to make competing imports less competitive (Athukorala et
al., 2003).

An example is given of the 1998 EC regulation that reduced the maximum permissible level of
aflatoxin in foodstuffs and animal feed to a lower level than international standards specified
by the Codex Alimentarius (EEC, 1998). The results suggest that the EU standards, which
would reduce health risk by approximately 1.4 death per billion a year would reduce exports by
more than 60% or US$ 670 billion from 9 countries (Cameroon, the Dominican Republic,
Ghana, Nicaragua, Nigeria, Sudan, Senegal, Tanzania and Zambia) (Athukorala et al., 2003), as
compared with regulation based on the international (Codex) standard.

There is evidence of some instances where standards prohibit trade altogether (Athukorala et
al., 2003:432). For example, a EU regulation requires that dairy products be manufactured
from milk produced by cows kept on farms and milked mechanically. This regulation virtually
precludes imports from many DCs where milk production is by and large a smallholder
activity. The EU recently invoked this regulation to ban import of camel cheese from
Mauritania, bringing hardship to a small enterprise, which developed the product at a
considerable cost (Athukorala et al., 2003). The EU also raised the issue that Mauritania is not
free of foot-and-mouth disease, although there is little scientific evidence to suggest that
camels (or, in particular, camel milk) can transmit the associated virus. An Australian
quarantine regulation requires that chicken meat imported from Thailand must be heated at 70 Celsius for 143 minutes to avoid the possibility of carrying a certain disease. This has effectively closed the Australian market for Thai chicken exporter (It is said that the required heat treatment transforms chicken into paper!). In June 2002, Thai authorities provided the Australian government with a risk assessment report showing that the risk of introducing IBDV to backyard flocks through cooked chicken meat was negligible.

References
Food Safety Issues, Trade and WTO Rules: A Developing Country Perspective (Athukorala et al., 2003)

Food Standards and International Trade (Sheldon, 2013)

The Oxford Handbook of the Economics of Food Consumption and Policy (Lusk et al., 2013)

African Perspectives on the Need for Global Harmonisation of Food Safety Regulations (Anelich, 2014)

The Impact of Food Safety and Quality Standards on Developing Countries Agricultural Producers and Exports (Chemnitz, 2011)

Trade and Competitiveness in African Fish Exports: Impacts of WTO and EU Negotiations and Regulation (Ponte et al., 2005)

Trade and Fisheries: Key Issues for the World Trade Organization (Asche et al., 2009)

Kenyan Exports of Nile Perch: Impact of Food Safety Standards on an Export-Oriented Supply Chain (Henson et al., 2004)

Bridging the Standards Divide: Recommendations for Reform from a Development Perspective (Wilson, 2001)


The Role of Science in the Uruguay Round and NAFTA Trade Discipline (Wirth, 1994)

4.3.10 Standards and Food Safety Regulations: Exploring the Intersections

A. Food Safety Laws and Regulations

A.1 Food laws and regulations cover all stages of the production, processing and distribution of food and animal feed. The general objectives of food laws and regulations are:

(a) guarantee a high level of protection of human life and health and the protection of consumers’ interests;

(b) guarantee fair practices in food trade, taking into account animal health and welfare, plant health and the environment;

(c) ensure free movement of food and feed manufactured and marketed in national or regional jurisdictions;

(d) facilitate global trade of safe feed and safe, wholesome food by taking into account international standards and agreements.
A.2 Food safety regulations require food facilities to have a food safety plan that includes:

(i) hazard analysis, preventive controls;
(ii) oversight and management of preventive controls;
(iii) monitoring; corrections and corrective actions (documented); and
(iv) verification that preventive controls are implemented and effective.

B. Food Safety Standards

Food safety standards help companies establish good manufacturing processes so they can produce safe products that comply with food safety legislation and meet quality levels expected by consumers.

While in developed countries compliance with public and private food safety standards focuses on public health, in underdeveloped countries, the emphasis is on economic development and how standards shape access to markets and what is their economic impact on producers.

C. Public and private regulation

Food safety touches upon issues of public regulation, private supply chain coordination, and international trade. More stringent food safety standards have emerged in the recent past as the result of several factors, including advances in hazard detection and epidemiology, high profile health scares, scientific and regulatory consensus on best approaches to risk management, and the recognition of global standards and approaches under the WTO. As a result there is a consensus “among nations about the basic components of an effective food safety system... the vision is of a farm-to-fork, risk-based, scientifically supported safety control system”.

Public standards constitute legal requirements for market entry, and can be used by governments to deny market access for exporting countries or firms that fail to comply. These standards may include requirements that must be met by public agencies in exporting countries as well as by private firms engaged in export. Public standards must meet World Trade Organization requirements for transparency, equal application to domestic and imported products, and must be based on scientific risk assessment. Typically such standards change only infrequently. Private standards are set by buyers (or a by a consortium of firms) and include both safety and quality specifications for particular market channels. While they may be de facto requirements for particular buyers, failure to comply with private standards will not, by itself, preclude entry into an importing country. Private standards change over time as buyers manage risks and reputation, and thus compliance must also evolve.

New regulations or standards can add to production costs. In high-income countries, such costs are weighed against the public health benefits from reduced foodborne illness. But in developing countries, studies have focused on how standards shape market participation, exports, and farm incomes. Higher public standards in importing countries reduce traded quantities, especially from low-income exporters. Higher standards can serve as catalysts for improved management, higher value added, and greater efficiency in production and marketing. The costs imposed by more stringent standards have elevated concern that food safety standards pose a barrier to market participation by small farms or firms. The high non-recurring costs of setting up a food safety quality control system might give an advantage to larger firms and farms that can employ economies of scale and exclude smaller competitors. In addition, buyers incur higher transaction costs when they have to monitor compliance from many small suppliers.
Failure to meet public standards imposed by high-income countries led to the exclusion from markets of some developing countries and firms as new standards came into force in the 1990s. Examples include European Union (EU) bans on imports of fishery products from Bangladesh in 1997; from Kenya in 1997-2000; and from Malaysia in 1998); and a U.S. ban on raspberries from Guatemala in 1997-98. Case studies document how bans led to substantial export revenue losses and how many banned firms, struggling to comply, went out of business or, if they survived, incurred high compliance costs. Public sector support in exporting countries was sometimes required to underwrite investments beyond the reach of individual firms. Such support enabled a resumption of exports as firms came into compliance, but at a lower and less profitable level than before. Even where countries maintained export market access and avoided product bans, compliance costs were substantial. Thus, exporter compliance with public standards imposed by importing countries increased costs and may have reduced trade. Compliance with public standards to achieve access to high-income markets may be a strategic priority for some governments, which suggests a public sector role in compliance.

References
Measuring the Impacts of Food Safety Regulations: A Methodological Review (Ragona et al., 2008)

Harmonization of Legislation and Regulations to Achieve Food Safety: US and Canada Perspective (Keener et al., 2014)

Hygiene Requirements, Controls and Inspections in the Fish Market Chain (Çaklık et al., 2013)

4.3.11 Utilization of Standards for Regulation

A. Role of Standards in Regulation Setting

A.1 National standards bodies should promote efficient and effective voluntary standardization in order to advance the national economy, support sustainable development, benefit the health, safety and welfare of workers and the public, assist and protect consumers, facilitate domestic and international trade and further international cooperation in relation to standardization. For regulated areas, additional considerations and guidance are needed to meet the expectations of policy and regulatory decision makers.

A.2 Increasing regulatory confidence in standards is critical to the overall social utility of the standards world. Standards only have value if they are used. When a standard is incorporated into a regulation, it is being utilized at the highest possible level and becomes part of the overall technical and social infrastructure of the jurisdiction(s) concerned.

A.3 Some advantages for a regulatory authority referencing standards developed within the National Standards System include:

(a) the standards have been developed by balanced committees of all relevant interests, employing the principles of consensus;

(b) the standards have undergone a public review process as well as a “second level review” by the standards body prior to publication;

(c) the standards are maintained and reviewed at appropriate intervals to ensure current technological developments are incorporated;
(d) the commercial needs of producers, users, and other interests are addressed at the development stage, thus ensuing regulations referencing these standards are more amenable to commercial acceptance; and,

(e) the standards address the national public interest by considering to the extent possible as appropriate to the subject of the standard, how it advances the national economy, supports sustainable development, benefits the health, safety and welfare of workers and the public, assists and protects consumers and facilitates trade.

B. Considerations on the Development of Regulatory-Oriented Standards

B.1 The effective development of a standard suitable for incorporation by reference in a legislative instrument requires that a cooperative effort between the regulatory authority and the standards development committee be established from the outset.

B.2 The standards development committee should be aware of the views of the regulatory authority with respect to the scope of the standard and its expected date of completion.

B.3 Representatives of interested regulatory authorities should be active participants on the standards development committee. If for reasons of balance, time, or distance this is not possible, they should be associate or corresponding members who can make comments and provide input.

B.4 Depending on the nature and complexity of the work of the standards development committee and the number of regulatory authorities involved, it may be advisable to establish an appropriate mechanism for coordination with all interested parties. For example, coordination with a range of regulatory authorities could be achieved by correspondence and through report sharing which is made simple and effective with current technology.

B.5 Should a standards development committee become aware of a requirement which is beyond the scope but related to, or considered essential to, a broader aspect of the subject under consideration, the standards development committee should refer the issue to the appropriate body, such as other standards or code committees or a regulatory authority so that the matter can be resolved.

C. The Content of the Standard

C.1 The body of a standard for reference in legislative instruments should contain only those requirements considered essential for regulatory reference.

C.2 A standard intended for regulatory reference as well as for marketplace needs should be drafted to facilitate this separation whenever possible.

C.3 Requirements should be divided into distinct, consistent and easily identifiable sections to facilitate their incorporation by reference in codes and regulations. This permits selected sections to be separately identified in a code or regulation when only part of the standard is referenced.

C.4 References to certification or administrative requirements relating to conformity assessment, marks of conformity and other non-technical issues, including promotional material, should not be included in the normative content of a standard. These requirements typically use terms such as "approved", "approval", "accepted", "acceptable", "certified", "listed" and "registered" and imply acceptance, endorsement, certification or listing by a regulatory authority or its appointee. Such requirements may be included in the preface, notes to the preface, foreword, or informative annexes.
C.5 A standard should not specify any date for enforcement of a standard to be referenced in a legislative instrument. The enforcement date is an administrative requirement determined by the regulatory authority.

C.6 The language for a standard to be used in regulation should be clear, direct and precise. A standard written in language which "recommends" is not likely to be suitable in a regulation if failure to comply could result in prosecution.

C.7 Each specific requirement of the standard should be stated unambiguously using wording that is logical, valid and specific. In particular,

(a) terms such as “adequate”, “adversely affected”, “sufficiently strong”, and “extreme conditions”, should be avoided;

(b) qualitative adjectives and nouns that could be taken as absolute should not be used unless defined. Examples include “waterproof”, “unbreakable”, “flat”, and “safe”;

(c) qualitative adjectives and nouns that describe a measurable property should not be used unless defined. Examples include “high”, “strong”, “transparent”, and “accurate”; and,

(d) the term "unless otherwise specified" should not be used, except when the "other specification" is clearly identified in the standard.

C.8 If a standard is to repeat requirements stated in another standard, the repetition should be by specific reference and clearly indicate the referenced version. The use of the term "latest issue" should be avoided unless it has been carefully thought out and decided by the standards development committee that there are valid reasons to do so.

D. Advantages of Referencing Standards in Regulations

When a standard is available and it allows the achievement of a regulatory objective by reference, it can provide some of the following advantages:

(a) **Fulfils the Need**: the process of developing a standard in a consensual manner, which takes into account various interests, supports a solution that is likely to meet the expectations of the majority of the stakeholders addressed by the regulation.

(b) **Verification**: a standard which lends itself to 3rd party certification enhances confidence in a product or a system and provides the necessary positive support for a regulatory requirement.

(c) **Effectiveness of Requirements and Access to Expertise**: a standard may represent the sum of the knowledge of a broader expert pool than the one which the regulatory authority has access to.

(d) **Uniformity of Requirements**: a standard produced in collaboration with representatives of several jurisdictions of regulatory authorities results in more uniform requirements, eliminating unnecessary trans-border barriers and favouring the exchange of good and services.
(e) **Marketplace Compliance**: by referencing standards which bring together marketplace and regulatory input, the likelihood of market compliance increases, thereby reducing the oversight burden.

(f) **Efficiency**: If manufacturers are using the same tool to meet market needs and regulatory needs it will be more effective and efficient where both are concerned.

(g) **Resource Savings**: referencing a standard which contributes to the objective of the regulation is likely to save significant resources. This saving can be examined in light of costs associated with participation by the regulatory authorities in the standard development process.

E. **Methods of Referencing Standards**

E.1 The method of referencing standards in regulations usually employs one of the following preferred variations:

(a) **Dated Identification (Referencing a Specific Issue of a Standard)**: This is the most restrictive reference, used when a specific issue of a standard is intended, and future amendments and editions are excluded. Such references should include a date of issue or edition number of the standard.

(b) **Dated Identification (Referencing a Specific Issue of a Standard Including Future Amendments)**: This type of reference incorporates a specific issue of a standard and includes all future amendments to that specific issue, but excludes new editions. Such references should include the date of the specific issue of the standard with the addition of the preferred phrase "as amended from time to time".

(c) **Undated Identification (Referencing to Incorporate New Editions of the Referenced Standard without Requiring a Change to the Regulation)**: This type of reference incorporates a standard with no mention of a date of issue or a specific edition. In such instances, regulatory authorities should add the phrase, "latest edition of". This is the most liberal reference and permits regulatory authorities to respond easily and quickly to technical changes.

E.2 Each regulatory authority is responsible for determining which type of reference it is empowered to employ and must consult the provisions of the appropriate legislative instrument. For example, some Acts may not allow the use of undated references as this could be interpreted as a delegation of legislative authority to the standards development committee.

F. **Referencing Options**

F.1 The following are potential options for referencing standards or parts of standards:

(a) **Complete Reference**: In this application, all of the contents of the standard are included by reference in the regulation.

(b) **Qualified Reference**: In this application, selected portions of the referenced standard are deleted as being inappropriate for the intended purpose, however, the retained balance of the standard is included in the regulation.

(c) **Partial Reference**: In this application, only selected portions of the referenced standard are included in the regulation.
(d) Reference as Good Practice: In this application, a standard is referenced as a guide to permit conformance to "good engineering practice". The method of compliance to ensure good engineering practice is generally determined by regulatory authorities. This is a flexible approach that does not require compliance with the referenced standard, but informs the user of its existence and acceptability.

(e) Reference as an Alternate: In this application, standards are referenced as examples whereby compliance will ensure that certain performance requirements will be satisfied or where compliance will allow the user to obviate certain provisions.

(f) Inclusive Reference to Standards: In this application, the standard selected as a reference contains one or more references to other standards. For example, standard X (the primary reference) may include a reference to standard Y, (the secondary reference) and Y in turn may reference standard Z (the tertiary reference). Regulatory authorities should ensure that such secondary or tertiary references are germane to the regulation being formulated. If not, this should be so indicated by specifying they are to be excluded, or by the application of the "Qualified" or "Partial" reference options described above.

G. Recommendations for Maintenance and Maintenance Procedures for Standards for Use in Legislative Instruments

G.1 National Standards bodies have procedures which require them to regularly review standards to ensure that they remain current and abreast of technology. When undertaking this review, standards development committees should determine the requirements of the interested regulatory authorities. When a standard is being considered for maintenance action, the standards development organization should provide sufficient notice to the interested regulatory authorities such that they may have ample opportunity to make their views known or to take such action as they consider appropriate.

G.2 Regulatory authorities should develop procedures to assist them in monitoring the status of standards referenced in their regulations. This monitoring should include updates, amendments and withdrawals so that the regulatory authority can take appropriate action to affected regulations. As part of its maintenance procedure, the regulatory authorities should maintain active participation in the appropriate standards committees.

References
Safe Food Australia: A Guide to the Food Safety Standards (ANZFA, 2001)
Private Food Safety Standards: Their Role in Food Safety Regulation and their Impact (FAO, 2010)
Analysis of Economic Impacts: Standards for the Growing, Harvesting, Packing and Holding of Produce for Human Consumption (FDA, 2011a)
Methods of Referencing Standards in Legislation with an Emphasis on European Legislation (Leibrock, 2002)
Key Considerations in the Development and Use of Standards in Legislative Instruments: Understanding the Partnership of the Regulatory and Voluntary Standards Systems (SCC, 2006a)
4.3.12 Regulation for Development in the Fisheries and Aquaculture Sector

A. Need for Fisheries and Aquaculture Management

A.1 Fisheries make essential contributions to human well-being, providing basic food supplies, employment, livelihoods, recreational opportunities, sources of foreign currency or recreational opportunities for hundreds of millions of people (Cochrane et al., 2009). They are an integral component of communities and societies almost wherever humans have access to water bodies: oceans, seas, lakes and rivers. So far, so good, but a problem arises because, in addition to providing benefits for society, fisheries also have negative impacts which, if not sufficiently controlled, can not only destroy or diminish the benefits they provide but also lead to damage to the ecosystem with resulting negative impacts on other important goods and services for humans, including the conservation value of the ecosystems.

A.2 Fisheries management is the process that has evolved to ensure that fisheries operate in a manner that not only provides the immediate benefits but also does not result in excessive or irreversible damage to the exploited fish stocks or the diversity, integrity and structure of the ecosystem, so that the stocks and ecosystem will continue to provide the full range of benefits in the future. Fisheries management has been successful in some cases but it has become widely recognised in recent decades that there have also been many, many cases of failure. As a result, there is global concern about the state of most aquatic ecosystems and their ability to continue to provide benefits, not least the production of fish for human use.

A.3 There are many reasons for this widespread problem, including amongst others: scientific uncertainty; an inherent conflict between short-term social and economic needs and goals and the longer-term need for sustainability; poor management practices in the past, particularly the absence of long-term rights and failing to ensure that stakeholders participate in management; insufficient capacity within the management agencies and others.

A.4 Cochrane et al. (2009) outline the following key principles to serve to focus attention on the starting points for effective fisheries management:

1) The fishing sector consists of a number of dynamic components, also commonly interacting with other sectors through the ecosystem and biological resources, the stakeholders and the market. The overall evolution of the sector and its components is therefore hard to predict in the long term.

2) Fish stocks and communities are finite and biological production constrains the potential yield from a fishery.

3) Biological production of a stock is a function of the size and structure of the stock and of the ecological environment with which it interacts and is influenced by natural and human-induced changes in this environment.

4) Human consumptive demands on fish resources are fundamentally in conflict with the constraint of maintaining a suitably low risk to the resource. Further, modern technology provides humans with the means, and demand for its benefits provides the motivation to extract fish biomass at rates much higher than it can be produced.

5) In a multi-species fishery, which description encompasses almost all fisheries, it is impossible to maximise or optimise the yield from all species or stocks simultaneously.
Uncertainty pervades fisheries management and hinders informed decision-making. The greater the uncertainty, the more conservative should be the approach (i.e. as uncertainty increases, realised yield as a proportion of estimated maximum average yield should be decreased).

The short-term dependency of society on a fishery will determine the relative priority of the immediate social and/or economic goals in relation to the longer-term goal of sustainable utilisation.

A sense of security of tenure and a long-term stake in the resource for those (individuals, communities or groups) with access ought to be most conducive to maintaining responsible fisheries.

Genuine participation in the management process by fully informed stakeholders is consistent with the democratic principle, facilitates identification of acceptable management systems and encourages compliance with laws and regulations.

In keeping with the integrated nature of fisheries ecosystems, these principles cannot be seen in isolation in considering how best to manage fisheries: their implications and consequences overlap, complement and confound each other, which is what makes fisheries management so demanding and challenging.

Figure 20: The hierarchical relationships between the different intentions (policy, goals and objectives), standards (reference points and indicators) and actions (management measures). Collectively these make up the management strategy and would be described in the management plan (Cochrane et al., 2009)
Figure 21: Historical and present-day perspectives on biological and ecological parameters and information of relevance for the sustainable management of aquatic natural resources (Cochrane et al., 2009).

NOTE The time axis moves from the past (left) to the present. In the early years of fishery science, the information used was catch and effort with no biological or ecological components. As dynamic pool models developed, a few biological parameters shown lower left were applied. Awareness and understanding of the need for more detailed information has resulted in a much wider range of data being necessary for management (boxes on the right).

A.6 Figure 22 illustrates a hypothetical coastal area in which several property-rights regimes are found together. On the coast is a private aquaculture area, next to a fishing territory controlled by a village. The coastal fishery within the territorial sea (up to 12 miles) and the offshore fishery in the Exclusive Economic Zone (EEZ usually up to 200 miles) are under state property. Beyond the EEZ there may be an international regime in force on the high seas, but the area may have many of the characteristics of an open-access situation with fishing fleets opportunistically targeting resources that acquire high market value. Resources may be effectively open-access within the territorial sea and the EEZ as well, if the state is unable to enforce its regulations, a common situation in many developing countries. The private and the communal areas may both be mixed regimes, as it is the state that normally leases aquaculture areas and enables a community to control its fishing area, as in co-management.

Although the example is hypothetical, many coastal areas in fact have co-existing and overlapping property-rights regimes. Resource managers cannot function effectively unless they know the property-rights regimes they are dealing with, and the implications of each with respect to dealing with the ‘tragedy of the commons’
**Figure 22: Different property-rights regimes in a coastal area**

**A.7** The term *management*, which carries implications of domination of nature, can be updated to highlight governance, social relationships, adaptation and the maintenance of the productive potential of the ecosystem. Most of the objectives commonly stated for fisheries management fall into three categories. One set relates to resource sustainability, ensuring that the biological productive capacity of the resource is maintained. The other two sets are social and economic, and relate either to the optimization of returns from the fishery (efficiency) or to the fair distribution of those returns among stakeholders (equity). Some 22 fishery objectives are recognized (Table 13) relating to sustainability (six of them), efficiency (twelve) and equity (eight) (Cochrane *et al.*, 2009). Any of these objectives may be a valid goal for a fishery, but it is not possible to achieve them all for a single fishery. Some of the objectives are incompatible with one another. For example, management can aim to maximize the biological yield or the economic yield but not both.
Table 13: Some objectives of fishery management

<table>
<thead>
<tr>
<th>Objective</th>
<th>Main purpose</th>
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<tr>
<td></td>
<td>Sustainability</td>
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<tr>
<td>1. Maximize catches</td>
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<td>2. Maximize profit</td>
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<td>3. Conserve fish stocks</td>
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<td>4. Stabilize stock levels</td>
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<td>5. Stabilize catch rates</td>
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<td>6. Maintain healthy ecosystem</td>
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<td>7. Provide employment</td>
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<tr>
<td>8. Increase fisher’s incomes</td>
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<td>9. Reduce conflicts among fisher groups or with non-fishery stakeholders</td>
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<tr>
<td>10. Protect sports fisheries</td>
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<td>11. Improve quality of fish</td>
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<td>12. Prevent waste of fish</td>
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<td>13. Maintain low consumer prices</td>
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<td>14. Increase cost-effectiveness</td>
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<td>15. Increase women’s participation</td>
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<td>16. Reserve resource for local fishers</td>
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<td>17. Reduce overcapacity</td>
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<td>18. Exploit under-utilized stocks</td>
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<td>19. Increase fish exports</td>
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<tr>
<td>20. Improve foreign relations</td>
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<td>21. Increase foreign exchange</td>
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<tr>
<td>22. Provide government revenue</td>
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B. Legal and Institutional Considerations

B.1 The fisheries law facilitates and supports fisheries management by implementing the general fisheries policy, defines the scope of its application and establishes institutional mechanisms for fisheries management. It also defines management responsibilities, recognises and regulates the interests of fishers and other stakeholders and the relationship between them to facilitate the attainment of fisheries management objectives. The ultimate purpose of fisheries law is to guarantee that the terms and conditions under which fisheries are managed and the mechanisms that regulate conflict are enforced. The latter is guaranteed through established processes for compliance and enforcement of assigned rights and duties in a judicial or other forum, for example, courts or administrative enforcement mechanisms or processes.

B.2 Matters Typically Addressed by Principal Fisheries Legislation

(a) **Objectives** – States general development policies and management objectives of policies and the law.

(b) **Definitions** – Defines terms and phrases used to assist in interpretation and application of the law.

(c) **Scope** – Defines the extent of application of law including extraterritorial applications, e.g., to nationals or persons within the territory, fisheries waters or types of fisheries.
(d) **Administrative and management institutional framework** – Establishes or designates the public management authority, executive head and staff, boards, committees, etc. and their powers and functions.

(e) **Management approaches, principles and planning** – Stipulates specific management aspirations or management approaches, guidelines, management plans including formulation, content and endorsement. A different or specific fishery that is to be managed and the approach to be used may also be described.

(f) **Statement of general fishing access and entitlements** – Sets out the prerequisites for fishing and the persons or groups of persons who can participate in fisheries, e.g., nationals, locally based foreign operators/vessels or foreign vessels.

(g) **Management tools and related processes** – Establishes and describes the management tools to be utilised for regulating input and output, such as concessions, licences and other authorisations, fishing rights, quotas including individual transferable quotas and spatial and temporal limits.

(h) **Monitoring, Control and Surveillance (MCS)† (Bio-economic and enforcement information requirements)** – Establishes and defines the MCS schemes and tools including scientific observer programmes and inspection schemes, procedures, powers and rights, for example, rights of observers or inspectors to access all parts of the vessel and stop, board and inspect vessels.

(i) **Prohibitions, violations and sanctions and enforcement processes** – Creates or describes prohibitions and violations, the administrative or criminal enforcement process to deal with violations including evidentiary provisions. This part of the law also establishes and describes sanctions for violations.

(j) **Alternative approaches to management** – Establishes the ability for the State or management authority to delegate, devolve or enter partnership or cooperative arrangements for management or to engage in other management approaches as appropriate.

(k) **Regulations** – Sets out requirements including standards, restrictions, procedures etc. that are too elaborate to be stated in principal legislation but are required for implementation of the principal law.

### B.3 National Fisheries and Related Legislation

Fisheries law, primarily as a body of national or domestic laws, is unique to the country or territorial subdivision within which the law applies. The manner in which the law is elaborated, interpreted and applied is subject to the country’s legal and judicial system (e.g. civil or common law) as shaped by the governance framework and the country’s legal history, philosophy, case law and customs.

Managers should be familiar with the principal sources of law they administer and where their management powers and functions come from. As a minimum, managers should know the fundamental elements of the principal fisheries legislation and appreciate that other laws that govern other sectors, to the extent that they operationally impact on any aspect of fisheries, are also considered part of the fisheries legal framework. Managers must then work within the ambit of that framework. Fisheries managers should be aware of a ‘non-fisheries-specific’ category of laws that govern other sectors but indirectly impact on fisheries such as fundamental laws (e.g. the Constitution) and laws on local government or decentralisation, shipping, veterinary, customs and excise, environment and conservation, health (food safety
and quality), trade and commerce. A basic awareness of these laws will facilitate the identification of the person or office within the other sector's regulatory authority that should be consulted on operational matters. In some instances, the manager is clearly instructed by the primary fisheries law to ensure that certain management interventions are consistent with other laws.

**B.4 International Instruments**

**B.4.1** A plethora of international instruments in capture fisheries addressing various fisheries management issues have emerged in the last two decades. Binding instruments include:


(b) Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessel on the High Seas


**B.4.2** The LOS Convention, often referred to as the constitution for the oceans, codifies customary international law of the sea and lays the foundation for all subsequent international arrangements and agreements relating to the use of the oceans and seas. Arising directly from the LOS Convention and designed to strengthen its provisions on high seas fisheries and transboundary stocks is the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement) and the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement).

**B.4.3** The influence exerted by binding fisheries instruments on national policies and legislation is remarkably visible. For example, in anticipation of entry into force of the LOS Convention, many coastal states enacted national legislation claiming 200 nautical miles exclusive economic zones (EEZs). As a consequence of Article 73 of the LOS Convention, there is a growing trend to limit sanctions against the crew of foreign fishing vessels found in contravention of the coastal state’s fisheries-specific laws in the EEZ to monetary and non-custodial sanctions in the absence of an agreement to the contrary between the states concerned. Coastal states now require vessels flying their flags, including those operating on the high seas, to be licensed and subjected to conditions set out in the Compliance Agreement and the UN Fish Stocks Agreement.

**B.4.4** A non-binding fisheries instrument of global significance is the FAO Code of Conduct. Although a voluntary instrument, the FAO Code of Conduct is of high value. It is implemented in numerous policy documents and national legislation. The FAO Code of Conduct, in issuing guidelines on areas where legislation is required for promoting responsible fisheries, is useful in policy and legislative development. The international plans of action (IPOA) developed under the auspices of the Food and Agriculture Organization of the United Nations (FAO) to implement certain aspects of the FAO Code of Conduct are similarly useful. The International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) warrants special mention. The IPOA-IUU contains valuable guidelines for legislative implementation particularly in MCS. An increasing number of states have adopted National Plans of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated fishing (NPOA-IUU) modelled on the IPOA-IUU.
B.5 Relationship between International and National Fisheries Legal Frameworks

International law and international fisheries instruments are vital to fisheries management as they reflect state commitments to recognised conservation and management doctrines, standards, rights and best practices (Figure 23). The manager is required to develop sufficient familiarity with international binding and voluntary instruments concerning fisheries to ensure their effective translation and application at the domestic level. This is necessitated by the often overlooked fact that international law and commitments by states as stipulated in conventions and agreements may bind states, but in many instances they will not be applied or enforced domestically against natural or juridical persons unless they are reflected in ‘enabling legislation’. For example, the requirement of a state party to the Compliance Agreement to record and license vessels flying its flag cannot be imposed on the owners or operators of such vessels unless there is in place national legislation that has the same requirement. Domestic enabling legislation is vital for non-binding instruments, such as the FAO Code of Conduct and IPOAs, as national legislation can translate the calls for voluntary action into legal requirements by enforcing rights and responsibilities and sanctioning non-compliance.

Figure 23: Representation of a typical national fisheries legal framework showing the relationship between international, non-fisheries-specific and fisheries-specific law.

B.6 Regional Fisheries Entities and Arrangements

Regional fisheries bodies (RFBs) and regional fisheries management organizations (RFMOs) and arrangements, to the extent allowed by their constitutions, have important institutional, advisory, regulatory and coordinating functions in fisheries management. These entities are the principal medium for multilateral cooperation for the management of shared resources as mandated by the LOS Convention and reinforced in the UN Fish Stocks Agreement, the Compliance Agreement, the FAO Code of Conduct, the IPOA-IUU and other binding and non-binding fisheries instruments. The management, regulatory or coordination regimes of these entities are often pragmatic and are of immediate relevance to state parties in terms of how management advice, measures and regulations are tailored to the region concerned. This in
turn often translates into efficient domestic implementation or enforcement of management measures, regulations or advice. The documented growing role of RFBs in preventing, deterring and eliminating IUU fishing clearly underlines the significance of their contribution to global fisheries management.

As a result of the duty for states to cooperate through RFBs, RFMOs and arrangements and the increasing role and involvement of RFBs in combating IUU fishing, more countries than in the past will become members of one or more regional bodies, including RFMOs, such as the various tuna bodies (e.g. the Indian Ocean Tuna Commission (IOTC)). Managers must be aware of the RFMOs or RFBs in which their country is involved, and the implications and obligations of membership or in becoming a ‘cooperating non-party’ particularly where the RFMO or RFB has the competence to adopt binding decisions.

C. Fisheries Management Approaches and Tools

Typically, the approaches or tools that can be used to manage fisheries are determined or restricted to those set out in the fisheries legislation as outlined below:

C.1 Fishery Plans: Many countries have embraced the management planning approach in regulating and managing fisheries by requiring the development of fishery plans in fisheries legislation. The manager should determine whether the law requires general (national) plans or specific fishery plans to be developed. The manager should also be familiar with the process for development and promulgation of the fishery plan, any mandatory elements of the plan, the legal status of such plans and their implementation, enforcement and review requirements. Examples of matters that can be regulated include the following:

(a) measures for the conservation, management, development, licensing and regulation of fisheries or any particular fishery, including total allowable catch and quota system as appropriate
(b) licensing any vessel or class or category of vessels to be used for fishing and related activities or any other purpose
(c) licensing or registration of fishing gear and other equipment or devices used for fishing
(d) types and sizes of fishing gears and other fishing devices including the sizes of fishing nets that may be used for fishing, where they may be used and prohibited fishing nets
(e) manufacture, importation and sale of fishing nets
(f) landing requirements for any vessel or class or category of vessel or licence
(g) catching, loading, landing, handling, transhipping, transporting, possession and disposal of fish
(h) tuna fishing or fishing for any specified species of fish
(i) importation, export, distribution and marketing of fish and fish products
(j) licensing, control and use of fish aggregating devices, and, the rights to the aggregated fish and prescribing times and the minimum distance from such devices to for fishing
(k) standards and measures for the safety of fishers
(l) matters relating to satellite monitoring of fishing activities
(m) aquaculture
(n) recreational fishing
(o) canoe fishing including markings and identity of canoes
(p) the provision of statistical and other information related to fisheries
(q) control, inspection or operation of fish processing establishments
(r) returns concerning fishing operations required to be submitted by licensees
(s) licences and logbooks to be carried on board motor fishing vessels
(t) further conditions for fishing licences
(u) conditions for the approval of charter agreements
(v) general matters for the achievement of the purposes of the principal fisheries legislation

C.2 Effort and Catch Management: The regulation of effort would most likely be achieved through the implementation of an authorisation (licensing or permitting) system. Many jurisdictions require in their fisheries laws that no person shall engage in fishing without a concession or an authorisation in a form of licence or permit issued in accordance with the fisheries law with effort control measures such as gear restrictions, fishing day limits and spatial restrictions in order to achieve better results in managing effort.

The typical catch management measure, the total allowable catch (TAC), is often prescribed in the fisheries law. For certain stocks, such as highly migratory tuna stocks, the requirement to specify the TAC is required by the LOS Convention and is restated in the national fisheries law as a matter of course. The only difference between the broad international commitment for setting the TAC stated in the LOS Convention and the requirements relating to TAC in national legislation is that the latter would normally elaborate how the TAC would be determined and allocated as fishing entitlements by the state.

At the multilateral and regional level, the RFMO that has been accorded the appropriate competencies by its members would be the authority that determines and allocates TAC entitlements. Many jurisdictions, particularly those employing quota management systems, would naturally have a requirement in the law for setting the TAC for a fishery.

C.3 Fishing Rights: Legally, a ‘right’ is the ability of the claimants to call upon others without such claims to acknowledge their duty to honour the claim, with any violation of such a duty sanctioned by the state or by an authority. It is ‘a capacity . . . of controlling, with the assent and assistance of the State, the actions of the others.’ The licence or permit to fish is one form of right while a TAC allocation as a quota is another form. An individual transferable quota (ITQ) is at the end of the spectrum which has more rights or valuable characteristics often referred to as ‘property rights’ as it possesses the elements of exclusivity – the ability to hold and manage the right without outside interference; duration, from long term to perpetuity as appropriate; security of tenure – the ability to withstand challenges of others to the title; and transferability, with varying degrees of restriction on transferees.
C.4 **Use of Technical Measures:** Two categories exist: (a) 'prohibitions' category, e.g., the use of explosives or toxic substances to take fish or the taking of fish using spear guns and electric shocks, or the taking of protected species are prohibited; (b) subsidiary legislation (regulations, decrees, by-laws or administrative orders) to regulate the use of, for example, fishing gear such as nets and vessels and their specifications including the requirements or conditions relating to the taking of certain species and temporal and spatial closures and conditions that apply to these closures.

C.5 **Participatory or Partnership Management:** Fisheries resources being *res communes* (of the public domain) are vested in the state and its agents to be regulated for the public good, meaning that law and institutional structures, were not designed historically to support partnerships or co-management. Thus partnerships, co-management arrangements and other forms of participatory management systems must have a legal basis. Co-management must be unhindered, enabled and supported by the fisheries legal framework so that rights and responsibilities, including decision-making for the management of common pool resources, are redistributed, protected and enforced.

![Image of partnership management levels](image)

**Figure 24: Levels of Partnership Arrangements That Can be Legislated**

The illustration of the levels of co-management in Figure 24 shows the varying degrees of partnership arrangements that exist. The legal framework is not likely to expressly label that which is essentially a cooperative arrangement as a ‘partnership’, particularly where such arrangements do not involve substantive management interventions. The prevailing practice indicates that the legal frameworks for co-management arrangements are largely ‘framework’ laws in that they primarily enable the use of co-management by vesting powers in the manager to use co-management where appropriate. These framework laws for co-management set out the basic essentials to provide for

(a) the designation of the co-management unit (e.g. fisher or other stakeholder groups);

(b) choice in demarcation of areas or fisheries for co-management;
(c) allocation of the mandate or such rights and responsibilities as are required for an effective co-management arrangement;

(d) elaborated regulatory framework governing behaviour and relations between various partners in the co-management arrangements and between designated co-management units;

(e) avenues for enforcement of rights and responsibilities and conflict resolution.

It is worth restating here that the manager should appreciate his or her role in the management or support of the prescribed or designated co-management system to ensure that it is well-coordinated and functions in an efficient manner.

**D. Fishing Access Agreements**

Many developing country coastal states with vast EEZs assign, under bilateral or multilateral access agreements, access rights to fish for foreign fishing vessels. Such agreements should contain the following essential elements:

(a) Provision of fisheries access, related activities and such other matters as are provided for by the fisheries legislation

(b) The granting of preferential access to vessels of certain countries or groups of countries

(c) The requirement that fishery allocations under the agreements do not exceed a level consistent with the conservation and management of fishery resources and the protection of fishing by citizens of the State and must be consistent with all fishery management plans

(d) The requirement to implement minimum terms and conditions of fisheries access as agreed from time to time including:

1. establishing the responsibility of the foreign party to take all measures necessary to ensure compliance by its vessels with the terms and conditions of the access agreement and with all applicable laws;

2. requiring the operator or any other person responsible for the operation of a licensed vessel not to tranship fish at sea whether or not such transhipment is done within areas under national jurisdiction or on the high seas, and only tranship through designated ports or as provided by the access agreement;

3. requiring the operator or any other person responsible for the operation of a licensed vessel to ensure compliance with requirements relating to:

   (i) the appointment of a resident local agent;

   (ii) the placement of observers;

   (iii) reporting requirements as to entry into and exit from the State waters;

   (iv) the maintenance of catch figures and log books;
(v) the provision of data and information;
(vi) the imposition of any other control required by law or necessary for the proper management or conservation of any fishery.

(e) The issuing of licences for fishing and related activities, and for any matter provided for under the fisheries legislation

(f) Requiring such other matters as may be necessary for the effective implementation of the access agreement

E. Monitoring, Control and Surveillance

E.1 MCS and the Law: The fisheries law fulfils the following basic functions in relation to MCS:

(a) defines the powers, duties and obligations of the management authority especially in regulating entry and the behaviour of persons engaged in the fishery (e.g. prohibiting certain activities, requiring that other activities be undertaken only under the authority of a licence, and prescribing the manner in which fishing and related activities must be conducted);

(b) establishes or designates the competent entity for MCS including the fisheries monitoring centre;

(c) designates or provides a mechanism for the designation of observers and enforcement officers;

(d) provides the basis for developing MCS plans and implementing various MCS tools, for example, vessel monitoring systems (VMS);

(e) protects the interests of fishers (e.g. confidentiality of information);

(f) grants enforcement powers to officials (e.g. to arrest, detain and seize);

(g) safeguards basic civil rights of alleged wrongdoers in enforcement action; and

(h) establishes the judicial or alternative enforcement system for penalising those who violate fisheries rules, the procedures in that enforcement system and the applicable sanctions.

The manager is essential to the process of identifying weaknesses or gaps in the management and MCS with a view to rectifying them.

E.2 Fisheries Management and MCS in the Fisheries Legal Framework: The need to have information on the behaviour and consequences of the behaviour of fishers and other stakeholders in a fishery, so that appropriate management action or the review thereof can be undertaken, is the core incentive for MCS interventions. The actions to furnish information can be set in motion prior to, during and after fishing operations. The means to procure the kind of information required (e.g. inspections, at-sea monitoring by observers or VMS surveillance) is by and large facilitated by the fisheries law. The manager should be sure to adhere to rules protecting the rights of the person providing information (e.g. ensuring confidentiality). Where enforcement becomes necessary, the fisheries law enables the enforcement authority to utilise available information or gather specific information (e.g. evidence of contraventions) to support enforcement action.
E.3 Participatory Management and MCS: Co-management and other participatory management systems could contemplate an MCS role for the co-management unit or participants. For the reasons elaborated above relating to the nature and implications of MCS interventions, it is vital that any MCS responsibility envisaged for the co-management unit be sanctioned by law. Compliance and enforcement functions for co-management units, particularly those that rely heavily on self-regulation, may not be provided for in the law, as the primary focus of such participatory management systems would be on voluntary compliance, but this is not necessarily true in all cases.

E.4 Vessel Monitoring Systems: VMS like other modern monitoring and near-real-time information systems is a relatively new technology in the MCS toolbox not fully utilized by most developing countries. Among the essential components for the regulatory framework for implementing VMS are:

(a) the enabling power of the FMA to introduce and implement VMS as an MCS tool;
(b) the VMS components and technical standards or specifications for the components;
(c) the rights and responsibilities of the FMA in managing the VMS system and the persons required to implement VMS;
(d) the ownership and the primary and secondary uses of VMS information;
(e) the requirements and specifications for ensuring confidentiality and security of information;
(f) the rules for ensuring efficient operation, maintenance and operational performance of VMS components supported by enforcement and sanctions against violations;
(g) the use of VMS information as evidence in a court of law.

The further use of existing VMS policy or MCS plans which will define how VMS will be used to achieve the objectives set out in such plans, or the formulation of new VMS policies and MCS plans, would greatly assist the development of such a regulatory framework.

E.5 Enforcement: The rules governing enforcement for non-compliance or contraventions of fisheries laws are usually precise. Strict adherence by enforcement officers to these rules, which should be broad enough to enable enforcement officers to carry out their duties but sufficiently strict to protect fishers against the abuse of power, is crucial. Initial enforcement actions such as boarding and inspection on suspicion of contraventions, collecting evidentiary material, directing an alleged offending vessel to port and fixing a bond or security for prompt release of a foreign fishing vessel and its crew are typically located in the principal fisheries legislation. In many developing countries, utilisation of existing enforcement agencies through cross-authorisation to enforce another sector’s law and close collaboration between law enforcement agencies ensures sensible utilisation of scarce resources. Ensuring where possible that there is standard or joint training of fisheries and ordinary law enforcement officers, coordinated exercises and cooperation between the management authority and other law enforcement agencies is essential for effective MCS.

E.6 IUU fishing: IUU fishing as defined in the IPOA-IUU is essentially a description of the problems that MCS and its supporting legal framework are set up to address. The ‘illegal’ and ‘unreported’ problems are typical aspects of the IUU fishing problem – the terms,
fundamentally, refer to situations where regulatory regimes exist and apply to the persons involved in the activities, but the persons who commit the ‘unlawful’ or ‘unreported’ acts deliberately choose to ignore the applicable rules. The compliance and enforcement components of MCS deal with these first two aspects of the IUU fishing problem. The ‘unregulated’ aspect of IUU fishing basically means that there is no regime governing the fisheries (i.e. there are no conservation or management measures in place) or a specific behaviour and therefore compliance and enforcement rules cannot be invoked. The IPOA-IUU and its related technical guidelines are a manager’s essential guidebooks on MCS. They present a wide range of MCS options including legal options to tackle the IUU fishing problem and are indispensable tools to the manager in fulfilling their MCS mandate.

E.7 Port States Measures: The use of Port State Measures (PSM) to complement other means to fight IUU fishing is becoming increasingly crucial. PSM are considered effective weapons against IUU fishing due to the fact that ports lie wholly within a state’s territory and general international law recognises that a state has wide discretion over what happens in its ports. PSM may include denial of access to ports or use of port facilities, refusal of permission to land or tranship catch and inspections to ensure that catches have been taken in accordance with applicable conservation and management measures.

F. Regulation of Fishing Gears and Methods

F.1 The need for fisheries management arises as the surplus production from fish stocks is overtaken by the catching capacity of fishing fleets. Catching capacity is the product of the fishing effort and the combined efficiency of the fishing gear and the fishing vessel (e.g. loading capacity, engine power, range capacity, fish finding and navigational equipment), as well as the skills of the crew.

F.2 Fishing gears

F.2.1 The Ideal Fishing Gear: Some criteria for the ideal fishing gear could be:

(i) highly selective for the target species and sizes, with negligible direct or indirect impact on non-target species, sizes and habitats;

(ii) effective, giving high catches of target species at lowest possible cost;

(iii) quality orientated, producing catches of high quality

F.2.2 Classification of Fishing Gears: Fishing gears are commonly classified in two main categories: passive and active. This classification is based on the relative behaviour of the target species and the fishing gear. With passive gears, the capture of fish is generally based on the movement of the target species towards the gear (e.g. traps), while with active gears capture is generally based on an aimed chase of the target species (e.g. trawls, dredges). A parallel on land would be the difference between the trapping of and hunting for animals.

G. Area and Time Restrictions

G.1 Defining Area and Time Restrictions

Practitioners refer to area closures (whether temporary, seasonal or permanent) by various names, each of which may have a particular formal definition, depending on the legislative or cultural context. Of these various terms, however, ‘Marine Protected Area’ is, perhaps, the most widely used. The International Union for Conservation of Nature (IUCN) defines a Marine Protected Area (MPA) as Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by
law or other effective means to protect part or all of the enclosed environment. Other jurisdictions define an MPA as:

an area of the sea . . . (that) has been designated . . . for special protection for one or more of the following reasons:

(a) the conservation and protection of commercial and non-commercial fishery resources, including marine mammals, and their habitats;
(b) the conservation and protection of endangered or threatened marine species, and their habitats;
(c) the conservation and protection of unique habitats;
(d) the conservation and protection of marine areas of high biodiversity or biological productivity; and
(e) the conservation and protection of any other marine resource or habitat.

The objectives for establishing area or time restrictions may be placed into three broad categories:

(1) Fisheries management issues
(2) Broader conservation considerations
(3) Equity issues.

G.2 As a fishery-management measure

States should prevent overfishing and excess fleet capacity and should implement management measures to ensure that fishing effort is commensurate with the productive capacity of the fishery resources and their sustainable utilization. Area and time restrictions can help in achieving these objectives in the following ways:

(1) Limiting harvest of specific life stages: Often it is desirable to prevent fishing on particular stages of a species life cycle that are especially vulnerable to capture or are critical to overall production. One example is of species that aggregate in particular areas to spawn. There might also be a need to protect areas where juveniles live. Fishing for the adults in an area with a high proportion of juveniles may lead to high juvenile bycatch that fishers cannot land for legal or practical reasons. Closing the area would allow those fish to grow and contribute to the landed catch in later years. Closed seasons, for example, are most often used for fast-growing species with a short recruitment period, such as prawns and shrimps. In fisheries for such species, closing the fishery early in the season allows individuals to grow to larger and more valuable sizes.

(2) Protecting depleted stocks and their habitats during the rebuilding phase of a fishery: If a fishery has collapsed, or is close to collapse, the action one must take to allow the stock to rebuild is likely to be severe, including a total ban on fishing or in some circumstances, allowing fishing in some areas but preventing it in those that are critical to the rebuilding.

(3) Protecting genetic reservoirs: Protected areas to help preserve genetically diverse sub-populations may in some settings provide insurance against such possibilities.
Protecting habitat that is critical for the sustainability of fished populations:
Some types of fishing gear can have large negative effects on benthic (sea, lake or riverbed) habitat that may be important for the sustainability of fished populations. Often such habitats will be inshore, where juvenile fish aggregate in areas with high physical structure such as seagrass beds or mangroves. Article 6.8 of the FAO Code of Conduct makes specific reference to protecting such critical fisheries habitat as a guiding principle for responsible fisheries.

To restrain excess fleet capacity and optimise the value of the catch: When there is excess fishing capacity, a short, properly chosen fishing season can prevent overexploitation of the stocks. With this approach, choosing the right time to open the fishery can have a big effect.

G.3 As a wider conservation measure

(1) Protecting benthic habitats of high conservation value: management measures should provide that ‘biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected’.

(2) Limiting bycatch: In some groundfish fisheries, for example off Alaska, the authorities set closed seasons to minimise bycatch rates or potential effects on marine mammals.

(3) Protecting attributes of the ecosystem that are critical for preserving ecosystem services, in particular the provisioning and regulatory services

G.4 To resolve equity issues

(1) Providing a mechanism to resolve conflict over multiple use of areas or resources, for example artisanal fishers versus industrial fishers, tourism, shipping and recreational fishing, where the only tractable solution is to restrict activities to certain areas by some form of zoning arrangement, either permanently or seasonally.

(2) Reserving valued marine and coastal resources for the preferred use of residents or traditional users: Often indigenous cultures have traditional (and sometimes exclusive) claims on certain lands or resources. Providing exclusive use in an area or season is a way to honour such claims. Similarly, local fishers’ cooperatives or communities might benefit from area-based rights protection.

References
Review of Fisheries and Aquaculture Development Potentials in Armenia (Yovhannisean et al., 2011)

Current Fisheries and Aquaculture Policies Relevant to the Regional Fisheries Livelihood Project (RFLP) in Timor-Leste (do Amaral, 2010)

Tanzania Fisheries Sector Development Programme (MLFD, 2010)

Review of Fisheries and Aquaculture Development Potentials in Georgia (Khavtasi, 2010)

A Fishery Manager's Guidebook (Cochrane et al., 2009)

A Model Strategic Framework for Prioritization and Development of Inland Water Bodies under Fisheries and Aquaculture (Roy, 2015)
4.3.13 The Politics of Food Safety and Food Security Indicators: The Politics of International Food Standards

A. Introduction
The general public as consumers want food to be safe—or safe enough—and they expect the food industry and government to make sure that it is. The public is also part of the political equation. Food safety is a matter of politics as well as science and stakeholders need to recognize the political forces at work in safety matters. One of the noticeable weaknesses of food safety systems governance in most countries is the fragmented, overlapping, and confusing distribution of authority among the national agencies concerned with food safety. While these disparate authorities are responsible for making sure that unsafe food does not get into the human food supply, most often the system fails to ensure that food companies follow rules designed to protect public health. The mandate overlap complicates government oversight of microbial contaminants in food, genetically engineered foods, and protection of the food supply against potential threats of bioterrorism.

There is a tendency by the food industries to promote economic self-interest at the expense of public health and safety. Whenever things go wrong, culpable companies shift blame to others or variables outside their control, and oppose, resist, and undermine food safety guidelines, following them only when forced to do so by government action or public opinion.

The food industry invokes science as a rationale for self-interested actions. In the case of the ongoing debate about the safety of genetically engineered foods, companies use scientific arguments that the products are not yet known to cause food safety concerns push for registration and approval of their products. Unscrupulous food companies use science as a political tool to oppose requirements to keep harmful microbes out of food, label genetically modified foods, or institute protective measures against bioterrorist threats. Greater attention to food safety has been raised partly by the extensive media coverage in recent years given to food scandals, food-borne human diseases, fears with regard to genetically modified foods, and, recently, consideration of the vulnerability of food and water supplies to terrorist activity.

Food safety is used as a means through which consumer advocacy groups raise issues about the self-interested exercise of corporate power, the imbalance in power between corporate and public interests, and the collusion of government policies with business interests. Advocacy groups can use questions of safety to address much broader social and political concerns.

B. Perceptions of Food Safety Risk
Safety is relative; it is not an inherent biological characteristic of a food. A food may be safe for some people but not others, safe at one level of intake but not another, or safe at one point in time but not later. Instead, we can define a safe food as “one that does not exceed an acceptable level of risk” (Nestle, 2010). Decisions about acceptability involve two overlapping approaches in which people assess risk to decide whether a food is safe: from the perspective of “science” and from the perspective of “values.” A “science-based” approach to food safety, which balances risk against benefits and costs and contributes to the estimation of risk, is distinguished from a “value-based” approach focused on the acceptability of risk, which tends to balance risk against dreaded outcomes or feelings of outrage. Scientific questions do not arise in value-free contexts and value-based approaches often consider scientific arguments. When such decisions have implications for commercial or other self-interested motives, food safety enters the realm of politics.

Nestle (2010) argues that the estimation of risk is a scientific question—and, therefore, a legitimate activity of scientists in government agencies, in universities and in the research institutions while the acceptability of a given level of risk, however, is a political question to be determined in the political arena.
Table 14: Comparison of “science-based” and “value-based” approaches to evaluating the acceptability of food safety risks

<table>
<thead>
<tr>
<th>“Science-Based”</th>
<th>“Value-Based”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts and calculates:</td>
<td>Assesses whether risk is:</td>
</tr>
<tr>
<td>- Cases</td>
<td>- Voluntary or imposed</td>
</tr>
<tr>
<td>- Severity of illnesses</td>
<td>- Visible or hidden</td>
</tr>
<tr>
<td>- Hospitalizations</td>
<td>- Understood or uncertain</td>
</tr>
<tr>
<td>- Deaths</td>
<td>- Familiar or foreign</td>
</tr>
<tr>
<td>- Costs of the risk</td>
<td>- Natural or technological</td>
</tr>
<tr>
<td>- Benefits of the risk</td>
<td>- Controllable or uncontrollable</td>
</tr>
<tr>
<td>- Costs of reducing the risk</td>
<td>- Mild or severe</td>
</tr>
<tr>
<td>- Balance of risk to benefits</td>
<td>- Fairly or unfairly distributed</td>
</tr>
<tr>
<td>Balances risk against benefit and cost</td>
<td>Balances risk against dread and outrage</td>
</tr>
</tbody>
</table>

Source: (Nestle, 2010)

Thus each dispute has two main components, factual issues and value issues. Factual questions include: What risks are involved? How big are they? Who is at risk? These are scientific questions. The central value question is: Given those facts, what should society do? A more detailed examination of the two approaches to evaluating risks—called, for lack of better terms, science-based and value-based—helps to explain why food safety issues are so political.

B.1 Science-Based Approaches: Counting Cases and Costs

Science begins with an observation, but rather than accepting an observation as a universal truth, scientists question its accuracy, interpretation, and relevance; develop theories to explain its significance; and design and conduct experiments to test those theories (Nestle, 2010). The quality of scientific research depends not only on the question under investigation (some research questions are more interesting and important than others) and the care (“rigour”) with which studies are conducted, but also on the ability of the studies to eliminate (“control for”) all possible causes of the observation other than the one being tested. Scientific methods also extend beyond observations to suggest probable causes, to exclude irrelevant causes (“confounding variables”), and to estimate the probability that a particular cause is the true reason for the observation of interest. However, probability is not the same as proof. Biological experiments in humans are complicated by genetic variation and behavioural differences, and study results nearly always depend on probabilities and statistics. This means that they are subject to interpretation and, therefore, to perception, opinion, and judgment. Scientists tend to minimize the subjective nature of interpretation and to view knowledge gained through the testing of theories as objective, accurate, evidence-based, hypothesis-driven, and rigorous.

In practice, a science-based approach to food safety is one that appears to focus exclusively on the characteristics of the risk itself: annual cases of illness, doctor’s visits, hospitalizations, deaths, costs to individuals and to society, the benefits of doing nothing about the risk, and the benefits and costs of risk reduction. From this perspective, risks are measurable and, therefore, “scientific” and “objective.” Researchers and government officials evaluate potential hazards through a formal process of risk assessment that involves identifying the hazard, characterizing it, determining its degree of exposure in the population, and calculating the
balance of risk to benefit and cost. Using this science-based approach, government agencies identify the primary preventable food safety hazards as microbial infections, antibiotic resistant Salmonella, food allergens, and certain pesticides. Because so much self-interest is at stake in such decisions, these areas have political as well as scientific dimensions—whether recognized or not.

B.2 Value-Based Approaches: Estimating Dread and Outrage

Scientific methods estimate the probability that something in a food might lead to illness, but they do not consider the intangible value or significance of that food to the people eating it. Many people, however, evaluate risks not only for their potential to cause health problems but also from the standpoint of personal beliefs and values that depend on a host of psychological, cultural, and social factors. These personal perspectives about food have also been studied extensively. Anthropologists, for example, tell us that the act of consuming food—taking it into our bodies—is so primal that societies create myths to explain the transformation of food into us. Because, in that sense, we truly are what we eat, food raises questions of intimacy and identity and provokes feelings of anxiety. People do not necessarily want food to be perfectly safe (or we would never eat wild mushrooms or raw oysters). We are just more comfortable knowing what we are eating. At some deep psychological level, “If we are what we eat, and we don’t know what we are eating, then do we still know who we are?”

On the ranking of potential hazards according to the degree of perceived harm, studies indicated that people worry most about risks perceived as highly dangerous, particularly to pregnant women and small children (a science-based concept), but they are also concerned about risks perceived as involuntary, unpreventable, unfamiliar, and inequitably distributed—factors based on values (Nestle, 2010). People are less willing to accept risks induced by technology, those poorly understood by science, and those subject to contradictory statements from experts. The more such value-based factors characterize a particular risk, the more the risk generates feelings of anxiety, alarm, dread, and outrage. In fact, risk communication researchers rank such factors on a predictable scale of dread and outrage.

With respect to food, acceptance of risk depends far more on perception of the number and intensity of dread-and-outrage factors than it does on the number of cases of illness. On a population basis, microbial contaminants unquestionably pose the most prevalent foodborne threat to health. The public, however, also ranks chemical pesticides and additives, irradiation, and genetic engineering high on the list of perceived risks, largely because exposures to them are invisible, involuntary, imposed, and uncontrollable. The health risks of genetically modified foods (however remote they may be) are hidden and undemocratically applied and as a result are far less acceptable. Because questions of who imposes risks and who takes risks are crucial in assessing whether a risk is acceptable, decisions about food safety take on political dimensions.

A comparison of the two approaches to assessing risk explains why whenever someone invokes science in discussions of food safety, we can be reasonably certain that questions of self-interest are at stake but are excluded from debate. Scientists talk about risk as a matter of illness and death. The public wants dread-and-outrage factors to be considered as well. The failure of food companies, scientists, and government agencies to recognize the need to address values as well as science in matters of food safety leads to widespread distrust of the food industry and its regulators. When officials and experts dismiss dread-and-outrage concerns as emotional, irrational, unscientific, and indefensible, they raise questions about their own credibility and competence. They fail to recognize their own biases as well as the predictability of public responses to food safety risks. When a risk manager continues to ignore these factors—and continues to be surprised by the public’s response of outrage—it is worth asking just whose behaviour is irrational (Nestle, 2010).
B.3 The Precautionary Principle: Look Before You Leap

The differences in the two approaches to food safety risk have an additional political dimension. They imply different expectations for the ways in which authorities make decisions about the release of new foods and ingredients. The science-based approach works on the proposition “nothing ventured, nothing gained.” Regulators determine as well as they can whether a food or ingredient is likely to cause harm and permit those that seem reasonably safe to enter the food supply. Food safety authorities use this approach for food additives characterized as “generally recognized as safe” (GRAS). If problems occur, the authorities deal with them after the foods are marketed. This approach requires neither premarket testing nor labeling; it is based on a standard that requires food manufacturers to demonstrate “reasonable certainty of no harm.” This standard, which translates as “safe enough to be acceptable,” leaves plenty of room for subjective opinion and judgment.

An alternative approach is one that has come to be known as the principle of precautionary action, or the “precautionary principle.” Whether or not to invoke the Precautionary Principle is a decision exercised where scientific information is insufficient, inconclusive, or uncertain and where there are indications that the possible effects on the environment or human, animal or plant health may be potentially dangerous and inconsistent with the chosen level of protection. The appropriate response in a given situation is thus the result of a political decision, a function of the risk level that is “acceptable” to the society on which the risk is imposed. In practice, invocation of the precautionary principle can be used to require companies to demonstrate that foods are safe before they are marketed. Further stressing the principle, the Wingspread statement on the precautionary principle states: “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context, the proponent of the activity, rather than the public, should bear the burden of protection” (Nestle, 2010). Further to this, European and United States experts on food biotechnology issued a joint statement in 2000 saying, “When substantive uncertainties prevent accurate risk assessment, governments should act protectively on the side of safety.” Even so mild a statement suggests that companies will have to do more to demonstrate safety in advance. But because testing can never prove that a food is perfectly safe, public willingness to accept a new food depends on how well it meets the value concerns summarized in Table 3. If a food ranks high in dread and outrage, it will never appear safe enough, no matter how much effort goes into attempts to prove it harmless.

C. The Political Economy of Foodborne Illness

The strengthening of food laws is a necessary political process intended to control food safety for which the society expects governments and their regulatory agencies to take responsibility. Accurate burden-of-illness estimates for foodborne diseases are useful for policy makers and others that seek to characterize and prioritize resources dedicated to addressing the problem of these diseases (Scharff, 2012).

Government agencies that employ economic cost data in regulatory analyses typically use either a basic cost-of-illness model that includes values for medical care, productivity losses, and mortality or a cost-of-illness model enhanced to include pain and suffering values. By including a value for pain and suffering, the enhanced model has the advantage of more fully accounting for economic costs associated with foodborne illness. This value is derived by monetizing quality-adjusted life years (QALYs) that have been designed to assess utility loss. Monetized QALY losses are the product of loss of well-being from a condition, the number of days with the condition, and the economic value of 1 day (derived from the value of statistical life). Ideally, this measure would represent the ill consumer’s willingness to pay to avoid these pain and suffering losses. In contrast, the basic model avoids the controversy over how QALYs should be used but does not provide a value for the legitimate economic costs associated with pain and suffering.
<table>
<thead>
<tr>
<th>Disease or agent</th>
<th>No. of illness</th>
<th>No. of hospitalizations</th>
<th>No. of deaths</th>
<th>Total cost (millions of US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Basic</strong></td>
</tr>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Bacillus cereus</em></td>
<td>63,400</td>
<td>20</td>
<td>0</td>
<td>2.28</td>
</tr>
<tr>
<td><em>Brucella spp.</em></td>
<td>839</td>
<td>55</td>
<td>1</td>
<td>8.24</td>
</tr>
<tr>
<td><em>Campylobacter spp.</em></td>
<td>845,024</td>
<td>8,463</td>
<td>76</td>
<td>437 – 4,031</td>
</tr>
<tr>
<td><em>Clostridium botulinum</em></td>
<td>55</td>
<td>42</td>
<td>9</td>
<td>4 – 416</td>
</tr>
<tr>
<td><em>C. perfringens</em></td>
<td>965,958</td>
<td>438</td>
<td>26</td>
<td>45 – 1443</td>
</tr>
<tr>
<td>Shiga toxin-producing <em>Escherichia coli</em> O157:H7</td>
<td>63,153</td>
<td>2,138</td>
<td>20</td>
<td>121 – 1,827</td>
</tr>
<tr>
<td>Shiga toxin-producing <em>E. coli</em> non-O157</td>
<td>112,752</td>
<td>271</td>
<td>0</td>
<td>11 – 273</td>
</tr>
<tr>
<td>Enterotoxigenic <em>E. coli</em></td>
<td>7,894</td>
<td>12</td>
<td>0</td>
<td>0.41</td>
</tr>
<tr>
<td>Other diarrheagenic <em>E. coli</em></td>
<td>11,982</td>
<td>8</td>
<td>0</td>
<td>0.28</td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td>1,591</td>
<td>1,455</td>
<td>255</td>
<td>95 – 6613</td>
</tr>
<tr>
<td><em>Salmonella</em>, non-typhoidal</td>
<td>1,027,561</td>
<td>19,336</td>
<td>378</td>
<td>1479 – 10881</td>
</tr>
<tr>
<td><em>S. enterica</em> Typhi</td>
<td>1,821</td>
<td>197</td>
<td>0</td>
<td>0 – 24</td>
</tr>
<tr>
<td><em>Shigella</em></td>
<td>131,254</td>
<td>1,456</td>
<td>10</td>
<td>38 – 768</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>241,148</td>
<td>1,064</td>
<td>6</td>
<td>29 – 434</td>
</tr>
<tr>
<td><em>Streptococcus group A</em></td>
<td>11,217</td>
<td>1</td>
<td>0</td>
<td>0.112</td>
</tr>
<tr>
<td><em>Vibrio cholerae</em>, toxigenic</td>
<td>84</td>
<td>2</td>
<td>0</td>
<td>0.3</td>
</tr>
<tr>
<td><em>V. vulnificus</em></td>
<td>96</td>
<td>93</td>
<td>36</td>
<td>54 – 538</td>
</tr>
<tr>
<td><em>V. parahaemolyticus</em></td>
<td>34,664</td>
<td>100</td>
<td>4</td>
<td>29 – 169</td>
</tr>
<tr>
<td>Other <em>Vibrio</em></td>
<td>17,564</td>
<td>83</td>
<td>8</td>
<td>28 – 179</td>
</tr>
<tr>
<td><em>Yersinia enterocolitica</em></td>
<td>97,656</td>
<td>533</td>
<td>29</td>
<td>69 – 1662</td>
</tr>
<tr>
<td><strong>Parasite</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Cryptosporidium spp.</em></td>
<td>57,616</td>
<td>210</td>
<td>4</td>
<td>21 – 394</td>
</tr>
<tr>
<td><em>Cyclospora cayetanensis</em></td>
<td>11,407</td>
<td>11</td>
<td>0</td>
<td>0.39</td>
</tr>
<tr>
<td><em>Giardia intestinalis</em></td>
<td>76,840</td>
<td>225</td>
<td>2</td>
<td>128 – 267</td>
</tr>
<tr>
<td><em>Toxoplasma gondii</em></td>
<td>86,686</td>
<td>4,428</td>
<td>327</td>
<td>1,112 – 5,726</td>
</tr>
<tr>
<td><em>Trichinella spp.</em></td>
<td>156</td>
<td>6</td>
<td>0</td>
<td>0 – 4</td>
</tr>
<tr>
<td><strong>Virus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Astrovirus</em></td>
<td>15,433</td>
<td>87</td>
<td>0</td>
<td>5 – 22</td>
</tr>
<tr>
<td><em>Hepatitis A</em></td>
<td>1,566</td>
<td>99</td>
<td>7</td>
<td>13 – 125</td>
</tr>
<tr>
<td><em>Norovirus</em></td>
<td>5,461,731</td>
<td>14,663</td>
<td>149</td>
<td>1,545 – 4,728</td>
</tr>
<tr>
<td><em>Rotavirus</em></td>
<td>15,433</td>
<td>348</td>
<td>0</td>
<td>4 – 21</td>
</tr>
<tr>
<td><em>Sapovirus</em></td>
<td>15,433</td>
<td>87</td>
<td>0</td>
<td>4 – 18</td>
</tr>
<tr>
<td>Total known</td>
<td>9,388,074</td>
<td>55,962</td>
<td>1,350</td>
<td>8,436 – 29,330</td>
</tr>
<tr>
<td>Total unknown</td>
<td>38,392,704</td>
<td>127,839</td>
<td>1,686</td>
<td>21,047 – 51,404</td>
</tr>
<tr>
<td>Grand total</td>
<td>47,780,778</td>
<td>183,801</td>
<td>3,036</td>
<td>31,214 – 76,142</td>
</tr>
</tbody>
</table>

The estimated cost of foodborne illness was substantial: $51.0 billion in annual health-related costs in the basic model and $77.7 billion in the enhanced model. Whether a potential food safety program improves social welfare is dependent on three factors: the cost per case of foodborne illness, the number of cases expected to be averted by the program, and the cost of
the program to government, consumers, and industry. When examining a particular program, social welfare will only be improved when the product of the cost per case and the number of cases averted exceeds the expected cost of implementing the program for society as a whole.

Underlying the discussions of Food Politics are several recurrent themes:

(1) The increasing concentration of food producers and distributors into larger and larger units

(2) The overproduction and overabundance of food in the United States

(3) The competitiveness among food companies to encourage people to eat more food or to substitute their products for those of competing companies

(4) The relentless pressures exerted by food companies on government agencies to make favourable regulatory decisions

(5) The invocation of science by food companies as a means to achieve commercial goals

(6) The clash in values among stakeholders in the food system: industry, government, and consumers

(7) The ways in which such themes demonstrate that food is political

D. Food Sources and Virulence

Regardless of the accuracy of cost and case estimates, one trend is clear: an increasingly broad range of foods is contaminated with harmful bacteria. Cases refers to the number of individuals who become ill—whether or not they report the disease. In contrast, outbreaks always are reported; authorities discover them when more than one person gets sick from the same food source and doctors report the illnesses to health officials. It is easier to identify cases—and, therefore, report them—when an illness occurs right after the food is eaten. With these distinctions in mind, the tracking information indicates a change in the food sources of outbreaks: seafood ranks first, followed by eggs, fruits and vegetables (sprouts, lettuce, berries, cantaloupe), beef, poultry, and foods such as salads and sandwiches made with multiple ingredients. In part because so many more meals are consumed outside the home, foods other than those prepared by home cooks now account for 80% of the outbreaks (although not necessarily 80% of the cases of food-borne illness).

E. Government Oversight in Food Safety

Government oversight in food safety is often spread among many institutions. Food safety politics involves diverse stakeholders with highly divergent goals. Food producers must compete for shares of the consumer’s food money. One way to do this is by taking advantage of a divided, inconsistent, and illogical government regulatory system. Food companies owe their primary allegiance to stockholders, and their principal goal must be profit, not public health. Whenever safety measures raise costs or intrude on autonomy, the affected industries mobilize their considerable political power to block actions perceived as unfavourable—even when such measures are strongly supported by science (example: antibiotics). Government regulatory agencies also engage in competition, in this case among themselves for scarce resources and territorial mandates. They often appear to be more concerned about protecting their own turf—or that of the industries they regulate—than about protecting the health of consumers. The public, unaware of such disputes, simply wants food to be safe and assumes that both industry and government share that goal and are doing everything possible to achieve it.
In this environment, the various participants in the food system blame one another (but never themselves) when outbreaks occur. The costs of foodborne illness to individuals, to society, and to food companies should encourage everyone to collaborate in efforts to ensure safe food. That the groups do not collaborate is a curious consequence of food safety politics.

Spriggs et al. (2001) argue that for international competitiveness, a food safety system must be designed consisting of a set of (governmental and non-governmental) institutional arrangements or a ‘governance structure’ providing formal and informal rules to ensure food safety. Institutional arrangements on food safety are important and it is crucial they evolve, as needed, in order to remain consistent with new technological innovations and changing consumer preferences.

Nestle (2010) posits that as citizens, we need to understand that producing safe food is not impossibly difficult. She argues that Sweden, Denmark, and the Netherlands have reduced foodborne illnesses by instituting control systems at every stage of production, starting on the farm. They set testing standards to reduce pathogens, limit antibiotics in animal feed, prevent infections in transported animals, test for microbes at slaughterhouses and supermarkets, and provide incentives to the industry to comply with safety rules.

F. Relevance of Food Safety Systems in Developing Countries to International Food Trade

The importance of developing countries as providers of an increasing percentage of the food being consumed globally is receiving growing recognition. This is because these countries remain an undeniably important source of key food items for developed-country consumers, including increasingly sophisticated food product offerings. Consequently, the status of the food safety and quality systems in these countries is no longer a matter of local interest only; a food safety challenge in Asia or Africa can have repercussions as well in developed countries (Gordon, 2015). As examined in the foregoing sections, governments and their regulatory agencies use standards and technical regulations as a means of assuring consumer demands for improved product safety, increased environmental protection, and greater product information (Sheldon, 2013).

Sheldon (2013) reports that there has been considerable discussion of the problems of regulatory compliance faced by developing countries in accessing developed country markets, given the latter typically have higher levels of regulatory intensity than the former. The growing movement of people, live animals, and food products across borders, rapid urbanization in developing countries, changes in food handling, and the emergence of new pathogens or antibiotic resistance in pathogens all contribute to increasing food safety risks. These issues are recognized in international trade negotiations under the WTO and in the FAO’s Committee on World Food Security. Managing food safety risks is a prerequisite for participation in international trade, and taking advantage of trade opportunities is an important strategy to reduce poverty. There is an increasing realization that exports are a critical component in rural economic growth. Thus, food safety has a dual role in poverty alleviation, as it is important to public health and to market development. At the same time, several global trends lead to increased complexity in food systems, including increased trade in fresh and processed foods, growing urbanization and increased demand for foods of animal origin, and associated changes in the way that food is produced, processed, and distributed.

Current understanding of food safety management and the desire of most industrial countries to be responsive to consumers and efficient in the use of public resources has brought about changes in food safety regulatory systems. The development of modern food safety systems: their structure, practices and functioning, depends on a number of principles and trends including (Unnevehr et al., 2000; Mwamakamba et al., 2012):
Emphasis on development of integrated and holistic food safety systems with a farm-to-table approach using a well-resourced consolidated authority. There is shift from sectoral approaches to managing food safety risks to more holistic and multi-faceted strategies. The farm-to-table approach to food safety is based on the premise that foodborne disease is commonly caused by multiple factors arising at dispersed points along the farm-to-table continuum. It addresses the notion that quality needs to be managed along the entire food supply chain, from the initial stages of raw material production to the final stages of food preparation to consumption.

The globalization of the food supply chain and obligations under trade agreements as well as advances in the control of foodborne hazards. Greater scientific understanding of food safety risks and means to assess their impact on public health as well as the development of international food standards by the Codex Alimentarius Commission are some of the factors that have influenced proactive approaches to food safety control over the years.

Increased recognition of the roles of stakeholders and cooperation with industry and consumers to provide information and education. There is a general shift in thinking about the roles of stakeholders from the farm-to-table, with responsibilities for food control shifting from the government to producers, processors, food manufacturers, transport operators, retailers and consumers that operate along the food chain. Food producers at all levels have a responsibility for the production of safe food. At the farm level, farmers and workers must control pesticide and other chemical inputs and recognize potential sources of microbial contaminants from water, soil, animals and humans. Fishermen must understand that the safety and quality of their catch is linked to the levels of contaminants in the harvest waters. The food processing and transportation industries must assess where food safety may be jeopardized at critical points in food production and transport and take appropriate measures to control these potential hazards. Retail establishments, restaurants and other food vendors must also understand how to ensure proper sanitary practices and temperature controls. The role of the consumer may be the most important since at that level food safety is assured at the point closest to food consumption. It is the last safety check on the road from the farm to table.

Reorientation of quality assurance protocols. There is a shift from the traditional focus on end-product testing toward quality management of the production process. There has been a renewed emphasis on preventive measures to food safety. A widely recognized preventive system, Hazard Analysis Critical Control Point (HACCP) is geared on sound science and focuses on identifying and preventing hazards from contaminating food.

An open decision making process that allows stakeholder participation.

Evaluation of public health outcomes from regulation.

G. Components of a National Food Control System

Food policy, law and regulations: Containing the necessary statutory powers to ensure jurisdiction over food safety from farm to table and allow competent food authorities to take immediate preventive and enforcement measures using updates food laws, regulations and updated food standards. They must tailor available information, concepts and requirements to the national context, so as to develop a regulatory framework that will both satisfy national needs and meet
international obligations and trading partners' demands.

(b) **Food control management**: Effective food control systems require operational coordination at the national level including an institutional structure which responds to the needs of food safety management. Where food control responsibilities lie among different government agencies, the roles and responsibilities of these agencies should be clearly defined and efforts made to establish a more integrated system, in order to provide increased consistency in assuring the safety of food.

(c) **Inspection services**: An effective food safety management system requires clear inspection policy and procedures that are applied by inspectors who are well trained not only to apply these procedures but also to act as quality assurance advisors and extension officers to the food industry.

(d) **Laboratory services**: Laboratories underpin decisions of food control services. It has been noted that limited resources to maintaining and equipping laboratories are often cited as major constraints to enhancing national laboratories. It has been pointed out, though, that while laboratory capabilities are expensive resources, it is essential, at least at the national level, that good laboratory facilities and competent personnel be adequately supported.

(e) **Information, education, communication and training**: Assuring food safety along the entire food chain requires partnerships and education at all levels. Stakeholder participation and empowerment grounded on sound knowledge of food safety is paramount. All should recognize their individual role to enhancing and minimizing food-related risks. Emphasis of food safety information, education and communication programmes should be in providing the different stakeholders with the information and motivation necessary to make informed decisions on food safety.

H. **Export Challenges Facing Food and Agriculture from Developing Countries**

Food export markets present a somewhat different set of challenges from domestic food safety regulation. Fresh food products are more likely to encounter sanitary and phytosanitary barriers to trade. Delivering safe food to distant markets requires process controls throughout the production process and mechanisms to certify to buyers that such controls are effective. Developing-country exporters need to know how to meet standards in different markets and how to meet the increasing demand for product trace-back and certification of production methods.

The SPS agreement of 1994 provides a framework for resolving disputes about SPS measures under the WTO. There is evidence that this agreement has stimulated activity to reduce SPS barriers to trade, but there remains significant disagreement at the international level over the role of science and consumer choice in regulating risk. Controversies at the global level influence the ability of countries to compete in export markets. They create uncertainties about the potential acceptability of production methods and products in different potential markets.

For Africa, the major challenges faced by countries include (Mwamakamba et al., 2012):

(i) **Limited awareness about food safety.** Information, education, health promotion and training programmes for the food industry and consumers are limited in a number of countries. There has been a drastic increase in countries of small-scale food industries, ever-growing number of food vendors and household level
production. This change, however, in the increase of small-scale food industries has not been accompanied by the improvement of food safety patterns in most countries. Personnel engaged in food production and processing have insufficient knowledge to comply with food safety assurance schemes including the Hazard Analysis Critical Control Point (HACCP) system.

(ii) **Inadequate coordination.** The administration of food safety is complicated by the fact that food safety has many facets. National food safety control systems within the Region often have a sectoral or fragmented structure. Typically, under such arrangements the food control responsibilities are shared between several government ministries such as health, agriculture, commerce, environment, trade and tourism. The roles and responsibilities of each of these agencies are specified but remain quite different. While multiple food control agencies may be the norm, they suffer several drawbacks, including lack of coordination, and confusion over jurisdiction. To overcome the problems associated with fragmentation of food control, food control functions could be transferred to a single government department or a national food control body with inter-ministerial and inter-departmental representation.

(iii) **Inadequate enabling policy, outdated legislation and regulations.** In many cases existing legislation is outdated, incomplete and fails to adequately address current and emerging food safety problems. Even with a food act and regulations, enforcement may be undermined by the lack of effective food control infrastructure and institutional capacities to ensure compliance. Failure to clearly clarify in legislative documents the respective responsibilities of the main stakeholders involved in food safety, and the mechanisms through which they should work together results in duplication of regulatory activities and inadequate coordination in policy implementation and surveillance. The existence of several different laws each addressing various aspects of food, animals, plants, public health and trade further compound the problem.

(iv) **Insufficient and inadequate capacities for food safety.** Human resource capacity is inadequate in terms of: development and implementation of policies that affect food safety and trade, including capacity to implement relevant international agreements; capacities for food analysis and microbiological risk assessment procedures.

(v) **Inadequate resources for food safety.** One key factor affecting food control systems is the lack of financial support. This is exacerbated by the low priority accorded to food safety in national and regional planning, and the limited funding food safety receives in relation to other areas. Funds are needed to improve infrastructure, purchase equipment, train personnel and monitor food contamination.

I. **North-South Trade and Food Standards**

Sheldon (2013) reports that it is typically claimed that developing countries are hampered in their ability to meet stringent food standards due to a lack of necessary human capital and poor governance. There is empirical evidence to support the hypothesis that the capacity to satisfy standards is correlated with real GDP per capita, developing countries specializing away from industries with heavier regulatory burdens. Standards in many export destinations for African agricultural and food products are viewed as as instruments of ‘protection in disguise’ (Jaffee *et al.*, 2004; CUTS, 2009; Otieno *et al.*, 2009; Kareem, 2014). For example, the growing concern among policy-makers and private entities in EAC developing countries is about the
proliferation and strengthening of food safety and agricultural standards in the EU market and how this is impacting upon their competitiveness. This concern is multi-faceted, involving:

(i) the suspicion that important standards can and will be used as a trade protection measure and be applied in a discriminatory manner;

(ii) the concern that EAC governments, traders and producers lack the administrative, technical and other capacities to comply with the emerging standards requirements in the EU, or that even in the few cases where they are able to comply, the costs incurred to attain compliance certainly undermines their comparative advantage; and,

(iii) the proposition that such institutional weaknesses and rising compliance costs only serve to marginalise weaker economic players, including small countries, small enterprises, and small-scale farmers.

Jaffee et al. (2004) argue that standards reflect the feasibility of implementation, which itself is influenced by legal and industry structures as well as available technical, scientific, administrative and financial resources. Some food safety risks, for example, tend to be greater in developing countries due to weaknesses in physical infrastructure (for example standards of sanitation and access to potable water) and the higher incidence of certain infectious diseases. Further, tropical or sub-tropical climatic conditions may be more conducive to the spread of certain pests and diseases that pose risks to human, animal and/or plant health.

Over time there has been greatly increased public awareness and concern about food safety within high-income developed countries in the wake of a series of highly publicized food scandals, foodborne illnesses and food-poisoning fatalities. In some countries, these events have shaken the underlying confidence of consumers in national or regional systems of food safety regulation. In response, there have been significant institutional changes in food safety oversight and reform of pertinent laws and regulations. For long-held concerns (for example the potential environmental and health impacts of pesticides), there has been a tightening of many standards in industrialized and other countries. In addition, new standards are being applied to address previously unknown or unregulated hazards.

In parallel with these changes in official standards and public oversight, have been accelerated moves by the private sector to address food safety risks and otherwise address the concerns and preferences of consumers and civil society organizations. Much of the motivation behind this trend has been the mitigation of reputational and/or commercial risks, while in some product lines and industries these moves have also been part of commercial strategies of differentiation. The ensuing result has been a growing plethora of private ‘codes of practice’, standards and other forms of supply chain governance. While these efforts have been especially prominent amongst major food retailers, food manufacturers and restaurant chains in industrialized countries, systems of private food safety governance are also being applied more widely in middle-income and some low-income countries, in part through the investments undertaken by multinational supermarket or restaurant chains and competitive responses by local firms. In addition, new food safety standards in industrialized countries are serving to shape the expectations of developing country consumers, especially those with higher incomes and in urban areas.

The proliferation and enhanced stringency of food safety and agricultural health standards is a source of concern among many developing countries and those promoting the increased integration of these countries into the world trading system. Reflecting wider changes in the trade regime for various agricultural and food products, there is a presumption that food safety and agricultural health measures can (and will) be used as a protectionist tool, providing ‘scientific’ justifications for prohibiting imports of certain products altogether, or discriminating
against imports by applying higher standards and/or more rigorous regulatory oversight than on domestic suppliers. Even if standards are not intentionally used to discriminate against imports, there is concern that their growing complexity and lack of harmonization between countries could still impede the trading efforts of developing countries.

![Figure 25: The Standards and Regulatory Environment for Food Trade (Jaffee et al., 2004)](image)

While the process of notification under the SPS Agreement has contributed to increased transparency of official food safety and agricultural health measures, this has been accompanied by the proliferation of private standards that fall outside of the purview of the WTO. Thus, the overall picture for food safety and agricultural health requirements in trade is becoming increasingly complex and fast moving as standards are promulgated in multiple spheres at both the national and international levels. Further, the complexity of this issue stems not only from the variability of standards on paper, it is magnified by differences in the ways, means and intensities by which the standards are monitored and enforced, which themselves are changing over time.

An illustration of this complexity is depicted in Figure 2. For a developing country exporter, the operative ‘rules of the game’ are derived by a combination of factors including the prevailing standards themselves, enforcement capacities and predilections of official agencies, nature of private standards and oversight arrangements such as certification, and the prominence of particular concerns among consumers and civil society organizations at any point in time. Clearly, there are potentially significant gains from the harmonization of standards, internationally, among countries and within the private sector. Yet, complexities will inevitably persist, especially as supply chains are increasingly driven by the exacting and more dynamic demands of consumers. The challenge for developing countries is clearly immense, although (as is discussed below) the pay-off for those that succeed is potentially significant. However one thing is certain, non-compliance is not an option for those that wish to continue to export!

**J. Food Security Indicators**

According to the World Food Summit of 1996 “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets
their dietary needs and food preferences for an active and healthy life” (FAO, 2001). This widely accepted definition points to the following dimensions of food security:

(i) **Food availability**: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).

(ii) **Food access**: Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).

(iii) **Utilization**: Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

(iv) **Stability**: To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

Food security can be assessed using the following indicators (Death, 2011; FAO, 2015):

<table>
<thead>
<tr>
<th>Availability:</th>
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<tbody>
<tr>
<td>• Average value of food production</td>
</tr>
<tr>
<td>• Share of dietary energy supply derived from cereals, roots and tubers</td>
</tr>
<tr>
<td>• Average protein supply</td>
</tr>
<tr>
<td>• Average supply of protein of animal origin</td>
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<table>
<thead>
<tr>
<th>Access:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Percent of paved roads over total roads</td>
</tr>
<tr>
<td>• Road density</td>
</tr>
<tr>
<td>• Rail lines density</td>
</tr>
<tr>
<td>• Gross domestic product per capita (in purchasing power equivalent)</td>
</tr>
<tr>
<td>• Domestic food price index</td>
</tr>
<tr>
<td>• Prevalence of undernourishment</td>
</tr>
<tr>
<td>• Share of food expenditure of the poor</td>
</tr>
<tr>
<td>• Depth of the food deficit</td>
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<table>
<thead>
<tr>
<th>Stability</th>
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<tbody>
<tr>
<td>• Cereal import dependency ratio</td>
</tr>
<tr>
<td>• Percent of arable land equipped for irrigation</td>
</tr>
<tr>
<td>• Value of food imports over total merchandise exports</td>
</tr>
<tr>
<td>• Political stability and absence of violence/terrorism</td>
</tr>
<tr>
<td>• Domestic food price volatility</td>
</tr>
<tr>
<td>• Per capita food production variability</td>
</tr>
<tr>
<td>• Per capita food supply variability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Utilization:</th>
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</thead>
</table>
Access to improved water sources
Access to improved sanitation facilities
Percentage of children under 5 years of age who are stunted
Percentage of children under 5 years of age who are underweight
Percentage of adults who are underweight
Prevalence of anaemia among pregnant women
Prevalence of anaemia among children under 5 years of age
Prevalence of vitamin A deficiency in the population
Prevalence of school-age children (6-12 years) with insufficient iodine intake

Additional Useful Statistics
- Total population
- Number of people undernourished
- Minimum Dietary Energy Requirement (MDER)
- Average Dietary Energy Requirement (ADER)
- Minimum Dietary Energy Requirement (MDER) - PAL=1.75
- Coefficient of variation of habitual caloric consumption distribution
- Skewness of habitual caloric consumption distribution
- Incidence of caloric losses at retail distribution level
- Dietary Energy Supply (DES)
- Average fat supply
- Prevalence of food over-acquisition
- Maximum Dietary Energy Requirement (XDER)

References
Safe Food: The Politics of Food Safety (Nestle, 2010)
The Oxford Handbook of Food, Politics, and Society (Herring, 2015)
Food Security and Marine Capture Fisheries: Characteristics, Trends, Drivers and Future Perspectives (Garcia et al., 2010)
Food Security Indicators 2015 (FAO, 2015)
Food Security: Issues and Trends in International Politics (Death, 2011)

4.3.14 The Politics of International Food Standards

A. Food Politics
Food politics are the political aspects of the production, control, regulation, inspection, distribution and consumption of food. The politics can be affected by the ethical, cultural, medical and environmental disputes concerning proper farming, agricultural and retailing methods and regulations. Government policies around food production, distribution, and consumption influence the cost, availability, and safety of the food supply domestically and internationally. On a national scale, food policy work affects farmers, food processors, wholesalers, retailers and consumers. Commodity crops, such as corn, rice, wheat, and soy are most often at the heart of agricultural policy-making. While most food policy is initiated domestically, there are international ramifications. Globally, protectionist trade policies,
international trade agreements, famine, political instability, and development aid are among the primary influences on food policy. Increasingly, climate change concerns and predictions are gaining the attention of those most concern with ensuring an adequate worldwide food supply.

Herring (2015) explains that simultaneously, the numbers and causes of people asserting political interests in food and agriculture beyond their own grain pile have likewise shifted out and up. Europeans have used a variety of policy and social-movement tactics to influence what Africans can grow and eat. American diplomats apply pressure to alter European political choices about what not to grow and eat. An international organization of People for the Ethical Treatment of Animals challenges traditional practices confining and slaughtering animals—and thus livestock as livelihood and meat as market. Trade conflicts over whether or not phyto-safety regulations constitute another form of agricultural protectionism or an expression of democratic sovereignty cross powerful currents of science and culture: if Americans and Chinese can eat transgenic virus-resistant papayas, how can Japanese legally regulate them out of their markets? In theory, the Codex Alimentarius represents species-wide knowledge of standards for food safety, which should allow deliberation within the World Trade Organization to set lines between agricultural protectionism and justifiable precaution in regulating novel foods. In practice, there are trade conflicts, ineffectual rulings, and intermittent rejection of WTO rulings. Bans on whale slaughter pit Japan against international political coalitions. Bans on eating companion animals such as horses and dogs, or intelligent animals such as dolphins, raise persistent politics in some places but not others, with consequences for international trade. Shark fin is a valued and traditional food in some cultures, but restaurants are routinely raided for surreptitiously serving it in many jurisdictions. Demands for a ban on cow slaughter have raised intermittently powerful politics in India but not in Pakistan or Texas. Signs on bridges in Europe declare “GMOs Kill.” If true, such a claim would justify, perhaps morally compel, political mobilization to ban GMOs, create GMO-free zones, attack biotech research facilities, and restrict international trade in genetically engineered foods.

Food politics thus depends fundamentally—and increasingly—on ideas, not simply the material interests that have dominated political economy as an approach. Conventional food politics was answerable in a context of classical political economy: the dynamic of interests within social systems. Major interests were fairly clear: control of surplus from the land. The landless fought for land that produced food, the landed resisted. Tenants mobilized around securing their interests; landlords mobilized around defending theirs. The hungry demanded food as traditional obligation or political right. Farmers demanded better deals from traders and moneylenders and state intervention to protect their livelihoods. These demands on the state for protection from the market continue today, and have become globalized with international allies with less direct material interests in outcomes. The new world of food politics thus adds distinctly different dimensions. Contention exists not only around the expertise of agricultural and nutritional sciences, but also around what have been called, since the mid-20th century, alternative paths to “development.” Not only are distal populations recognizing a political imperative to alleviate hunger in societies our moms probably knew little about, but justifications differ, as do contending development theories advocating proper roles for states and markets.

B. Standards and Regulatory Capitalism

Food safety standards are among the most long-standing public health regulations and were also among the first to “go global,” as a way of harmonizing national standards and reducing frictions in trade (Post, 2005). Moreover, the World Trade Organization (WTO) relies on international food standards in resolving trade disputes among countries over potentially protectionist policies. Although there has not been the same innovation in regulatory instruments experienced in other fields, such as the environment, the case of food safety provides a strong argument for both the existence of regulatory capitalism and its diffusion via
horizontal agents. At the same time, it highlights the resilience of national differences in the face of common global structural forces.

Food safety presents a complex challenge. On one hand, in the United States alone, an estimated 76 million people become ill from foodborne illnesses each year, and 5,000 die. Clearly, monitoring and regulation are needed to prevent such occurrences. On the other hand, trade in food and agriculture is a huge global business, estimated at over $1,486 billion and US$1,765 billion per year respectively (WTO, 2015). At a minimum, differing national food safety standards hinder food trade, increasing costs to the consumer. More of a concern is that national standards are frequently accused of serving as non-tariff barriers to trade, that is, having protectionist purposes with no actual public health effect. Indeed, conflicts over food safety standards have emerged as one of the most controversial international trade issues in recent years, as indicated by U.S. and European Union (EU) tussles in the WTO over beef hormones and genetically modified foods.

To help address these twin concerns of safety and protectionism, an international governmental organization called the Codex Alimentarius Commission (CAC) sets food standards that in turn are used by the WTO in dispute resolution.

Two contradictory expectations arise with respect to how international standards affect domestic policies:

(i) From international relations and international law, whether soft law such as international norms influence the actions of countries or whether only “hard” or binding law and force matter

(ii) Whether, on one hand, international standards will be the result of a least common denominator and subsequently push domestic standards lower or, on the other hand, international standards will help raise domestic standards because large companies can use the higher standards to squeeze out competition. Do international norms matter at all, and if so, in which direction do they push national standards?

There is also need to consider how international standards influence domestic regulations, in particular: (i) how dominant states—primarily the United States, the EU and other Organisation for Economic Co-Operation and Development (OECD) countries—are shaping the global order of food safety, in particular how they are using the international arena to project their own domestic ideas of what regulation should be; and (ii) regional integration initiatives as both horizontal and top-down forces of diffusion best explain the degree of convergence that has happened thus far.

C. The Codex Alimentarius Commission and Food Safety

The CAC is an international governmental organization created more than forty years ago by the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO). Its purpose is to develop international food standards that ensure consumer safety and fair practices in food trade. As a highly technical organization, its work went mainly unnoticed by the broader international community up until 1994, when the establishment of the WTO cast Codex standards in a more prominent light. Under the terms of the WTO Sanitary and Phytosanitary (SPS) Agreement, which governs disputes related to food safety standards among others, Codex food standards serve as a benchmark in resolving disputes between nations related to trade in food commodities. This development has prompted a massive increase in attention to and participation in Codex activities. One of the key criticisms of the CAC is that despite its dual mandate to protect public health and promote fair
trade practices, in fact public health protection takes a back seat to trade interests (Post, 2005).

The relation between the CAC and the WTO is emblematic of the transformation of governance that is embodied in regulatory capitalism. Although the WTO aims to remove barriers to trade among all member countries, it does not advocate complete deregulation. Rather, it seeks to walk a fine line between liberalizing trade and maintaining national regulations. In signing the SPS Agreement, WTO member states acknowledged that safety standards for human, animal, and plant health remain in the domain of states to decide. Yet these domestic measures must either rely on international standards or be based on a risk assessment. Thus, as states agree to free their markets to trade, at the same time they reassert their rights to determine their own safety standards.

The importance accorded to international standards in the WTO SPS agreement, coupled with the failure so far of any national SPS regulations to pass through the WTO dispute resolution process unscathed, has contributed to a tremendous increase in the perceived importance of developing Codex standards. The number of countries participating in Codex Commission meetings jumped from 77 in 1991 to 188 in 2016, a 244 percent increase. Yet although Codex membership is currently composed of more than 188 member states, as well as numerous nonvoting international governmental and nongovernmental organizations, in practice the development of standards is done by a fraction of the membership, mostly developed countries.

What this means is that although Codex standards are international, in fact they reflect bargaining and negotiation mostly among a set of well-known countries. Although initial drafts of standards are often issued from the Codex secretariat, in fact the drafts are usually written by individual countries. Most of the actual drafting work is done by working groups. Once a carefully tailored draft reaches the full committee for discussion, it is in theory open for discussion, but in fact the working group members are often extremely reluctant to reopen debate on the draft. They argue that the draft reflects a well-thought-out consensus on the part of working group members. In part, this reflects the difficulty of trying to negotiate international standards by committee. But regardless of whether the intention is to exclude opinions, the result is that a handful of countries, usually those that can afford to devote staff time to drafting Codex standards in between committee meetings, dominate the framing of the standard.

D. Perspectives on Diffusion of Standards

There are three overarching types of explanations for the diffusion of regulatory capitalism: top-down, bottom-up, and horizontal as summarized in Table 5. The main source of top-down diffusion involves producers in the major exporting countries. These producers are interested in having similar legal standards across the markets that they export to. Two kinds of effects can result. A race to the bottom of lax regulatory standards occurs when producers press for the lowest common denominator of standard across the range of countries. A race to the top, on the other hand, occurs when dominant producers press for a ratcheting up of standards because they already have to meet a high standard in one country. Thus, under the international explanation, producers in powerful exporting countries (in this case, the United States and countries in the European Union) would work to develop Codex standards that reflect their interests and then work to have countries adopt those standards. Depending upon their interests, standards would vary in stringency.

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2 188 Codex Members - 187 Member Countries and 1 Member Organization (EU) 234 Codex Observers - 54 IGOs, 164 NGOs, 16 UN.
Table 16: Perspectives on Diffusion of Standards

<table>
<thead>
<tr>
<th>Forces of Diffusion</th>
<th>Direction of Diffusion</th>
<th>Promote Convergence and/or Stringency?</th>
</tr>
</thead>
<tbody>
<tr>
<td>International producers</td>
<td>Top-down</td>
<td>Yes on convergence, probably on stringency. Will lobby for convergence of standards because it is easier to meet one standard across markets. May lobby for more stringent standards, since they are more capable of meeting higher standards than small producers and will therefore derive a competitive advantage from higher standards.</td>
</tr>
<tr>
<td>Domestic trade groups</td>
<td>Bottom-up</td>
<td>Depends. Will lobby for convergence with international standards depending on whether they will benefit from adoption of the standard. Similarly, will lobby for stringency if they can derive competitive advantage from it.</td>
</tr>
<tr>
<td>Government officials</td>
<td>Bottom-up</td>
<td>Depends. Will lobby for convergence if they are persuaded by international organizations that this is important. No expectations regarding stringency.</td>
</tr>
<tr>
<td>Regional associations</td>
<td>Horizontal or top-down</td>
<td>Possibly on convergence, probably not on stringency. Member states are supposed to converge on the standards set by the association, so convergence toward international standards depends on whether the association has adopted the international standards already. Increased stringency is unlikely in most regional associations because the primary goal is trade facilitation, and the negotiators generally have that as their main goal.</td>
</tr>
</tbody>
</table>

The second and third perspectives on diffusion incorporate bottom-up actors. The first is industry, such as particular domestic trade associations within the country of interest. Within a country, who wins and who loses from the adoption of a Codex standard? At the national level, if the domestic interests explanation dominates, one would expect that domestic producers or trade associations would be involved in promoting or opposing specific standards depending on whether they win or lose from those standards. The second category of bottom-up domestic interests are actors in government. From this point of view, international standards are not promoted by particular actors; rather, they help domestic actors in government to identify problems and solutions in food safety. Here, the main causal force lies with government actors in the countries that learn from the international system. Rather than seeing governments as adopting standards purely by assessing costs and benefits of doing so, the international standards shape the perceived interests of government actors and help set government agendas. If this explanation dominates, one would expect that what government actors consider as important is to some degree contingent upon what the CAC is considering. This explanation may be particularly important for areas involving scientific and technical knowledge, where epistemic communities may form to push for particular policy changes.

A fourth perspective on diffusion can be found in regional integration initiatives. These can be either a horizontal or a top-down force for diffusion, depending on whether they can be viewed as an interdependent decision of multiple countries or an unchanging exogenous force. Government actors in regional economic communities (for example, EAC, SADC, ECOWAS or COMESA) discuss their standard-setting activities in the context of what the regional integration initiatives require them to do. Because regional trade bodies have explicitly acknowledged Codex standards as at least one basis for harmonization, this pathway of influence is a very important one. Thus, variation in national adoption of Codex standards in this view would depend on the degree to which countries are integrated with regional integration initiatives. This approach views regional initiatives as conduits for policy transfer.

E. The Political Perspectives of Standards

It is evident that under certain conditions—in particular, when a country participates in and perceives as important a regional integration initiative that upholds Codex standards, and
when there is little prior regulatory history—international standards do influence countries’ policies. In the case of food additives, the result has been to drive standards to more stringent levels than they otherwise might have been, due to the successful efforts of European states to impose their preferences on the Codex standard.

Regional integration initiatives are key to understanding the pattern of convergence since the participation of policy makers in them, can be viewed as part of a policy transfer process. Alternatively, the process can be considered one of institutional isomorphism, where institutions come to resemble those in their immediate environment. This is complementary to the world society approach. Depending on the degree to which regional integration initiatives take decisions apart from their member states, these can be either horizontal or top-down forces for diffusion.

Regulatory capitalism in the form of Codex standards is not a disinterested, objective form of regulation. Rather, it is shaped by powerful countries and actors. In this case, the European Union shaped the standard for food additives. In other areas, other countries have similarly influenced the Codex outcome. The role of politics and power in forming highly technical standards often goes unnoticed. Yet how and by whom the standards are shaped—and for what purposes—has ethical and distributive consequences. “Once clothed in technical language, such [technical] decisions lose their transparency and acquire a look of impartial credibility that resists criticism by actors lacking the necessary expertise”. Wealthy countries are shaping the international food safety regime and then encouraging poorer countries to adopt elements of it, and there are potential problems with this, similar to conclusions others have drawn regarding the global financial system. Thus, as regulatory capitalism continues to spread, conclusions about whether this is a normatively good or bad phenomenon will be highly case-specific, and power in addition to expertise should continue to be a subject of investigation.

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The Oxford Handbook of Food, Politics, and Society (Herring, 2015)

4.3.15 The Case for an Enhanced Regional Fish Trade Framework

A. Introduction

Cocker (2014) reports that fish and fishery products are important to Africa in dietary terms and also add substantially to national and regional economies through employment (Africa has 4 million fishers) and generate much needed foreign revenue through exports streams. The exports are mainly to developed nations (high value fish exports from Africa generated USD$5 billion in 2009, 5% of the global total). Fish are Africa’s leading agricultural export commodity above those such as coffee and bananas. Currently, the continent is a net importer of fish and fish products in order to supply the demand from rising populations, increasing urbanization and the continued economic growth Africa has seen over the past decade. Recent estimates for the continent put intra-African fish trade at approximately US$615million (a significant underestimate as a major factor is the high level of informal, often illegal fish trade within Africa). Aquaculture in Africa, particularly sub-Saharan Africa (SSA), has been viewed with
renewed interest in recent years as a means of alleviating the supply gap which is currently filled by imports.

Aquaculture in SSA has been viewed with renewed interest in recent years and in some regions is expanding rapidly. Over time, it is therefore expected to develop and supply a substantial proportion of national/regional markets, thus reducing pressures on capture fisheries and SSAs reliance on imports. There is now a real drive to steer efforts away from earlier subsistence and production-led strategies and focus on best strategies for meeting market demand. Issues such as the minimization of post-harvest losses and ensuring the quality of product for consumers are equally important for growing an effective production sector. SSA also has the potential to supply inter-continental markets with high value, quality and safe aquaculture products (as it does now with capture fishery exports), complying with the phytosanitary, traceability and certification demands insisted upon by developed markets such as the EU.

B. Opportunities for Growth of Aquaculture and Fisheries Trade

Future fish production must be able to supply a quality product to the market in a timely manner, whether these are local, regional or international. As markets for fish farmers could be dualistic i.e. to supply local, community markets for instance and/or larger, more demanding foreign, importing customers such as supermarkets (demanding in terms of food hygiene standards, traceability and often certification requests), this could either be achieved through larger ventures or cooperative assemblages of small producers or a combination of both, instigating codes of practice and standards that ensure compliance with phytosanitary and traceability issues.

![Figure 26: Dualities in Fish Supply Chains in Developing Countries (Cocker, 2014)](image)

Increased supply and quality would enable the establishment of new fish market chains, with aquaculture products that by their very nature can be differentiated from wild caught counterparts in terms of freshness and availability. Improvements in distribution expand the market for producers and enable production volumes to be increased without immediately impacting on local prices. Conversely, up-scaling production results in economies which can allow prices to fall and the market to expand even further as the product becomes affordable to a larger proportion of the population. The more affordable aquaculture products become, the greater the health benefits for poorer consumers who have to spend proportionately more of their available income on food according to Engels Law. For example lower retail prices due to increased aquaculture production have seen per capita fish consumption double in Egypt since 1995.
Factors to be considered for growth of demand for fisheries and aquaculture products in Africa include the following (Cocker, 2014):

(a) Rising domestic and intra-African demand due to growing economies, rising populations, increasing urbanization and depleting wild fish stocks

(b) Dualities in fish quality between fish for domestic consumption and fish destined for export

(c) Fish species familiarity, availability, taste and price are very important marketing issues and paramount purchasing priorities for domestic consumers

(d) Aquaculture products are competing with domestic capture fisheries and foreign imports. There is little or no differentiation between farmed and wild caught fish

(e) Current traditional market chain traders deal with both wild caught and aquaculture production

(f) Domination of small traditional traders dictating prices and distribution particularly for small aquaculture producers who often have no option but to sell their product low down in the market/value chain

(g) Large presence of women as small-scale traders in the traditional fish marketing chains

(h) Large presence of women as small-scale processors in the traditional fish marketing chain

(i) Predominance of traditional retail/open air markets for domestic fish sales

(j) Supermarkets are establishing themselves

(k) Little/limited information dissemination and communication occurs between stakeholders throughout the current traditional fish marketing chains and producers themselves are often ignorant of current market prices and consumer demand trends

(m) Predominance of small-scale aquaculture producers

(n) Current lack of access to formal credit/finance particularly by small-scale producers

(o) Growing presence of medium/large scale aquaculture producers

(q) Little or no direct marketing is undertaken by producers, particularly small producers

(r) Little processing and/or value addition is undertaken by producers, particularly small-scale producers

(s) Poor infrastructure continues to hamper aquaculture production and marketing, including unreliable electricity supplies, cold-chain issues, poor storage facilities and lack of transportation which can all lead to potentially high post-harvest losses in quantity and quality and undermines distribution channel efficiency

(t) Opportunities to satisfy growing market demands in-country in high fish consumption areas for example via urban and peri-urban fish farms and expansion opportunities into geographic areas with lower fish consumption levels

(u) Opportunities for integrating aquaculture with agricultural systems, particularly in small-scale ventures
(v) Opportunities to expand aqua-product distribution to adjacent countries and/or export intra-Africa and/or inter-continentially

C. Fish Trade and Sustainable Development

For many developing countries, the fisheries sector represents a major source of foreign exchange revenue through trade with developed countries and through foreign fishing licence agreements. Fish exports can strengthen income and employment opportunities for local people in domestic fisheries in coastal and inland regions. However, in many countries, policy related to fish trade cannot keep pace with this rapidly growing and evolving sector. Inappropriate policy frameworks put at risk the benefits of increased trade for national development and local communities. Weak governance in the presence of expanding fish trade could aggravate overexploitation of vulnerable fish stocks and diminish access of local markets through traditional trading links and market chains.

Table 17: Factors that Influence the Contribution of Fish Trade to Development in West and Central Africa (FAO, 2007)

<table>
<thead>
<tr>
<th>Historical Context</th>
<th>Risks</th>
<th>Impacts</th>
<th>Regulation</th>
<th>Change</th>
<th>Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• well-established local, national and international fish producing areas, markets and trade routes</td>
<td>• production sources and markets at all levels are subject to unpredictable changes and shocks (e.g. weather, fish stock productivity, market changes)</td>
<td>• contribution to gross domestic product (GDP) and to wider trading options</td>
<td>• national and international laws; challenges of compliance</td>
<td>• rapidly changing trade patterns: new products, markets,</td>
<td>• vital for harnessing fish trade for development by encouraging wealth generation and widening opportunities (e.g. enabling trade and market access)</td>
</tr>
<tr>
<td>• increasing demand for fish across most markets</td>
<td>• risks can be reduced in more diverse trading conditions – e.g. multiple suppliers, stocks, markets, transport options</td>
<td>• local ‘winners’ and ‘losers’ through effects of competition, power and economic redistribution</td>
<td>• leading role of the World Trade Organization (WTO)</td>
<td>• participants and regulations with different impacts on different countries</td>
<td>• opportunities to use wealth generated for positive development investments in and outside sector</td>
</tr>
<tr>
<td>• traditional trade between Africa and Europe</td>
<td>• unknown net impact of trade liberalization on developing countries</td>
<td>• erosion of trade preferences for developing countries</td>
<td>• unknown impact of trade expansion on fish resource sustainability in conditions of weak fisheries management</td>
<td>• quality and certification are increasingly important</td>
<td>• limit negative impacts, manage risks and ensure future opportunity and equitable benefit sharing</td>
</tr>
<tr>
<td>• Africa now a key supplier; Europe a key market but changing patterns</td>
<td></td>
<td>• globalization may be linked to ‘food insecurity’ by diverting essential local food to richer markets</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actors</th>
<th>Supply Factors</th>
<th>Trade Mechanisms</th>
<th>Wealth/Profit</th>
<th>Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• wide range of stakeholders with evolving linkages and market power; usually highly competitive</td>
<td>• raw material access, post-harvest quality and careful handling of perishable products</td>
<td>• selling and buying goods (fish products) and services (fishing services) and adding value to them</td>
<td>• attracts entrepreneurial activity and diverse investment at all operational levels</td>
<td></td>
</tr>
<tr>
<td>• fish trade requires specific business skills and knowledge to deal with changes and manage risk</td>
<td>• basic infrastructure: roads, shipping, air transport</td>
<td>• direct and indirect contribution to income, employment, food supply and distribution</td>
<td>• reinvestment of generated income and profit can take place in the sector and the wider economy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• adequate and timely flow of information on supply, demand and prices</td>
<td></td>
<td>• potential redistribution benefits through taxation and government investment</td>
<td></td>
</tr>
</tbody>
</table>

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D. Establishing an Enhanced Regional Fish Trade Framework

Within this overall context, there are three major areas in which to identify issues and prioritize policy interventions to maximize the contribution of fish trade to development and minimize potentially negative distributional and sustainability impacts. These cover trade mechanisms, economic and livelihood impacts and trade policy and change management.

Figure 27: Establishing an Enhanced Regional Fish Trade Framework

D.1 Trade Mechanisms: Intra-African Trade

Consumer issues which need to be addressed for trade to take place include:

**Food safety:** primarily based on recognized standards for products, hygiene and processes
**The ‘SPS’ and ‘TBT’ Agreements:** Forming the basis for nations to establish food and safety regulation for plant and animal products intended for trade.

**HACCP:** Sanitary control systems are now applied by many importing countries to the whole supply chain, such as the HACCP system.

**Traceability:** A traceable ‘chain of custody’ is vital in applying SPS and related standards and another major issue to exports.

**Certification and Branding:** In addition to public regulations of food safety and quality, a range of related standards have been introduced by the private sector. Branding is the independent process through which a company promotes certain quality attributes in order to differentiate a product, process or service from others in the marketplace and generate a preferential purchasing attitude towards that brand/logo, thus create loyalty and premium prices and/or stronger access to specific markets.

**BMPs and GAPs:** Adoption of Better Management Practices (BMPs) – focusing on environmental and social issues, and Good Aquaculture Practices (GAP) – focusing on food safety aspects.

Numerous barriers exist to intra-African trade including cumbersome import and export procedures, border crossing delays, corruption, limited Information and Communication Technology (ICT) usage, inconsistent electricity supply, lack of storage facilities and infrastructure. Major exporters such as Mauritania and Senegal have overcome some constraints, i.e. domestic supply, by investing in infrastructure and fishing fleets. Other countries still have unrealized fish trade potential (Guinea, Liberia, Sierra Leone).

**D.2 Economic and Livelihood Impacts**

Fish trade policy in African countries must cope with the dynamic nature of global market opportunities and trade patterns. Declining domestic supplies, rising incomes and changing consumer preferences increase the gap in fish supplies in developed countries. This situation generates new opportunities for developing countries to successfully engage in international fish trade. Studies project an increase in demand in developing countries triggered by increased purchasing power and urbanization. Despite the guidance of international trade theory – indicating that any trade is better than no trade – concerns about increased trade persist, especially in situations where domestic food supplies are potentially threatened. The key question is whether emerging trade in fish with Asia is a threat to local people in Africa or an opportunity for benefits from free-trade and the globalization of fish markets.

The impact of foreign competition on regional and local fish trade in Africa is growing. Small pelagics (sardinellas) – an important fish for human consumption in the region, are traded through three routes: local, national and regional trade based on small-scale fisheries, regional trade from industrial fisheries and international trade based on distant water fleets under fishing agreements. Trade with Asia – particularly China – is increasing. This could affect fish supplies in local markets by reducing the supply of inexpensive fish in local markets. There are concerns that this would have negative impacts on the food security of poor people.

**D.3 Trade Policy and Change Management**

Fish trade can contribute to development, primarily through the trade mechanism for wealth generation. In turn, wealth contributes to economic growth, for example, through reinvestment in other parts of the economy. In order for this mechanism to function properly, an appropriate policy framework and policy process is required. Policy-making processes for economic development and poverty reduction have often overlooked the fisheries sector and fish trade,
indicating a general weakness in the policy process. Fisheries and trade-related government institutions often lack capacity, finances and support from central government to develop strong policy processes to support the contribution of fish trade to development, evaluate investment options and make appropriate decisions, including investments in new forms of trade.

Trade policy and development-related policies often lack coherence. For instance, while free trade is promoted as a mechanism to generate wealth and economic growth based on empirical evidence from countries such as the ‘Asian Tigers’, there is also concern on the impact of liberalized trade in other countries. Free trade can have a negative impact on the livelihoods of marginalized and poor groups. The key question is whether liberalized trade can be pro-poor under conditions of weak governance and lack of policy coherence. A strategic long-term vision on the role of fish trade, supported by effective fisheries management systems, is needed.

A conflict exists between fish trade policy and fisheries management policy due to trade-offs and limitations of unilateral actions. Often there is a case for limiting fish trade development unless adequate fisheries management systems are in place to offset trade-driven overexploitation. In the short-term, it will be necessary to prioritize certain actions such as limiting trade in overexploited or vulnerable fish stocks.

To fully exploit the potential of fish trade to contribute to development in Africa at all levels, effective implementation of trade and fishery management policies will be decisive. If governance is weak, the ‘losers’ in fish trade are likely to be the poor and marginalized. Fish trade policies and actions which ignore this problem, e.g. by capitalizing on trade liberalization but failing to compensate with other livelihood inputs or opportunities, do not add effectively to pro-poor growth.

Faced with limited information on the fish trade and its economic and social impacts, specific policy prescriptions are inappropriate to the highly varied sectoral and national contexts in West Africa. Given these current information constraints, appropriate policy actions by governments, public and private-sector actors in trade, development and fisheries management can include:

**D.4 Roadmap for Regional Fisheries and Aquaculture**

Priorities include the following:

- Developing sector-wide strategies at national level for expansion and intensification of aquaculture
- Harnessing the opportunities for SME development provided by expanding domestic markets for fish, including growing urban demand
- Harnessing the opportunity of expanding export markets for high-value products to increase investment in African aquaculture production and processing
- Encourage formation of national, sub-regional, regional and international networks for information exchange
- Strengthen producers’ understanding of aquaculture socio-economic aspects (business plan, record keeping, etc.) and assist them with business plans for aquaculture
- Provide public sector support to private entrepreneurs in setting up the technological infrastructure required for aquaculture (e.g. cold chains, storage facilities, etc)
The removal of market barriers through policy reviews, support to small and medium scale aquaculture enterprises to meet market demand and standards, and improving market information systems are crucial. There is now a clear trend towards the establishment of various types of standards that can be measured, monitored and certificated by independent bodies to provide producers with clear guidelines and consumers and market chain participants with confidence in the environmental or social provenance of the product. Certification and quality assurance schemes are needed with brand development and marketing favourable to aquaculture products from smaller producers.

**Figure 28: Aquaculture Markets and Marketing: A Roadmap (Cocker, 2014)**

When it comes to actually aiding and encouraging the marketing of aquaculture production governments should:

- Make available information to producers and consumers through newspapers, newsletters, radio or other ICT media
- Protect local producers against unfair foreign competition (via imports) provided that protective measures are permissible within the international trade conventions/agreements
- Provide basic marketing infrastructure, such as roads and communication channels
- Assist producers in promoting aquaculture products in order to stimulate demand through agricultural fairs and other such opportunities
- Encourage commercial producers to develop market channels which can be accessed by smaller producers
- Prepare, publish and regularly monitor guidelines on quality standards of aquatic products to protect public health as well as to improve the acceptability of aqua-products

Aquaculture growth has been (and will continue to be) driven by rising demand from growing and urbanizing populations, stagnating supplies from capture fisheries, investment in education and technology research, a dynamic private sector and high levels of public investment in infrastructure to support agricultural development. By improving production, processing and access to regional and global markets through improved policies and investments infrastructure, quality control, capacity, MISs, and sector management, SSA aquaculture, will see substantial growth and sustainable production.

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4.3.16 The Political Economy of Undernutrition: Bringing Fisheries and Aquaculture to Bear

A. Concepts in Malnutrition (WFP, 2012)
Malnutrition occurs when the nutrient and energy intake does not meet or exceeds an individual’s requirements to maintain growth, immunity and organ function. Malnutrition is a general term and covers both undernutrition and over-nutrition (overweight/obesity).

Undernutrition is the consequence of an insufficient intake of energy, protein and/or micronutrients, poor absorption or rapid loss of nutrients due to illness or increased energy expenditure. Undernutrition encompasses low birth weight, stunting, wasting, underweight and micronutrient deficiencies.

Undernourishment indicates food intake that is insufficient to meet dietary energy requirements continuously. Undernourishment is not assessed at the individual level.

Nutrient gap is the difference between nutrient requirements and nutrient intake. While diets may be adequate in terms of energy (kcals), they may still be inadequate in terms of nutrients, leaving individuals at risk of undernutrition.

Micronutrient deficiency is a lack or shortage of a micronutrient (also called vitamins or minerals). Micronutrients are essential components of enzymes and hormones and are therefore key in bodily processes, immunity, proper growth and metabolism of an individual. Micronutrient deficiencies often occur simultaneously and can arise due to lack of intake, absorption, or utilization of one or more vitamins or minerals. It is referred to as hidden hunger because a large percentage of the population may be deficient without showing any clinical symptoms or signs of deficiency.

Growth failure is the condition where an individual is shorter and/or thinner than their well-nourished counterparts and where the individual does not meet her/his growth potential. Growth may fail due to deficiencies of various micronutrients, energy, protein and/or macro-minerals.

Acute malnutrition, also known as wasting, develops as a result of recent rapid weight loss or a failure to gain weight. In children, it is assessed through the nutritional index of weight-for-
height (WFH) or mid-upper arm circumference (MUAC). Acute malnutrition is also assessed using the clinical signs of visible wasting and nutritional oedema. In adults, wasting is assessed through MUAC or Body Mass Index (BMI). In pregnant and lactating women (PLW), wasting can be assessed through MUAC. The degree of acute malnutrition of an individual is classified as either moderate (MAM) or severe (SAM) according to specific cut-offs and reference standards. At the population level, acute malnutrition is categorized in three ways:

(i) **Global acute malnutrition (GAM)** represents the proportion of children 6-59 months in the population classified with MAM + SAM according to their weight-for-height (WFH) (Z-score), and/or nutritional oedema. GAM is an indicator of acute malnutrition in a population, and is used to assess the severity of the situation.

(ii) **Moderate acute malnutrition (MAM)** represents the proportion of children 6-59 months in the population who are classified with WFH ≥ -3 and < -2 (Z-score).

(iii) **Severe acute malnutrition (SAM)** represents the proportion of children 6-59 months in the population who are classified WFH < -3 (Z-score) and/or presence of nutritional oedema.

**Nutritional oedema** indicates a serious type of acute malnutrition in which nutritional deficiencies lead to swelling of limbs (feet, hands) due to retention of fluids. Children with nutritional oedema are automatically classified with severe acute malnutrition (SAM), and often require therapeutic feeding and medical treatment to recover. Also known as bilateral oedema.

**Chronic malnutrition**: Chronic malnutrition is also referred to as stunting and develops as a result of inadequate nutrition or repeated infections or both; typically, during the critical window of opportunity of the first 1,000 days from conception to two years of age. It is measured by the nutritional index of height-for-age (HAZ) and is manifested by a child being too short for his or her age. Unlike wasting, the development of stunting is a slow cumulative process that may not be evident immediately. Chronic malnutrition cannot generally be reversed, only prevented.

### B. The Problem of Undernutrition/Malnutrition

According to IFPRI (2015) good nutrition signals the realization of people’s rights to food and health. Without good nutrition, human beings cannot achieve their full potential. When people’s nutrition status improves, it helps break the intergenerational cycle of poverty, generates broad-based economic growth, and leads to a host of benefits for individuals, families, communities, and countries. Good nutrition provides both a foundation for human development and the scaffolding needed to ensure it reaches its full potential. Good nutrition, in short, is an essential driver of sustainable development.

Malnutrition, though, is a problem of staggering size—large enough to threaten the world’s sustainable development ambitions. Malnutrition takes many forms: children and adults who are skin and bone, children who do not grow properly, people who suffer because their diets are imbalanced, and people who are obese or suffer from nutrition-related non-communicable diseases. Malnutrition affects all countries and one in three people on the planet. Nearly half of all countries face multiple serious burdens of malnutrition such as poor child growth, micronutrient deficiency, and adult overweight.

### C. Burden and Causes of Malnutrition in Africa

The main factors associated with undernutrition as a public health problem can be grouped into the following: environmental (natural or entropic causes), sociocultural-economic (linked to poverty and inequality) and political-institutional. Together, these factors increase or decrease
biomedical access and productivity abilities, through which they determine the quantity and quality of dietary intake and the absorption capacity, which constitute the elements of undernutrition. Each of these factors increases or decreases the likelihood of a person to suffer from undernutrition (see Figure 29). Further, the importance of each of these factors depends on the level of the country’s demographic and epidemiological transition as well as on the person’s current stage in the life cycle. Together these factors determine the intensity of the resulting level of undernutrition.

Figure 29: The Causes of Undernutrition (AUC et al., 2014)

Poor environmental conditions may increase insect and protozoan infections and also contribute to environmental deficiencies in micronutrients. These include the risks stemming from the natural environment itself and its cycles (floods, droughts, frosts, earthquakes and other phenomena), as well as those produced by humans themselves (such as water and air pollution, contamination of food, expansion of agriculture, etc.). Overpopulation, more commonly seen in developing countries, can reduce food adequacy, leading to inadequate food intake or intake of foods of poor nutritional quality and quantity. The sociocultural-economic determinants include elements associated with poverty and inequality, education and cultural norms, employment and wages, access to social security and coverage of aid programmes. The political-institutional factors encompass government policies and programmes aimed specifically at solving the population’s food and nutritional problems.

Production factors include those directly associated with the production and access to food by the population at risk. The availability and autonomy of each country’s dietary energy supply depend directly on the characteristics of production processes, the degree to which they utilize natural resources, and the extent to which these processes mitigate or aggravate environmental risks.

Finally, biomedical factors take into account the individual’s susceptibility to undernutrition, insofar as deficiencies in certain elements limit the capacity to make biological use of the food consumed (regardless of quantity and quality).

D. Consequences of Undernutrition in Africa

Bain et al. (2013) reports that malnutrition is estimated to contribute to more than one third of all child deaths, although it is rarely listed as the direct cause. Contributing to more than half of deaths in children worldwide; child malnutrition was associated with 54% of deaths in children in developing countries in 2001. Protein-energy malnutrition (PEM), first described in
the 1920s, is observed most frequently in developing countries but has been described with increasing frequency in hospitalized and chronically ill children in the United States. Child undernutrition has long-term negative effects on a person’s life, most notably in the aspects of health, education, and productivity (see Figure 30). These elements are quantifiable as costs and expenditures to both the public sector and to individuals. Consequently, these effects exacerbate problems in social integration and increase or intensify poverty. A vicious cycle is perpetuated as vulnerability to undernutrition grows.

**Figure 30: The COHA Framework of Social and Economic Consequences of Child Undernutrition in Africa (AUC* et al.*, 2014)**

Kwashiorkor and marasmus are two forms of Protein Energy Malnutrition (PEM) that have been described. The distinction between the two forms of PEM is based on the presence of edema (kwashiorkor) or absence of edema (marasmus). Marasmus involves inadequate intake of protein and calories, whereas a child with kwashiorkor has fair-to-normal calorie intake with inadequate protein intake. Although significant clinical differences between kwashiorkor and marasmus are noted, some studies suggest that marasmus represents an adaptation to starvation whereas kwashiorkor represents a dys-adaptation to starvation.

In addition to PEM, children may be affected by micronutrient deficiencies, which also have a detrimental effect on growth and development. The most common and clinically significant micronutrient deficiencies in children and childbearing women throughout the world include deficiencies of iron, iodine, zinc, and vitamin A and are estimated to affect as many as two billion people. Although fortification programs have helped diminish deficiencies of iodine and vitamin A in individuals in the United States, these deficiencies remain a significant cause of morbidity in developing countries, whereas deficiencies of vitamin C, B, and D have improved in recent years. Micronutrient deficiencies and protein and calorie deficiencies must be addressed for optimal growth and development to be attained in these individuals.
Undernutrition may have immediate or evolving impacts throughout a person’s lifetime; individuals who suffered from undernutrition during early years of their life cycle (including intrauterine) are more likely to be undernourished later in life. Health studies have shown that undernutrition leads to increased appearance or intensified severity of specific pathologies and increases the chance of death during specific stages of the life cycle. The nature and intensity of the impact of undernutrition on pathologies depends, in part, on the epidemiological profile of a given country.

In education, undernutrition affects student performance through disease-related weaknesses and results in limited learning capacity associated with deficient cognitive development. This translates into a greater probability of starting school at a later age, repeating grades, dropping out of school and ultimately obtaining a lower level of education. Later in life, individuals may experience lower physical capacity as a result of stunting. Stunting, which is caused by food deprivation and nutrient deficiencies, is established by low height-for-age measurements during childhood. In adulthood, it leads to an overall reduced body mass when compared to the full adult potential.

E. The Political Economy of Malnutrition: The Cost of Hunger in Africa

Africa has experienced a recent period of economic growth that has positioned the region as a key area for global investment and trade. The pace of real GDP growth on the continent has doubled in the last decade and six of the world’s fastest growing economies are in Africa. All this has occurred despite some of the highest rates of child undernutrition in the world. Globally, there has been progress in reducing both stunting (low height-for-age) rates and the number of stunted children in the last 20 years. In Africa, the proportion of stunted children reported has decreased from 41.6 percent (1990) to 35.6 percent (2011) (see Table 5). Nevertheless, for that same period, the number of stunted children has increased from 45.7 million to 56.3 million, evidencing that stronger efforts must be put in place to have a decisive impact. The biggest proportion of these children are located in East Africa, where 22.8 million represent more than 40 percent of all stunted children on the continent. Together with West Africa, they account for three out of every four stunted children on the continent.

Child undernutrition is one of the most critical negative effects of hunger. When a child is undernourished before the age of five, his or her body and brain cannot develop at its potential, and they are at risk for cognitive delays. Figure 5 illustrates the rates of stunting in Africa. According to this data, 17 countries on the continent have stunting rates above 40% and 36 countries have rates above 30%. Furthermore, a large proportion of Africa’s population often does not access diets containing the essential vitamins and minerals required for optimum health and productivity.
Figure 31: Stunting Rates by Country (AUC et al., 2014)

Table 18: Estimated Prevalence and Number of Stunted Children Under Five Years of Age (Moderate or Severe), by UN Region: 1990, 2010, 2011 (AUC et al., 2014)

<table>
<thead>
<tr>
<th>Region</th>
<th>Prevalence estimate (%)</th>
<th>Number (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern</td>
<td>41.6</td>
<td>35.9</td>
</tr>
<tr>
<td>Middle</td>
<td>50.6</td>
<td>42.5</td>
</tr>
<tr>
<td>Northern</td>
<td>47.2</td>
<td>35.6</td>
</tr>
<tr>
<td>Southern</td>
<td>28.6</td>
<td>21.3</td>
</tr>
<tr>
<td>Western</td>
<td>36.2</td>
<td>31.1</td>
</tr>
</tbody>
</table>

Table 19: Number of Undernourished People, by Region (FAO et al., 2012)

<table>
<thead>
<tr>
<th>Region</th>
<th>1990-1992</th>
<th>Proportion</th>
<th>2010-2012</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>175</td>
<td>18%</td>
<td>239</td>
<td>28%</td>
</tr>
<tr>
<td>Asia</td>
<td>739</td>
<td>74%</td>
<td>563</td>
<td>65%</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>65</td>
<td>7%</td>
<td>49</td>
<td>6%</td>
</tr>
<tr>
<td>Oceania</td>
<td>1</td>
<td>0%</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>World</td>
<td>1000</td>
<td></td>
<td>868</td>
<td></td>
</tr>
</tbody>
</table>
Table 20: Effects of Child Undernourishment through Life (AUC et al., 2014)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 years</td>
<td>Undernourished children are at higher risk of anaemia, diarrhoea, fever and respiratory infections. These additional cases of illness are costly to the health system and to families. Undernourished children are at a higher risk of dying.</td>
</tr>
<tr>
<td>6-18 years</td>
<td>Stunted children are at a higher risk of repeating grades in school and dropping out of school. Grade repetitions are costly to the education system and to families.</td>
</tr>
<tr>
<td>15-64 years</td>
<td>If a child has dropped out of school early and has entered the workforce, he or she may be less productive, particularly in the non-manual labour market. If engaged in manual labour, he or she is likely to have reduced physical capacity and will tend to be less productive. People who are absent from the workforce as a result of undernutrition-related child mortality represent lost economic productivity.</td>
</tr>
</tbody>
</table>

Table 21: Summary of Costs of Child Undernutrition (AUC et al., 2014)

<table>
<thead>
<tr>
<th>Country</th>
<th>Losses National Currency</th>
<th>Losses US$</th>
<th>Equivalent % of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>EGP20.3 billion</td>
<td>3.7 billion</td>
<td>1.9</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>ETB55.5 billion</td>
<td>4.7 billion</td>
<td>16.5</td>
</tr>
<tr>
<td>Malawi</td>
<td>MKW147 billion</td>
<td>597 million</td>
<td>10.3</td>
</tr>
<tr>
<td>Rwanda</td>
<td>RWF503.6 billion</td>
<td>820 million</td>
<td>11.5</td>
</tr>
<tr>
<td>Swaziland</td>
<td>SZL783 million</td>
<td>92 million</td>
<td>3.1</td>
</tr>
<tr>
<td>Uganda</td>
<td>UGX1.8 trillion</td>
<td>899 million</td>
<td>5.6</td>
</tr>
</tbody>
</table>

F. The Contribution of Fish Intake, Aquaculture and Fisheries to Improving Nutrition

F.1 The health benefits of fish and seafood have been well documented and widely promoted in recent years. Fish is low in saturated fat and is a healthy alternative to red meat. It provides the body with essential vitamins and minerals, including iron; zinc (from shellfish); vitamins A, B and D; and, of course, protein. Omega-3 fatty acids found in fish are also beneficial, particularly in terms of cardiovascular health. Preliminary evidence suggests that early exposure to omega-3 fats may enhance brain development as well (ARHP/PSR, 2004).

F.2 Tacon et al. (2013) reports that despite the fact that the African region has the lowest per capita supply of aquatic animal food products of any region (9.50 kg/year, with the bulk of this supply coming from capture fisheries), aquatic food products represent over 18.5% of total animal protein supply within the region, and only second to the Asian region at 22.6% in 2009. Moreover, 18 sub-Saharan countries derive the bulk of their very limited animal protein supply from aquatic animal food products, including: Sierra Leone (64.8% total animal protein supply), Gambia (56.6%), Comoros (55.6%), Ghana (54.5%), Cameroon (49.3%), Congo Republic (48.0%), Sao Tome and Principe (46.4%), Equatorial Guinea (42.8%), Nigeria (41.1%), Congo DPR (39.6%), Senegal (38.6%), Mozambique (37.6%), Benin (35.7%), Guinea (33.3%), Guinea (33.3%), Uganda (33.3%), Cote d'Ivoire (31.8%), and Malawi (27.1%).

F.3 In terms of nutrient composition, aquatic animal food products represent one of the world's most healthy and nutritious food sources. Thus, compared with terrestrial farmed meat
products, aquatic animal foods (whether captured or cultured) generally have the following nutritional and health attributes:

(a) Aquatic animal foods have a higher protein content on an edible fresh weight basis (mean 17.3%) than most terrestrial meats (mean 13.8%), despite having a higher moisture content than most terrestrial meats.

(b) Aquatic animal food proteins are highly digestible and have a high biological value, as evident by their excellent essential amino acid (EAA) profile, the latter closely approximating to the recommended human dietary EAA requirement pattern. In particular, aquatic animal proteins are rich dietary sources of methionine and lysine. Since these EAA are usually limiting within most edible plant proteins consumed by humans, aquatic food products constitute a perfect addition to the typical plant-based diets consumed by the rural poor.

(c) Aquatic animal foods are generally leaner on an edible fresh weight basis (average of fat = 2.7%) compared with terrestrial meats (average of fat = 16.6%), have a lower saturated fat content (average of 0.16% in crustaceans, 0.32% in molluscs, 1.19% in fish, and 4.97% in terrestrial meats), have a lower calorific density (average of 101.3 kcal/100g) than terrestrial meats (average of 209 kcal/100g).

(d) Aquatic animal food products contain the highest concentration of long-chain omega-3 \([n-3]\) polyunsaturated fatty acids of any foodstuffs, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) of terrestrial meat. Highest levels of EPA/DHA were reported within small pelagic fish species, and farmed and wild salmonid fish respectively. Although not analyzed or presented here, it is important to mention that filter feeding freshwater fish species (such as silver carp *Hypophthalmichthys molitrix* and bighead carp *Hypophthalmichthys nobilis*) are also rich sources of EPA/DHA, which they derive from freshwater plankton. As a general rule, the tissue levels of EPA/DHA within farmed fish and crustacean species are usually derived from the level of fish oil used within their formulated feeds, with higher levels usually reported with feeds containing higher dietary fish oil levels. In health terms, fish-derived omega-3 \([n-3]\) fatty acids EPA and DHA have been shown to have a positive role in infant development (including neuronal, retinal, and immune function), cardiovascular diseases (including reduced incidence of heart disease in adults), cancer, and various mental illnesses (including depression, attention-deficit hyperactivity disorder, and dementia.

(e) Aquatic animal food products are a richer source of most essential minerals and trace elements than most terrestrial meats, including: Calcium; Phosphorus; Magnesium; Iron; Potassium; Sodium; Zinc; Copper; Manganese; Selenium.

(f) As with the long-chain omega-3 fatty acids EPA and DHA, higher levels of mineral elements were observed in small pelagic fish species (includes European anchovy, Atlantic and Pacific herring, Atlantic mackerel and Spanish mackerel), compared to other fish species, including calcium, iron, magnesium, potassium, zinc, copper, manganese, and selenium. Aquatic animal food products are also rich dietary sources of other important essential trace elements that are generally lacking in terrestrial meat products, including iodine, fluorine, and trivalent chromium.

(g) Aquatic animal food products are a richer source of several key water soluble and fat soluble vitamins than most terrestrial meats, including: Vitamin A; Vitamin C; Vitamin B12; Folic acid; Vitamin E; Vitamin D; Choline.

(h) As with the omega-3 fatty acids and minerals, higher vitamin levels were observed in small pelagic fish species (includes European anchovy, Atlantic and Pacific herring and
Atlantic mackerel), compared to other fish species, including riboflavin, niacin, vitamin B12, and vitamin D.

**F.4** Last, but not least, edible aquatic plants or seaweeds also play an important role as a valuable source of essential nutrients in global food supply, including:

(a) Depending upon the species, season, and or culture conditions, edible seaweeds may contain considerable amounts of protein, with the red seaweeds such as *Porphyra* spp. (Nori) usually having the highest levels of protein (up to 47% on a dry weight basis), followed by green seaweeds such as *Enteromorpha lactuca* (former *Ulva*; sea lettuce) with protein levels ranging between 10 to 25%, and lastly by brown seaweeds such as *Laminaria japonica* with the lowest protein levels of between 5 and 12%, on a dry weight basis. Aspartic acid and glutamic acids constitute a large part of the amino acid make-up of edible seaweed proteins, with these amino acids being highest within brown seaweed proteins. Moreover, edible seaweeds such *Palmaria palmata* (Dillisk/Dulse) and *Enteromorpha* spp. (sea lettuce) are good sources of essential amino acids such as histidine, leucine, isoleucine, methionine and valine, with the levels of isoleucine and threonine in *Palmaria palmata* being similar to the levels found in legumes, and histidine levels is in *Enteromorpha pertusa* being similar to the levels found in egg proteins.

(b) Although the lipid fraction of marine edible seaweeds is usually low (typically ranging between 1.5 and 3.5%, on a dry weight basis), the lipids present are rich in omega-3 polyunsaturated fatty acids, and in particular EPA and to a lesser extent DHA, which are important to human health.

(c) Edible seaweeds are a good source of dietary fibre, including insoluble fibre and soluble fibre. The main component of the fiber component in marine seaweeds are xylans, alginates, carageenans and/or agar.

(d) Edible seaweeds are a rich dietary source of biologically available minerals and trace elements (compared with most other terrestrial plant food sources), including: iodine; iron; zinc; copper; magnesium; potassium; and calcium.

(e) Edible seaweeds are a rich source of many water-soluble and fat soluble vitamins, including vitamin C, vitamin E, vitamin B12, thiamin, riboflavin, niacin, pyridoxine, inositol, folic acid.

**F.5** Lastly, edible seaweeds may contain a variety of different species specific bioactive chemicals with potential pharmaceutical and health enhancing properties, including bromophenols, phytosterols, photosynthetic pigments, and immune enhancing polysaccharides.

**F.6** Kawarazuka (2010) explains that aquaculture interventions can contribute to improving nutritional status of households through people consuming fish produced from their own ponds, selling fish for household income to enhance their purchasing power, and by expanding wider accessibility to fish by lowering market prices. Fish sold for cash income contribute to purchasing sufficient staple foods, and can also be used for consumption or purchase of non-staple foods which directly improve dietary intake beyond energy intake.
Kawarazuka (2010) reports on studies which indicate that fish is a major animal protein source and own catches are kept for household consumption although the proportion of catches consumed at household varies from around 10% to 70% of total catches. In the areas where fish are abundant year-round or seasonally, people consume fish caught by household members, and hardly buy them in the markets. The species consumed at household level are low market-value fish and other aquatic animals. Invertebrate and other aquatic animals are more likely to be kept for household consumption while high market-value finfish are exclusively sold at market.

Furthermore, fish supplied from common-pool resources are widely traded in the local markets and therefore fish sold in the local markets can nutritionally contribute to not only households that engage in fishing for household consumption, but also large populations including those who do not engage in small-scale fisheries but purchase fish from local markets.
Fish supplied by common-pool resources are also an important source of household income for the poor. The pathway is very similar to that of aquaculture, where cash from fish is primarily used to purchase staple foods in some studies. The proportions of fish catches sold varied from 30% to 90% among different countries. Many case studies showed the important role of small-scale fisheries as a seasonal part-time income source, contributing to diversifying livelihoods, especially during lean seasons when incomes from farming or labour wages are low. Furthermore, unlike fish produced by aquaculture which are mostly traded as fresh fish, fish supplied by small-scale fisheries are often seasonal and therefore many fish are processed during high production season. Hence, processing is also an important income source in seasonal small-scale fisheries, in particular, the areas where marketing network for locally processed fish (smoked and dried) to urban markets are well developed.
Improving dietary intake through diversifying the diet is one way to improve nutritional status. Adding small fish into the starch-based diet, as characteristic of the poor, increases micronutrient intakes effectively, with a high bioavailability, and fish carry other vegetables and some oil through a cooking process, contributing also to enhancing the bioavailability of the micronutrients in these foods. In this direct pathway, small-scale fisheries and aquaculture of nutrient-dense fish played an important role, while the nutritional effect of adding large fish into the diet was not fully analysed although it provided animal protein and PUFAs to some extent. Most nutrient-dense fish come from small-scale fisheries, and therefore conservation of these species and integrating them into already existing aquaculture systems is recommended. Food-based strategies which include the promotion and nutritional education of nutrient-dense fish have potential to strengthen this direct pathway.

Increasing purchasing power through the sale of fish for cash income which can be used to ensure household food security is an indirect pathway to improve overall dietary intake. Cash income from fish enabled households to add various food items into the diet, besides fish. Some studies reported that household income was used for purchasing animal-source foods or
other food items. However there is a challenge that households with insufficient staple foods exchange fish for staple foods, but did not make enough cash from their fish sales to purchase other food items. In this case, households remain with starch-based diets, thereby their quality of diet is not improved.

Another pathway linking small-scale fishery and aquaculture activities with household nutritional outcomes was through women’s involvement in production, processing or sale of fish. Women often engage in fishing activities for household consumption, contributing to strengthen the direct pathway, while trading and processing contribute to empowering women which indirectly improves care for and diet of children.

This review analysed the role of aquaculture and small-scale fisheries separately. The pathways appeared however, to be basically the same. Aquaculture contributed to increasing household income with its high profitability and productivity. However owning a fish pond is an essential condition to initiate aquaculture, except in some cases where common-pool resources and seasonal fish ponds are abundant. On the other hand, fish supplied by small-scale fisheries were not only caught and consumed by household members, but also widely traded in the local markets, providing various livelihood opportunities for the poor, landless and women. Supporting small-scale fisheries through increasing capacity of sustainable resource management is required to keep fish supply from common-pool resources for the poor, as current aquaculture technologies and production systems cannot exactly replace the role played by small-scale fisheries. Nevertheless, aquaculture using common-pool resources such as river channels and floodplains, near shore, marine and lake waters, and seasonal water bodies, has potential for the sustainable supply of fish and household income for the poor, especially the landless and women.

Other linkages, such as health service and health environment of communities, and diseases were not examined as the data were scarce. To fully understand the determinants of nutritional status, integrated research and interventions are required.

**References**


*Combating Micronutrient Deficiencies: Food-Based Approaches* (FAO et al., 2011)


*Malnutrition in Sub-Saharan Africa: Burden, Causes and Prospects* (L. E. Bain et al., 2013)

*Nutrition at the World Food Programme: Programming for Nutrition-Specific Interventions* (WFP, 2012)

*The Political Economy of Undernutrition in Pakistan* (Zaidi et al., 2013)


4.3.17 Best Practices in Securing and Enforcing of Fisheries Resource Instruments

A. Introduction

Securing and enforcing fisheries resource instruments should attract the same efforts as those put towards securing land-based resources. There are international, regional and subregional fisheries governance instruments which seek to ensure that fisheries resources are sustainably utilized. The effectiveness of these instruments vary across the continent, but for the most part these instruments have issues of improvement.

B. International Fisheries Governance Instruments

B.1 The United Nations Convention on the Law of the Sea in 1982 (UNCLOS, the Convention) and other associated agreements provide an essential framework for establishing a more adequate system of ocean governance. The Convention elaborates a comprehensive regime for governance of the oceans, covering all aspects of ocean space from delimitation to environmental control, scientific research, fishing and other economic and commercial activities, technology and the settlement of disputes relating to ocean matters.

B.2 Exclusive Economic Zone (EEZ): The exclusive economic zone (EEZ), (UNCLOS, Arts. 55-75), was the most significant innovation in relation to the governance of marine fisheries resources in the second half of the twentieth century. By the time the Convention was agreed in 1982, more than 80 coastal States had declared EEZs, mostly of 200 nm. Within this zone, the coastal State enjoys "sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living" (Art. 56). It has the right to set a total allowable catch on the basis of the best scientific evidence available to it (Art. 61). This has established a legal right for coastal States to manage fisheries off their coasts and a framework within which coastal States can effectively limit access to their fisheries.

B.3 Fish Stocks Agreement: In the early 1990s, a consensus among States developed that the general provisions of the Convention requiring cooperation between States in the conservation and management of high seas fisheries resources (Arts. 117-120) needed strengthening. This led to the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN, 1995), also known as the United Nations Fish Stocks Agreement (the Agreement). The Agreement seeks to build upon two provisions of the Convention:

(i) All States have a duty to ensure that their nationals comply with conservation measures adopted for high seas stocks (UN-LOSC 1982, Art.117).

(ii) On the high seas, States have jurisdiction over vessels flying their flag (UN-LOSC 1982, Arts. 90-98).

The Agreement provides for the establishment of regional fisheries management organizations. The Agreement sets out comprehensive areas in which such an organization will have competence covering scientific research, stock assessment, monitoring, surveillance, control and enforcement (Art. 10). The organization can limit participation by new entrants according to a set of criteria listed in Art. 11.

B.4 FAO Code of Conduct for Responsible Fishing: A number of other multilateral agreements further elaborate the evolving set of rules for fisheries governance. The Code
of Conduct for Responsible Fishing (1995) inter alia spells out flag State responsibilities for the activities of fishing vessels flying its flag and seeks to advance management measures, by agreement among States, that improve the optimal and sustainable use of fisheries resources. The Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Resolution 15/93) similarly builds on flag State responsibility for fishing vessels flying its flag (Art. III) and operating on the high seas. A range of other global and regional treaties exist that, in some cases, have a direct bearing on the governance of the fisheries sector.

C. National Fisheries Instruments

Fisheries regulations focus on sustainable exploitation of fisheries resources and providing wholesome fish food for human consumption. The rules and regulations are embedded into the Fish (Fisheries) Act of each country. Fish trade may be provided for within the specific fisheries regulation or provided as an annex or through a specific Statutory Instrument.

The License is the major statutory instrument used to regulate fish trade by the countries within the region. Some countries use gear selectivity measures and some add on the slot size measures to regulate fish production and control trade in undersized fish. Some fisheries regulations are not specific on trade aspects but generally imply under fishing areas. A few of the countries have detailed specific trade requirements included in the fish quality and safety rules.

The fisheries regulations of the selected countries are at different levels. Some are outdated and hence, with many subsidiary statutory instruments, others are being updated and some are new.

C.1 Fish and Fisheries Regulations: An overview of the lists of principle and subsidiary legislations in countries in Sub-Saharan African countries in which the four corridors of the Fish Trade Programme are focused to highlighted in line with earlier study titled Regional Analysis/Mapping of Certification Procedures and Standards in Africa.

C.2 Observations on the Fish and Fisheries Regulations: The following observations can be made from the various laws and regulations of the listed Member States:

(1) All Member States have laws and regulations and national institutional structures to enforce the implementation of the laws and regulations. However, the institutional structures are not identical.

(2) The laws and regulations in some Member States (e.g., Burundi, D. R. Congo, Malawi and Sudan are fairly outdated and cannot seem to have been aligned with current best practices in the governance of fisheries and aquaculture.

(3) Most of the laws and regulations are geared towards regulating the exploitation of the fisheries resources with a view to sustainability. In this respect, the laws provide for:

   (i) Maturity of harvest taking into account the growth characteristics of the fish species, the breeding seasons and grow-out characteristics. Some regulations specify timings for closing of the fishing areas to avoid negatively affecting these fish species at these vulnerable seasons.
(ii) The type and nature of equipment to be used for particular target fish species. This includes the types of nets and their mesh sizes and types of fishing vessels.

(iii) Many Member States have regulations detailing the amount of fishing in tonnage which can be extracted from their specific fishing waters. These regulations also specify necessary actions with respect to by-catches and requisite penalties and sanctions for violations.

(4) Most of the laws and regulations do not reflect an ecosystem-based fisheries management approach and thus miss out on important sustainability perspectives.

(5) A number of Member States have progressive laws which define areas to be accessed by artisanal fisher groups by banning foreign access and specifying equipment which can be used in those areas.

(6) Licensing and registration of fishing vessels features in most laws and regulations.

(7) More recent laws and regulations (like those of Zambia) exhibit a coherent consolidation as opposed to outdated laws which are littered with amendments, repeals and subsidiary decrees which are sometimes difficult to comprehend.

(8) Older laws are often at loggerheads with the current trade and integration arrangements of Member States, thus creating barriers to trade and a source of disharmony among Member States.

(9) Some countries, e.g., Angola, Cabo Verde, Mozambique, Namibia and South Africa seem to have laws and regulations which are rather comprehensive and can serve as references for other Member States in Africa.

(10) Many African countries have not domesticated the FAO Code of Conduct for Responsible Fisheries.

(11) Some laws and regulations provide for the full value chain while others are only concerned with the fisheries up to the landing points.

(12) Many Member States have not promulgated aquaculture legislation despite this have a high potential to contribute to their fisheries resources, poverty reduction and rural development strategies.

(13) Most of the laws and regulations do not emphasise on generation and maintenance of fisheries data and statistics.

C.3 Impacts of Fish and Fisheries Laws and Regulations of Trade Facilitation: The disparities evident in the laws and regulations of Member States should raise the first red flag with respect to the potential trade barriers which could arise. The following is a summary of the possible impacts of the regulatory frameworks in this context:

(1) The outdated laws such as those in Burundi, DR Congo, Malawi and Sudan predispose these countries to internal and external vulnerabilities. Internal vulnerabilities include the underdevelopment and underperformance of the fisheries sector leading to failure of realizing its potential to contribute to the
national food and nutrition security, employment and wealth creation and lack of professional development.

The external vulnerabilities include dependence on imports contributing to trade deficits; lack of capacity to control safety and quality of imports; inability to quantify national income forfeited and unfavourable foreign exploitation of the countries fisheries resources with low resource rents.

(2) Unresponsive national laws and regulations create a barrier to trade since they do not create trust and confidence in trading partners. Trading partners need to be convinced that the national regulatory framework can create conditions to attain food safety and quality before they can engage in trade with any given country.

(3) Most laws and regulations are either focused on internal circulation of fish products or are geared towards exports outside of Africa. There is always an underestimated internal market which can be supplied by other African countries but the overwhelming attitude is that imports from other African countries are overlooked by an unsubstantiated national self-reliance. Wherever there are attempts to import fish products from other African countries, fears of unfair competition with local fishers quickly lead to erection of barriers based on the discretionary interpretation of national laws and regulations.

References
Code of Conduct for Responsible Fisheries (FAO, 2011c)
Governability of Fisheries: Theory and Applications (Bavinck et al., 2013)

4.3.18 Securing Africa’s Fisheries Resources: Marine and Shared Water Resources

A. Introduction
Many African States with fisheries resources have demonstrated unmitigated inabilities to manage these resources on a sustainable basis. Major problems experienced in African fisheries arise from: illegal, unreported and unregulated (IUU) fishing; overfishing and degradation of the fisheries resources.

This section is intended to highlight the IUU problem and its effects as a means of creating a strong background to inform the development of good practices and credible sustainability criteria for sustainable fisheries. Experiences from the past standardization initiatives have indicated that many standardization experts underestimate the IUU problem, sometimes considering as constituting a barrier to fisheries trade. Examples of the current problems are intended to reinforce the section and provide avenues for sustainability principles, criteria, indicators and verifiers.

B. Illegal, Unreported and Unregulated (IUU) Fishing
The threat posed by illegal, unreported and unregulated (IUU) fishing is widely recognized by the international community (RoNam, 2007; OECD, 2004). The IUU fishing problem affects both domestic waters and the high seas, and all types of fishing vessels, regardless of their size or gear.

But a fundamental question is – why does IUU fishing happen at all? We all know the answer, unless we like to pretend not to! There exists a plethora of excellent and fully available legal and institutional instruments such as the UN Fish Stocks Agreement, the Compliance
Agreement, as well as voluntary instruments such as FAO's Code of Conduct and the various International Plans of Action. Many other States, spent precious time and resources developing these! So then, why does this rape of the sea continue? Why are IUU vessels still able to offload at ports under the noses of certain port states and find lucrative markets for their illicit cargoes? The answer is simple – it is because fishermen, vessel owners, governments and international bodies have to date failed to stop it. In particular, it is because of a lack of political will to tackle the problem. We should control our vessels and nationals. IUU fishing is not an accident – it is carefully planned and, unfortunately, tolerated. Those who finance it make great profits. Some may have high contacts in the right places. As a result, some States continue to offer ports of convenience. Again, there must be real political commitment to stop it.

Many states have signed up to laudable and prudently crafted international conventions, agreements and arrangements. It is however a pity that we are simply failing to meet our obligations to such instruments. But why is this? It seems that we agree on these plans and instruments just as a formality, a diplomatic nicety, but that’s all! It would appear that individual states, be they coastal, flag or port states, are the main culprits for allowing IUU fish to be landed in the first place. Why should the political leaders of this world abdicate from their responsibilities? We can talk and develop prudent and well-intended plans and instruments to our heart’s content, but if real political will is lacking for implementation, then we are all wasting our time, and the rape will continue unabated!

One might reasonable question whether States will not abuse and disrespect voluntary instruments such as the FAO IPOA on IUU fishing, given that so many are after all failing to abide to their legally-binding duties under international instruments.

C. Defining and Categorizing IUU

IUU or illegal, unreported and unregulated fishing is fishing that is conducted contradictory to legal conservation and management measures currently in place around the world. The FAO International Plan of Action to prevent, deter and eliminate illegal unreported and unregulated fishing FAO IPOA-IUU (FAO, 2002) contains the accepted definitions:

C.1 Illegal fishing refers to activities:
(i) conducted by national or foreign vessels in waters under the jurisdiction of a state, without the permission of that state, or in contravention of its laws and regulations;

(ii) conducted by vessels flying the flag of states that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the states are bound, or relevant provisions of the applicable international law; or

(iii) in violation of national laws or international obligations, including those undertaken by cooperating states to a relevant regional fisheries management organization.

C.2 Unreported fishing refers to fishing activities:
(i) which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations; or

(ii) undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.
C.3 **Unregulated fishing refers to fishing activities:**

(i) in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, or by those flying the flag of a state not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or

(ii) in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with state responsibilities for the conservation of living marine resources under international law.

D. **Dimensions of IUU**

1. unregulated fishing takes place in nations that lack the resources to establish fisheries laws or monitoring, including the monitoring and supervision of foreign ships licensed under unfavourable agreements;

2. some unreported fishing stems from a lack of scientific data collection; and

3. while other unreported catches conceal illegal activity.

These three dimensions of illegal fishing are a major threat to the oceans, consumers and seafood businesses around the world.

E. **Contributing Factors to IUU**

E.1 **Too many fishers chasing too few fish:** Overcapacity in fishing — The fishing industry has too much capital invested in vessels that it must operate to realize a return. More and more boats remove more and more fish, not allowing for their reproductive needs. Fish are being caught younger, some being harvested before they can reproduce. Some commercially targeted fish require only a few years to reach a reproductive age while others may take more than 30 years. The result of this is the catch per unit effort (CPUE) has gone up, meaning more effort is being expended to catch fewer available fish. Therefore, in an era of overfished fish stocks and substantial excess fishing capacity, IUU fishing is recognized as a major threat to the long term sustainability of the world’s oceans.

E.2 **High and growing demand for seafood:** As world populations continue to soar, the demand for seafood, an attainable protein resource, increases, and fisheries stocks are harvested beyond their ability to sustainably reproduce. “Fishing down the food chain” is the result. Fish that were previously discarded as “trash fish” are now fisheries targets. While aquaculture is one potential measure to meeting high consumer demand and reducing soaring wild harvest levels in the future, the gap between supply and demand continues to widen.

E.3 **Highly profitable:** IUU fishing is highly profitable so a strong economic incentive exists to participate. It is simply more “expensive” to be a responsible fisher in the global market. The complexity of the fishing industry and the many levels of organization involved leave it vulnerable to the influence of organized crime and corruption. Fishing vessels may also be used in activities such as drug or human trafficking.

E.4 **Weak Enforcement:** Many countries do not dedicate sufficient enforcement resources to fight illegal fishing and lack capacity to prevent trade of stolen fish. Even vessels that have been blacklisted for illegal fishing activities by international organizations are
intercepted at port only 25 percent of the time. Lack of government oversight and resources, poor enforcement and corruption all contribute to the failure of fisheries enforcement. Reviewers of illegal fishing and compliance reform in South Africa specifically noted budget cuts, including a two-thirds decline in natural resources agency staff over the course of a decade, which prevented South African officials from conducting any visible policing.

E.5 Few Laws: Some fisheries are not bound by any law at all. Authorities can only carry out enforcement when their nation provides regulatory and legal backing, including adoption of international conventions. Unregulated fishing may also include fishing in remote locations or by seasonal participants who are not part of a local community. Remote locations include the majority of the ocean’s waters that are beyond national boundaries, known as the high seas. There is no designated police force responsible for the high seas, and the laws binding fishing and other activities in international waters are minimal. In a notorious chase, an Australian patrol boat pursued a Chilean sea bass fishing vessel across the high seas for 4,000 miles – yet this kind of enforcement is the exception rather than the rule. Sections of the ocean are managed with varied success by “regional fisheries management organizations (RFMOs)” which include Antarctica’s Commission for the Conservation of Antarctic Marine Living Resources. In one study, half of ports visited by known illegal vessels were located in nations that belong to a regional fisheries management organization, though these visits did not always lead to enforcement action. The effectiveness of RFMOs is limited by the political will, regulations and capacity of participating nations, suffering the same weaknesses as the United Nations.

E.6 The Shell Game: Illegal fishing is a shell game, with constantly moving vessels that change names to stay ahead of enforcement authorities. When the ship returns to port, fraud, bribery, false documentation and money laundering facilitate the sale of stolen seafood. Finally, some of the most valuable illicit catches tap into organized crime networks for international distribution. Fraud, crime networks and the lack of government controls or traceability systems make it easy to distribute stolen seafood around the globe.

E.6.1 Fake IDs for Fish: Flags of convenience are notoriously used to cover up crimes committed at sea. The United Nations Law of the Sea requires that all vessels fly their national flag while on the high seas. Every vessel is required to be registered in its home country and issued an identification number and documents for the purposes of law enforcement and safety at sea. The state of registry is known as the “flag state” and linked to the vessel through its owner, manager or nationality. Pirate vessels deliberately evade policing efforts by hiding their flag, identity and ownership. This deception can be as simple as not flying a flag, or covering its name and registration while conducting illegal activity. Panama and other countries began allowing non-nationals to fly their flags for a fee in the early 1900s in response to U.S. Prohibition laws against alcohol. Ever since then, countries in need of foreign income compete for ship registration fees and have neither the incentive nor capacity to enforce regulations that ensure safety at sea, environmental, labour and other standards. Illegal fishing vessels use flags of convenience like a fake ID to conceal stolen fish and reduce liability for the owners if the vessel is captured. Illegal vessels also register in international tax havens, through front companies or joint ventures and frequently change their registration to new countries. Vessels registered under flags of convenience do not necessarily have nationals from that country as owners or crew and may never visit the country issuing the flag. During the 1990s and 2000s, long-standing flags of convenience from Panama and Belize were joined by flags from Togo, Equatorial Guinea, Mongolia (landlocked), Russia, China and North Korea among others, as
suspected criminals continually sought new places to hide. Fraudulent identities also extend to shipping manifests and catch documents.

E.6.2 Mixing Fish at Sea: One of the most common ways that stolen fish enter mainstream seafood trade is by mixing legal and stolen catches together at different steps along the supply chain. Some countries require fishing vessels to report how much fish they catch, where it is caught and other details to monitor compliance with fishing laws. By mixing in stolen fish, they then take on all of the documentation of the legal fish and are effectively laundered. Transfer of fish at sea, known as trans-shipment, is one of the ways that legal and stolen fish are combined. Refrigerated cargo vessels collect catches from many different fishing vessels. Because they do not catch fish, cargo vessels are exempt from catch documentation and monitoring and provide a gap in the chain of custody.

E.6.3 Mixing Fish in Aquaculture Pens: Transfer through aquaculture facilities provides another way to mix stolen fish in with legal fish. Bluefin tuna ranches in particular have been identified as a place where undersized fish are accepted from fishing vessels and exact numbers of fish are not reviewed by inspectors, facilitating misreporting of catches. Tuna ranches are aquaculture facilities where wild-caught tuna, often juveniles, are kept in pens until they reach a marketable size.

E.6.4 Corruption and Bribery: Corruption and bribery of authorities can happen anywhere seafood is being inspected. When government observers are on-board fishing vessels, they are vulnerable to attacks, harassment and bribery. Individual relationships between fishing businesses and local officials can develop over time, leading to tolerance of illegal activity, bribery and collusion. Stolen fish can move with the assistance of fees paid to local officials or through gangster-controlled transportation networks. Institutionalized corruption can trickle through an agency or corporation. Pirate fishing operations forge or alter paper catch documents, bribing inspectors to accept entry of stolen fish as legal product. Customs and border patrols are also vulnerable and have in some cases have accepted bribes, signed off on blatantly false catch documents or allowed stolen seafood to enter without proper documentation.

F. Effects of IUU

IUU fishing can have far reaching consequences. Some effects include the following:

(i) **Unsustainable harvest of fish stocks and other marine wildlife**: IUU products often come from fisheries lacking the strong and effective official conservation and management measures. IUU fishing most often violates conservation and management measures, such as quotas or bycatch limits, established under international agreements. By adversely impacting fisheries, marine ecosystems, food security and coastal communities around the world, IUU fishing undermines domestic and international conservation and management efforts. Furthermore, IUU fishing risks the sustainability of the official industry.

(ii) **Destruction of marine habitats and loss of fish for future harvest**: IUU fishing often raids officially designated marine parks hosting vulnerable species. Stiles *et al.* (2013) states that pirate fishermen often target the richest and most vulnerable ecosystems in spite of efforts to protect them and cites cases from Australia, Thailand and Guinea Bissau.

(iii) **Loss of nutrition and food safety**: The conditions on ships engaged in IUU fishing often do not meet safety standards and pose food safety and health
hazards. IUU fishing also deprives coastal communities of access to fish proteins from their diets.

(iv) **Loss of income and employment for legitimate fishers:** IUU fishing activities reduce the available stocks to local communities and negatively impact incomes and employment opportunities.

(v) **Deplete local, and potentially global, fish stocks** to the point where they become commercially unviable or even push them to the brink of extinction.

(vi) **Undermine labour and safety standards:** Use of unsafe vessels prone to sinking in the seas; unsafe working environments compared to onshore regulations and practices with some akin to medieval era (Stiles *et al.*, 2013);

(vii) **Distort markets of legally harvested fish:** IUU products are routinely low priced since the illegal operators do not meet the same environmental or sanitary standards. This undercuts bottom-lines for legitimate operators by as much as 10 to 15%. The targeting of overfished species reduces the chances of recovery and can lead to fisheries industry collapse. Cracking down on illegal fishing can boost the economy, restoring profitability to the fishery. By eliminating illegal small-mesh nets in Guinea-Bissau, profits for other fishermen could increase between 50 and 100 percent.

(viii) **Contribute to the loss of economic stability in developing coastal nations:** Foreign vessels often perpetrate illegal fishing in the waters of developing countries. Plundering this critical food supply can bankrupt local fishing businesses and stall long-term economic growth. In Somalia alone, illegal, unreported and unregulated fishing removes $300 million from the national economy each year. West Africa is especially vulnerable to illegal fishing by foreign fleets, in addition to heavy fishing pressure from officially sanctioned foreign vessels. Fishermen in Cameroon report wanton destruction to artisanal fishing gear by illegal trawlers from China and the EU (Belhabib *et al.*, 2015; GreenPeace, 2015), who also overexploit coastal fisheries. The combined losses for artisanal fishermen in West Africa due to poachers represent nearly 35 percent of their total catch.

G. **Stopping the Looting of African Fisheries**

G.1 How can the problem of illegal fishing be stopped? Effective at-sea enforcement will require much greater investment by individual nations in their detection and patrolling capacity, prosecution and penalties against poachers. In China’s fisheries, the number of violations dropped from the 1990s to the 2000s after modest increases in both penalties and enforcement for illegal fishing. Another enforcement study predicted that an increase in the chance of being caught is even more likely to prevent fishing crime than a similar increase in fines. In addition to at-sea enforcement, more systemic concerns must also be addressed to stop illegal fishing. Pirate fishing happens quickly, sometimes in a few hours, making detection by law enforcement even more difficult. The actual fishing is then followed by days to months of elaborate transactions designed to disguise the origins of stolen fish. Each fish is shuffled and relabelled many times in the black market to break any obvious links to the scene of the crime. By the time stolen fish arrives on consumers’ plates, its true identity is a mystery. The global problem of pirate fishing involves the “entire range of economic transactions associated with catching fish and bringing them to market” and will require a suite of reforms in fisheries management. Harmful government subsidies currently distort the fishing fleet, propping up corrupt businesses involved in illegal fishing and inflating the total number
of vessels beyond what can be sustained by the world’s fish populations. These subsidies must be redirected to transition the fleet toward a sustainable future.

There is a wide range of possible measures that can be undertaken to address the problem of IUU fishing. These will need to cover legal, institutional, economic and social dimensions and will require the involvement of multiple players in the national, regional and international fisheries sectors. Determining the cost-effectiveness of alternate approaches to addressing IUU fishing problems should be undertaken to help identify priorities amongst the possible options so that the best results can be obtained from the limited resources that are available to national governments and international organisations.

G.2 Seafood Traceability Deters Illegal Fishing: Industry and government initiatives to stop illegal fishing are increasingly focused on traceability — tracking seafood from boat to plate. Despite increased at-sea enforcement, it will always remain a challenge to catch poachers in the act of illegal fishing. However, traceability provides an opportunity to catch poachers each time stolen seafood is sold or transported. It may be intercepted at the dock, in the warehouse for processing and freezing, at the airport customs desk and all along the distribution channels for seafood. The European Union is currently implementing regulations to ensure that seafood imports are fully documented and legally caught. Similar catch documentation is already in place elsewhere and being refined for the fisheries with the most illicit activity, including bluefin tuna and Chilean sea bass. Experience from the Chilean sea bass traceability system emphasizes how important it is for traceability to include the entire supply chain across all fishing gears, products and jurisdictions. This includes the need to ban any imports that do not participate in traceability. Additional lessons learned include the need for centralized data and surveillance systems, online documents and advance notification of landings to allow inspectors to verify the catch. The U.S. has no traceability requirements for domestic or imported seafood and few regulations for imports or catch documentation. Additionally, the majority of U.S. seafood imports are neither inspected nor labelled with basic information as to when, where and how the fish was caught.

(1) Full chain traceability of seafood: Tracking seafood from boat to plate is essential to keep illegally caught fish from entering the U.S. market. Traceability requires documentation to follow the fish through the entire supply chain. In order to stop flow of illegal seafood products, a traceability system must be transparent and verifiable. Frequent inspections confirming the identity of seafood products is critical to the success of any documentation scheme.

(2) Global information systems: A global fishing vessel database is needed to connect existing vessel registers maintained separately by different governments and regional fishery management organizations. Though global vessel identifier numbers are issued by the International Maritime Organization, these numbers focus on shipping and are not currently required for fishing vessels. The High Seas Task Force identified information-sharing between agencies as a critical gap in intelligence currently exploited by illegal operators to evade enforcement. A minimum standard must be established for vessel and catch documentation to facilitate information sharing across jurisdictions and through the supply chain.

(3) Trade flow analysis: Patterns in trade and financial flows that indicate suspicious activity could be applied to identify pirate fishing, similar to their use in anti-terrorism efforts. Identifying critical points in the supply chain where trade flow analysis will help will assist in directing enforcement interventions.
Cooperation between authorities: Pirate fishing sometimes escapes detection due to overlapping jurisdictions within the U.S. government and between member countries of regional fishery management organizations. As recommended by the Government Accountability Office report on seafood fraud, fighting fraudulent fish requires increased sharing of information and inspection resources between the Food and Drug Administration, Customs and Border Patrol and the National Oceanic and Atmospheric Administration. Most cases where pirate vessels are apprehended on the high seas have involved cooperation between authorities from several different countries.

G.3 Flag State Actions: Links between flags of convenience and tax havens have been established and a more concerted approach towards both could be undertaken. There is a need to improve transparency on the procedures and conditions for re-flagging and de-flagging. More countries could usefully investigate the possibilities for applying extra-territorial rules for their nationals. The penalties for IUU fishing offences should be significantly increased and harmonised between jurisdictions.

G.4 Port State Actions: The development of minimum guidelines for port state controls and actions against IUU fishers, particularly with respect to the use of prior notice and inspection requirements (including health and safety conditions), should be encouraged. The harmonisation of these controls and actions should be a priority. There is a need to ensure a broader use of port state control measures including inspections, preventing access to services and goods of IUU vessels. There needs to be an agreement to make it illegal to tranship, land and trade in IUU fish. There is also a need to improve the monitoring of the provision of at-sea services and transhipment of fish and fish products.

G.5 Coastal State Actions and International Trade Responses: It is necessary to augment monitoring, control and surveillance capacities and improve fisheries management across the board, but in particular in developing countries. Improving and extending the use of catch and trade documentation schemes could help provide additional information on IUU fishing activities. Fair, transparent and non-discriminatory countermeasures should be adopted, consistent with international law, against countries that do not comply with the conservation and management measures adopted by RFMOs, or fail to effectively control the vessels flying their flag, in order to ensure they comply with the conservation and management measures adopted by RFMOs. Countries should identify the area of catch, name of fishing vessels and their past history (of name and flag) in order to collect information necessary for better fisheries management and elimination of IUU fishing.

G.6 RFMO Actions: Strengthening the mandate and role of RFMOs and RFBs, in particular their possibilities for tracking IUU fishing, is an important requirement. There is a need to improve information sharing and co-operation among RFMOs, particularly in terms of linking and integrating their data on IUU fishing activities. More RFMOs should consider publishing lists of companies and vessels engaged in high seas IUU fishing activities and lists of vessels that are authorized to fish. The use of positive and negative lists of IUU fishing vessels and companies is strongly encouraged in this regard. The creation of a global record/register of authorised fishing vessels that are technically capable of engaging in high seas fishing should be considered.

G.7 International Co-ordination: Resources matter: more technical and financial resources are needed for capacity building, in particular in the developing states, for monitoring, control and surveillance, and in all activities to combat IUU activities. The international community should move to ratify relevant international treaties on labour and working conditions in the maritime sector in order to strengthen international hard
and soft laws to protect fishing crews in general. Improved monitoring of foreign direct investments (out-going and in-coming) in the fishing sector will assist in tracking potential IUU fishing operations. Work should be undertaken nationally and multilaterally to lift the veil of corporate secrecy surrounding the companies undertaking IUU fishing activities and related services. Partnerships between public authorities and businesses offer important scope in the fight against IUU fishing. In this regard, the OECD Guidelines for Multinationals offer some possibilities that could be followed-up by national regulatory authorities. A major effort is required, in particular by regional fisheries management organisations and market countries, to collect and disseminate relevant information. The efforts already underway to improve information at all levels and mechanisms to share information need to be supported and strengthened.

**G.8 NGO and Private Sector Actions:** Whenever possible, governments should consider bilateral consultation with businesses engaged in IUU activities to determine if alternative means of getting IUU vessels out of the business can be found. There should be continued efforts to communicate the IUU problem, for example through promotional/educational campaigns with the market, including intermediate buyers, processors, distributors and consumers. Such activities will help raise awareness of the problem and improve the knowledge of the social, economic and environmental consequences of IUU activities. Industry and NGOs should be encouraged to continue to self-organise their response to IUU fishing and information collection.

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4.3.19 Ecosystems for Water and Food Security: Security of Watersheds and Hinterlands

A. Introduction
Fisheries and aquaculture activities take place within the aquatic environment which is a dynamic ecosystem hosting a large number of live forms. Gradual natural weathering of watershed rocks and soils are carried by runoff into the aquatic environment and their accumulation can impact the quality of the water and the aquatic environment in which the fish grows. Anthropogenic activities can accelerate the flow of materials into the aquatic environment, creating conditions for multiplication of toxins and accumulation of heavy metals to unsafe levels. Anthropogenic activities contribute elevated levels of heavy metals such as mercury, copper, cobalt, chrome, iron, manganese, lead, zinc, arsenic and cadmium. Additional water pollution activities result from agricultural and human settlement activities in the form of agro-chemicals and wastewater systems.

Trash, especially plastic and litter cause adverse effect on fish. Plastics do not degrade easily in environment and therefore remain in the same stable / undegraded form in water bodies. Fish mistakenly confuse plastics as food materials and ingest them which causes blockage in the digestive system and kill the fish. There is also probability that fish and other marine life often get stuck in plastic items. Plastic often cause fish to starve to death by getting stuck around their mouth making them unable to eat. Plastic items can also cause slow choking of marine life to death by getting stuck around the neck of marine life. Apart from plastic, metal, rope, nets and ‘styrofoam’ are among other human made trash items which are disposed off in water bodies and harm marine life.

Tannery effluents contain both organic and inorganic solids in high concentration in either suspended or dissolved forms which results to high oxygen demand in water including admixture of harmful elements like toxic metal salts and chromium metal ion in the water. Without proper treatment and discharge of untreated wastes in water bodies causes serious harm to both environment and life threatening for the aquatic flora and fauna. It has deleterious effect on the soil also adjacent to the water bodies are characterized by high contents of dissolved, suspended organic and inorganic solids giving rise to high oxygen demand and potentially toxic metal salts and chromium metal ion. The tannery effluent, if not treated properly, can cause serious damage to soil and water bodies resulting to increase in soil salinity, reduced fertility and soil infertility and reduces potentiality for growth of crops. In many underdeveloped countries, the harmful and climatic unfriendly effluents from the tanneries are discharged directly into large water bodies even without proper treatment which is a grave and serious issue of concern for the environmental, climatic and public health. Oil spills from industrial sources runoff into the water sources which coat the skin of fish and kill them. Oil provides a source of toxins for fish that can cause disease, genetic defects/alterations and death. The oil damages the surface protective activity of skin which keeps the marine mammal warm. Some sewage feed algae that also flow off in the ocean. These algae grow at a rapid rate and have a high nutrient concentration producing red tides. They are called red tides because of the red appearance of the foam of the ocean waves. Red tides kill fishes by releasing toxins.

Excessive noise production from boats and drilling causes stress on fish and other marine life which make them sick and lethargic. This affects their mating behavior adversely. Fluctuations in water temperature from power plants and factories kill off coral and cause marine life to migrate for relocation in an attempt to find waters with a more sustainable thermal condition. Radioactive waste generated from industrial and military wastes enter the water bodies and are absorbed by fish and can cause genetic, mutagenic and teratogenic defects in them.
B. Purpose
The purpose of this section is to highlight how direct and indirect human activity affect the availability, safety and quality of capture and aquaculture fisheries. Standardization focus for fisheries and aquaculture should take into account parameters which are likely to affect the quality and safety of fisheries and aquaculture products arising from environmental degradation in the immediate aquatic environment and the upstream sources of the water.

This section outlines the possible health and safety hazards arising from environmental degradation.

C. Possible Health and Safety Hazards
(1) Quality of Seafood from Aquaculture
(2) Safety Aspects of Seafood
(3) Abiotic Environmental Factors Affecting Seafood Safety and Properties
(4) Biotic Environmental Factors Affecting Seafood Quality
(5) Seafood Quality Assurance for Algal Toxins
(6) Fish and Shellfish Diseases and Seafood Quality

D. Best Environmental Management for Healthy Fisheries and Aquaculture
The link between the health and safety of the environment and the fisheries and aquaculture resources calls for drastic action on the part of the environmental protection and fisheries authorities in order to assure the quality, safety and health of the fisheries and aquaculture products.

The securing of the watersheds and the strict observance of non-discharge of wastewater into water courses should be enforced without reservation since the consequences of not taking this kind of action seriously compromises the safety and health of fisheries and aquaculture products with assured deleterious impacts on human health and safety.

Lax regulations along watersheds, waterways and water bodies should be reviewed if Africa is to safeguard its fisheries and aquaculture resources availability, quality and safety. The reaction to clean up the environment only on account of export requirements should desist as it implies that national populations are of less concern while in effect the political economy of a healthy population demonstrates the converse.

Notorious discharge of industrial waste into water systems on account of industrialization and job creation excuses is not to be accepted under any circumstances since the costs cannot be justified. Infringements into watersheds on account of population increases should be reviewed and mitigated to offset the costly impacts such infringements would manifest on fisheries and aquaculture resources downstream.

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Environmental Regulation and Food Safety: Studies of Protection and Protectionism (Jha, 2005)
Infectious Disease in Aquaculture: Prevention and Control (Austin, 2012)
Environmental Best Management Practices for Aquaculture (Tucker et al., 2008)
5. **Fish Processors and Traders**

5.1 **Methodology of Delivery**

A two-day interactive seminar is envisaged to raise the level of knowledge of fish traders and processors about the market dynamics, in particular the standards, regulations and conformity assessment regimes which must be complied with in order to trade nationally and across the borders. Most processors and traders are often taken by surprise whenever faced with these requirements and this seminar will be designed to respond to some of their concerns in a guided manner. It is to be appreciated that these two groups are the link between the producers and fishers and the demands of the market. These groups are also critical in product development and ensuring that standards are actually put to use for the manifestation of their intended benefits. The contents delivered shall include those aimed at imparting the necessary knowledge for facilitating standards-based value addition which ensures conformity with market requirements and thus ease of access to markets and establishing a strong foundation for sustainable industrialization in the sector.

The mode of delivery is expected to be PowerPoint presentations with substantive papers prepared and bound for ease of reference. Additional useful reference materials shall be provided in electronic format.

5.2 **Institutional Coordination**

ARSO will be primarily responsible for ensuring effective delivery of the workshop. Coordination with the departments of fisheries, national WTO TBT and SPS coordinators, national standards bodies, fish processors and traders associations, PAQI and individual consultants will be considered.

5.3 **Content Outlines: Fish Processors and Traders**

The following provides the framework of the content to be delivered for fish processors and traders. The content is heavily oriented toward standards-based value addition, compliance with standards, regulations and conformity assessment in the sector. Further refinements may be necessary to suit the dynamics in the market and with respect to trade requirements.

5.3.1 **Fisheries and Aquaculture Resource Endowments of Africa: A Review of Opportunities and Challenges**

A. **Introduction**

The fisheries resources in Member States include the following depending on the geographical positioning:

(a) Marine capture fisheries

(b) Inland capture fisheries and

(c) Aquaculture

B. **Marine Capture Fisheries**

This is practiced both at artisanal and industrial scales. Key fish species include:

(1) Hake

(2) Horse mackerel
(3) Anchovy
(4) Pilchards
(6) Lobsters
(7) Tunas: Bluefin tuna; Southern albacore; Yellowfin; Bigeye; Skipjack
(8) Shrimps and prawns
(9) Demersal fish: breams; Groupers, and Snappers
(10) Octopuses
(11) Scallops and clams

C. Inland Capture Fisheries

This is practiced both at artisanal and industrial scales. Key fish species include:

(1) Nile perch: *Lates niloticus* and *L. macrocephalus*
(2) Tilapias:
(3) Small pelagic fishes: *Rastrineobola argentea* (Dagaa/Omena/Mukene), *Stolothrissa tanganicae* and *Limnothrissa moidon* (Kapenta), *Poecilothrissa mueruensis* and *Bangweluesnis* (*Engraulicypris moeruensis*) (Chisense) *Neobola bredoi* (Muziri) and *Brycinus nurse* (Ragoogi)
(4) African Lungfish
(5) African catfish: *Clarias gariepinus*
(6) Common Shrimp: *Caridina nilotica*
(7) *Stolothrissa tanganicae*: Lake Tanganyika sprat — Chilwe, Kapenta, Nsembe (Zambia); Ndagala (Burundi); Dagaa, Ndagala, Ndakala (Tanzania); Ndagala (DR Congo).

Table 22: Some Common Fish Species in African Water Bodies

<table>
<thead>
<tr>
<th>Lakes</th>
<th>Coverage (km²)</th>
<th>Countries</th>
<th>Production</th>
<th>Main species</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>68.800 km²</td>
<td>Kenya, Tanzania and Uganda</td>
<td>900000 (2010)</td>
<td><em>Lates niloticus</em> (Nile Perch) <em>Rastrineobola argentea</em> (Dagaa), <em>Oreochromis niloticus</em> (Tilapia) <em>Haplochronis, Bagrus, Clarias</em> <em>Synodontis, Protopterus</em></td>
<td>Dagaa (60%), Lates (30%) and Oreochromis (7%) 194,172 fishers and 65758 fishing crafts (2010)</td>
</tr>
<tr>
<td>Tanganyika</td>
<td>32.900 km²</td>
<td>Burundi, DRC (45%) Tanzania (41%) Zambia</td>
<td>200.000 tons in (2011)</td>
<td><em>Stolothrissa tanganicae</em> and <em>Limnothrissa moidon</em> (Kapenta) <em>Lates stappersii</em> (Bukabuka Mukeke) <em>Lates anguistifrons</em> (Capitaine) <em>lates Marie</em> (Ngonzi, Sangala) <em>Lates microlepis</em> (Nonzi/ Nyunvi) Tilapiine</td>
<td>About 94,800 active fishers (2011). Kapenta contributes 60% to total catch and lates stappersii 30%</td>
</tr>
<tr>
<td>Malawi/Nyasas</td>
<td>29600 km²</td>
<td>Malawi, Tanzania and Mozambique</td>
<td>50.600 (2007)</td>
<td><em>Haplochronis spp.</em> (Mbuna), <em>Copadichromis spp.</em> (Utaka), <em>Preochromis spp.</em> (Chambo), <em>Rhamphochromis spp.</em> (Ncheni). <em>Engraulicypris sandella</em> (Usipa), <em>Barbus paludinosus</em> (Matemba), <em>Bagrus meridionalis</em> (Kapango) and <em>Clarias, gariepinus</em> (Mbamba)</td>
<td>About 50.000 fishers and over 350000 fish processors, traders etc in Malawi</td>
</tr>
<tr>
<td>Turkana</td>
<td>7200(7570) km²</td>
<td>Kenya and Ethiopia</td>
<td>2.493 (2005)</td>
<td>Nile perch, Tilapia, Labeo, bagrus, Barbus, Citharinus, Distichodus, Clusirus, Symodontis, Hydrocymus forskali</td>
<td>New Supplier to regional trade for DRC</td>
</tr>
<tr>
<td>Lakes</td>
<td>Coverage (km²)/ Countries</td>
<td>Production</td>
<td>Main species</td>
<td>Remarks</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------</td>
<td>------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Albert</td>
<td>5270 km²</td>
<td>More than 150,000 (in 2010)</td>
<td>Atlethes baremose (Ngaar)Hydrocynus forskahl (Ngasia), Lates niloticus, L. macrophthalmus, Brycinus nurse (53 %), Neobola (22% Bagrus bayad</td>
<td>The small pelagic (Ragoogi) and Muziri catch is over 60 % of the Lake in Uganda Production data is for Uganda only</td>
<td></td>
</tr>
<tr>
<td>Mweru-Luapula</td>
<td>4580 km²</td>
<td>More than 22,000 (in 2010)</td>
<td>Poecilothrissa mweruensis and Bangeluensis(Chisesnse) Oreochromis macrochir(Tilapia) Hydrocynus vitattus (Tiger fish)</td>
<td>About 25000 fishers in Zambian waters</td>
<td></td>
</tr>
<tr>
<td>Edward</td>
<td>2325 km²</td>
<td>10,000 (2010)</td>
<td>Tilapia, bagrus, barbus, Protopterus. Clarias, Haplochromis</td>
<td>516 fishers (No. of fishers, boats and fishing gears are controlled/set in Uganda</td>
<td></td>
</tr>
<tr>
<td>Kariba</td>
<td>5400 km²</td>
<td>23226 (in 2001)</td>
<td>Limnothrisa miodon Oreochromis spp. Tilapia rondalli, Labeo hydrocynus vittaus, Mormyrids, Clarias gariepinus</td>
<td>Lake Kariba is famous for Cage fish farming. Kapenta</td>
<td></td>
</tr>
<tr>
<td>Kivu</td>
<td>2370 km²</td>
<td>7000 (1991)</td>
<td>Oreochromis niloticus, (Ingerge), Stoloithrissa tanganicae and Limnothrisa miodon (Kapenta) Barbus spp., Clarias spp. Haplochromis spp.</td>
<td>About 6500 fishers Kapenta (Limnothrisa contribute over 80% of the total catch</td>
<td></td>
</tr>
</tbody>
</table>

### D. Aquaculture Fisheries

African aquaculture can broadly be divided into two: *community based aquaculture* which is promoted by international organizations, aid agencies and governments as part of their efforts to alleviate poverty, create livelihoods and improve the food supply situation; and *commercial aquaculture*, which is mainly privately financed and export oriented. Key fish species include:

1. African catfish (*Clarias gariepinus*)
2. Trouts
3. Tilapias (*Oreochromis niloticus, O. andersonii, O. macrochir, and Tilapia rendalli* especially)
4. Common carp (*Cyprinus carpio*)
5. Freshwater prawns (*Machrobraccium rosenbergii*)
6. Marine species include the Black Tiger prawn (*Penaeus monodon*)
7. Oysters (primarily the Pacific Oyster *Crassostria gigas*)
8. Abalone

### E. Non-Fish Aquatic Resources

There is a markedly significant farming of the Nile crocodile (*Crocodylus niloticus*) in some African countries for skin and meat.

### F. Economic Contribution of African Fisheries and Aquaculture

A recent study by de Graaf et al. (2014) estimates the value added by the fisheries sector as a whole in 2011 to be more than US$24 billion, 1.26 percent of the GDP of all African countries. Detailed figures by subsector highlight the relevance of marine artisanal fisheries and related processing, and also of inland fisheries, which contribute one-third of the total catches in African countries. Aquaculture is still developing in Africa and is mostly concentrated in a few countries but it already produces an estimated value of almost US$3 billion per year. As data on licence fees paid by foreign fleets were not easily available to the national experts...
participating in this study, an attempt was also made to estimate the value of fisheries agreements with Distant Water Fishing Nations (DWFNs) fishing in the exclusive economic zones of African States. Considering that 25 percent of all marine catches around Africa are still by non-African countries, if also these catches were caught by African States in theory they could generate an additional value of US$3.3 billion, which is eight times higher than the current US$0.4 billion African countries earn from fisheries agreements.

According to the new estimates produced by the study, the fisheries sector as a whole employs 12.3 million people as full-time fishers or full-time and part-time processors, representing 2.1 percent of Africa’s population of between 15 and 64 years old. Fishers represent half of all people engaged in the sector, 42.4 percent are processors and 7.5 percent work in aquaculture. About 27.3 percent of the people engaged in fisheries and aquaculture are women, with marked differences in their share among fishers (3.6 percent), processors (58 percent), and aquaculture workers (4 percent).

<table>
<thead>
<tr>
<th>Total GDPs African countries</th>
<th>Gross Value Added (US$ millions)</th>
<th>Contribution to GDP %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fisheries and Aquaculture</td>
<td>24,030</td>
<td>1.26</td>
</tr>
<tr>
<td>Total Inland Fisheries</td>
<td>6,275</td>
<td>0.33</td>
</tr>
<tr>
<td>Inland fishing</td>
<td>4,676</td>
<td>0.24</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>1,590</td>
<td>0.08</td>
</tr>
<tr>
<td>Local licences</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>Total Marine Artisanal Fisheries</td>
<td>8,130</td>
<td>0.43</td>
</tr>
<tr>
<td>Marine artisanal fishing</td>
<td>5,246</td>
<td>0.27</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>2,870</td>
<td>0.15</td>
</tr>
<tr>
<td>Local licences</td>
<td>13</td>
<td>0.00</td>
</tr>
<tr>
<td>Total Marine Industrial Fisheries</td>
<td>6,849</td>
<td>0.36</td>
</tr>
<tr>
<td>Marine industrial fishing</td>
<td>4,670</td>
<td>0.24</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>1,878</td>
<td>0.10</td>
</tr>
<tr>
<td>Local licences</td>
<td>302</td>
<td>0.02</td>
</tr>
<tr>
<td>Total Aquaculture</td>
<td>2,776</td>
<td>0.15</td>
</tr>
</tbody>
</table>

(de Graaf et al., 2014)

In West Africa fishing activities, mostly in the marine artisanal subsector, are a major contributor to GDP with high overall contributions in Ghana, Mauritania and Sierra Leone. In Central Africa, inland fisheries is the major contributor to GDP with high overall contributions by the Democratic Republic of the Congo and Uganda. In Southern Africa, marine industrial fisheries is the major contributor to GDP.

The total GDPA is compiled by the national statistical offices according to the International Standard Industrial Classification (ISIC). It includes “Agriculture, livestock, hunting, forestry, and fishing” but excludes processing, which is covered under “Manufacture of Food Products”. Therefore, the contribution of fisheries to GDPA can be only calculated as the share of fishing
and aquaculture economic activities in the agriculture production but excluding the value generated by post-harvest.

Total value added of fishing and aquaculture in Africa is US$17.4 billion. With a total GDPA of US$288.4 billion, the fisheries sector contributes 6 percent of the GDPA for the whole of Africa. The highest contribution is from marine artisanal fishing contributing 1.82 percent of total GDPA, whereas inland fishing and marine industrial fishing have the same contribution of 1.62 percent, and aquaculture contributes almost 1 percent.

References
The Value of African Fisheries (de Graaf et al., 2014)
A Fishery Manager’s Guidebook (Cochrane et al., 2009)
Harnessing Fishery Resources: Swimming the Tide to Africa’s Development (UNECA, 2012)
Mariculture in the WIO Region: Challenges and Prospects (Troell et al., 2011)
A Complete Guide to the Freshwater Fishes of Southern Africa (Skelton, 2001)
A Guide to the Common Sea Fishes of Southern Africa (Van der Elst, 1993)
Field Identification Guide to the Living Marine Resources of Kenya (Anam et al., 2012)
Maximizing Utilization of Pelagic Fish Resources (Hariono et al., 2006)

5.3.2 The Rules-Based Nature of Fish Trade: Implications of the WTO TBT and SPS Agreements — The National Obligations Under the OIE and WTO Fish Trade Facilitation Regimes

A. Introduction

Trade within national jurisdictions and across borders is increasingly affected by the proliferation of standards and technical regulations with increased regulatory intensity being particularly noticeable in the food and agricultural sectors covering cereals; fish, crustaceans and other aquatic vertebrates; edible preparations of meat, fish and crustaceans; edible vegetables, roots and tubers; prepared vegetables, fruit, nuts and other plant parts; and prepared cereals and flours (Sheldon, 2013). The proliferation of standards and technical regulations in both the food and agricultural sectors is typically regarded as the response of policymakers to consumer demands for improved product safety, increased environmental protection, and greater product information. Standards and technical regulations “have as their prima facie objective the correction of market inefficiencies stemming from regional, national, transnational, or global externalities associated with the production, distribution, and consumption of these products.

Standards in the food and agricultural sector can be classified under two broad categories: (i) provision of public goods such as control of pesticide use in agricultural production; and (ii) reduction of transactions costs associated with information asymmetries between producers
and consumers concerning food product characteristics, e.g., the extent of pesticide residues in
a product which consumers are unable to ascertain either before or after its consumption.
While the theory of optimal intervention prescribes that market distortions should be targeted
at source, there is also acknowledgement that they may also provide protection for domestic
producers and are, therefore, subject to “regulatory capture” (Sheldon, 2013). Given the
potential for standards and technical regulations to distort international trade, a key outcome
of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994 was the
securing of multilateral disciplines on their use through the World Trade Organization’s (WTO)
Agreement on the Application of Sanitary and Phytosanitary Measures (SPS), and the
Agreement on Technical Barriers to Trade (TBT). The objective of these agreements is to ensure
that standards and technical regulations, while potentially meeting legitimate economic
objectives, are not disguised restrictions on international trade.

Sheldon (2013) reports that there has been considerable discussion of the problems of
regulatory compliance faced by developing countries in accessing developed country markets,
given the latter typically have higher levels of regulatory intensity than the former. Testing the
hypothesis of “standards as barriers” has been a dominant feature of the limited amount of
empirical research on the impact of food safety regulations on trade flows of specific food and
agricultural commodities. A common finding of these empirical studies is that more stringent
standards imposed by developed countries act as barriers to trade.

B. Basic Definitions under WTO SPS and TBT Agreements

Certification system: the set of rules for executing of works on certification, its participants
and rules for operation of the certification system as a whole.

Standard: a document establishing, for the purposes of voluntary multiple use, the product
performances, the rules for realization and the characteristics of processes of production,
operation, storage, transportation, marketing and utilization, executing of works or rendering
of services. The standard may also contain the requirements for terminology, symbology,
packing, marking or labelling, and the rules for their affixing.

Standardization: the activity of establishing of rules and performances for the purpose of their
voluntary multiple use, aimed at achievement of orderliness in the spheres of production and
circulation of products, and at heightening of competitiveness of products, works or services.

Technical regulating: the legal regulating of relations in the field of establishing, application
and executing of obligatory requirements for products, processes of production, operation,
storage, transportation, marketing and utilization, and also in the field of establishing and
application, on a voluntary basis, of the requirements for products, processes of production,
operation, storage, transportation, marketing and utilization, executing of works or rendering
of services, and legal regulating of relations in the field of conformity assessment.

Technical regulation: a directive, compliance with which is mandatory, whereby the
competent authority, through an administrative action, establishes the characteristics of a
product or the production processes or methods relating to the product, including applicable
administrative provisions. It may also include, or exclusively address, requirements in the
areas of terminology, symbols, packaging, branding or labelling applicable to products,
including buildings, structures and constructions, for processes of production, operation,
storage, transportation, marketing and utilization. Preparation, adoption and application shall
be the responsibility of the respective Ministries or agencies duly authorized for this purpose.

C. Pivotal Provisions of the WTO SPS Agreement

SPS measures include all relevant laws, decrees, regulations, requirements and procedures
including, *inter alia*, end product criteria; processes and product methods; testing, inspection,
certification and approval procedures; quarantine treatments including relevant requirements
associated with the transportation of animals and plants, or with the materials necessary for their survival during transport; provisions on relevant statistical methods, sampling procedures and methods of risk assessment; and packaging and labelling requirements directly related to food safety.

D. Key Expectations

(i) Except under very special circumstances, countries generally benefit from removal or reduction trade barriers arising from SPS measures and technical regulations.

(ii) In principle, SPS standards are introduced by government in the interest of the society, to protect public, animal and plant health, and the environment.

(iii) In theory, establishment of SPS standards (or other technical standards) could facilitate trade through reducing transaction cost, by assuring consumers that the food they consume is of an acceptable standard and reducing the cost of uncertainty that they face in assessing product quality.

(iv) Standards can serve to signal quality in foreign markets and thus contribute to increasing elasticity of substitution between similar goods produced in different countries, thereby permitting relatively more efficient producers to thrive through export expansion.

(v) Efficiency of production would be increased through standardization as it reduces information asymmetries between buyers and sellers, and promotes product commutability, thereby allowing for increased economies of scale and scope.

E. Key Impacts

Importing countries may deliberately craft SPS measures that impose a cost or other disadvantage on foreign competitors to provide protection for domestic producers.

Even when comparable SPS measures are applied in developed countries to both domestic and imported products, they can act to impede imports from developing countries because of asymmetry in compliance cost.

Food safety has the potential of mutating to a ‘luxury’ good whose demand rises as income levels rise, and greater prosperity tends to be accompanied by increased demand for more stringent SPS standards in developed countries. Many in developed countries see the much laxer SPS standards that often prevail in developing countries as a threat precipitating ‘a race to bottom’.

As traditional trade barriers such as tariff and quantitative restrictions continue to decline, protectionist interests are likely to make increasing use of food safety regulations and other technical barriers to block trade.

Among African countries, TBTs and SPS measures have been deployed on the instigation of foreign interests to hinder intra-African trade.

Institutional capacity constraints to conduct conformity assessment on fish products coupled with rapid changes in the food safety perceptions of export destination countries. Significant investments are usually required to procure equipment, materials and competent human resources which represent a major barrier to developing countries.

Discriminative technical and financial assistance and transitional periods for the application of
environmental and biodiversity safeguards such as turtle excluder devices (TEDs) in shrimp trawlers to reduce sea turtle mortality (Asche et al., 2009).

The globalization of the fish trade has led to substantial product that is exported to one country, processed, and then re-exported, sometimes back to the original country. If product is processed in a country besides the one harvesting or producing it, traceability may be more difficult. Traceability requirements could then become technical barriers to trade not just for raw product but also for processed product that ostensibly originates in the importing country.

Export-oriented fisheries are subjected to legislative and regulatory pressures in the export destinations which may demand significant costs in legislative and regulatory reforms and upgrades of processing facilities, and in some cases loss of markets and closing down of facilities unable to upgrade (Henson et al., 2004).

The WTO SPS Agreement anticipates SPS measures differ in the first instance due to significant differences in tastes, diets, income levels and perceptions that influence the tolerance of populations toward these risks. Differences in climate and in the available technology (from refrigeration through to irradiation) affect the incidence of different food safety and agricultural health hazards. Standards reflect the feasibility of implementation, which itself is influenced by legal and industry structures as well as available technical, scientific, administrative and financial resources. Some food safety risks, for example, tend to be greater in developing countries due to weaknesses in physical infrastructure (for example standards of sanitation and access to potable water) and the higher incidence of certain infectious diseases. Further, tropical or sub-tropical climatic conditions may be more conducive to the spread of certain pests and diseases that pose risks to human, animal and/or plant health (Jaffee et al., 2004).

F. Key Obligations of Member States under WTO SPS and TBT Regimes

Member States are under the following obligations whenever they anticipate developing and adopting SPS measures and technical regulations:

F.1 SPS Measures

(1) Relevant technical regulatory authorities shall prepare, adopt and enforce technical regulations establishing essential minimum SPS measures in relation to products originating from the separate countries and/or places, including the restriction of import, use, storage, transportation, marketing and utilization, providing biological safety (irrespective of the ways of safety assurance used by the manufacturer).

(2) The SPS measures may provide for the requirements for products, for methods of product processing and production, for procedures of product testing, inspection, conformity assurance, the quarantine rules, including the requirements connected with transportation of animals and plants, for materials necessary to ensure life or health of animals and plants during their transportation, and also for methods and procedure of sampling, for methods of test and evaluating of risk and other requirements contained in technical regulations.

(3) Regulatory authorities shall ensure that any SPS measure that it prepares, adopted, maintained or enforced is:

(a) based on scientific principles, taking into account relevant factors including, where appropriate, different geographic conditions;
(b) not maintained where there is no longer a scientific basis for it; and

(c) based on a risk assessment, as appropriate to the circumstances.

(4) Each regulatory authority shall ensure that an SPS measure that it adopts, maintains or applies does not arbitrarily or unjustifiably discriminate between domestic goods and like goods of another country, or between goods of another country and like goods of any other country, where identical or similar conditions prevail.

(5) SPS Measures shall be proportionate to the appropriate level of protection, taking into account technical and economic feasibility.

(6) Regulatory authorities shall not adopt, maintain or apply any SPS measure with a view to, or with the effect of, creating a disguised restriction on trade.

(7) Technical regulatory authorities shall use, as a basis for preparing sanitary and phytosanitary measures, relevant international standards, guidelines or recommendations which will not be trade disruptive.

(8) Governments shall continuously register and analyse all cases causing harm, as a result of violation of requirements of SPS measures, to life or health of people, property of natural or legal persons, state or municipal property, environment, life or health of animals and plants, taking into account the weight of this harm, and also shall organize the informing of purchasers, manufacturers and sellers on the situation in the field of observance of technical regulation requirements.

F.2 Technical Regulations

(1) The following objectives shall constitute the legitimate purposes for the preparation, adoption and application of technical regulations in consistency with the provisions of the WTO TBT Agreement:

(a) protection of life or health of people, property of natural or legal persons, state or municipal property;

(b) protection the environment, life or health of animals and plants;

(c) prevention of actions misleading the purchasers / deceptive practices.

(2) In pursuing the legitimate objectives, regulatory authorities may establish the levels of protection that it considers appropriate.

(3) Regulatory authorities shall not prepare, adopt, maintain or apply any technical regulations with a view to or with the effect of creating an unnecessary obstacle to trade. An unnecessary obstacle to trade shall not be deemed to be created where:

(a) the demonstrable purpose of the measure is to achieve a legitimate objective; and

(b) the measure does not operate to exclude products of other Member States that meet that legitimate objective.

(4) Regulatory authorities shall ensure that a technical regulation shall:
serve clearly identified policy goals, and be effective in achieving those goals;

have a sound legal and empirical basis;

produce benefits that justify costs, considering the distribution of effects across society and taking economic, environmental and social effects into account;

minimize costs and market distortions;

promote innovation through market incentives and goal-based approaches;

be clear, simple, and practical for users;

be consistent with other regulations and policies; and

be compatible as far as possible with competition, trade and investment-facilitating principles at domestic and international levels.

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G. 
World Trade Organization (WTO) Dispute Resolution Mechanism

For any state or customs territory, WTO membership implies accepting limitations on regulatory autonomy in five areas: (1) trade in goods; (2) trade in services; (3) the protection of intellectual property rights; (4) the settlement of disputes; and (5) periodic review of national trade policies (Hoekman et al., 2007).

SPS and TBT Agreements address trade in goods and services and under the WTO legal obligations, all disputes arising from the implementation of these agreements shall exclusively be addressed through the Dispute Settlement Body (DSB).

Settling disputes is the responsibility of the Dispute Settlement Body (the General Council), which consists of all WTO members. The Dispute Settlement Body has the sole authority to establish “panels” of experts to consider the case, and to accept or reject the panels’ findings or the results of an appeal. It monitors the implementation of the rulings and recommendations, and has the power to authorize retaliation when a country does not comply with a ruling.

- **First stage: consultation** (up to 60 days). Before taking any other actions the countries in dispute have to talk to each other to see if they can settle their differences by themselves. If that fails, they can also ask the WTO director-general to mediate or try to help in any other way.

- **Second stage: the panel** (up to 45 days for a panel to be appointed, plus 6 months for the panel to conclude). If consultations fail, the complaining country can ask for a panel to be appointed. The country “in the dock” can block the creation of a panel once, but when the Dispute Settlement Body meets for a second time, the appointment can no longer be blocked (unless there is a consensus against appointing the panel).

Officially, the panel is helping the Dispute Settlement Body make rulings or recommendations. But because the panel’s report can only be rejected by consensus in the Dispute Settlement Body, its conclusions are difficult to overturn. The panel’s findings have to be based on the agreements cited.
The panel’s final report should normally be given to the parties to the dispute within six months. In cases of urgency, including those concerning perishable goods, the deadline is shortened to three months.

The agreement describes in some detail how the panels are to work. The main stages are:

Figure 35: The structure of the WTO (Hoekman et al., 2007)
(1) **Before the first hearing**: each side in the dispute presents its case in writing to the panel.

(2) **First hearing: the case for the complaining country and defence**: the complaining country (or countries), the responding country, and those that have announced they have an interest in the dispute, make their case at the panel’s first hearing.

(3) **Rebuttals**: the countries involved submit written rebuttals and present oral arguments at the panel’s second meeting.

(4) **Experts**: if one side raises scientific or other technical matters, the panel may consult experts or appoint an expert review group to prepare an advisory report.

(5) **First draft**: the panel submits the descriptive (factual and argument) sections of its report to the two sides, giving them two weeks to comment. This report does not include findings and conclusions.

(6) **Interim report**: The panel then submits an interim report, including its findings and conclusions, to the two sides, giving them one week to ask for a review.

(7) **Review**: The period of review must not exceed two weeks. During that time, the panel may hold additional meetings with the two sides.

(8) **Final report**: A final report is submitted to the two sides and three weeks later, it is circulated to all WTO members. If the panel decides that the disputed trade measure does break a WTO agreement or an obligation, it recommends that the measure be made to conform with WTO rules. The panel may suggest how this could be done.

(9) **The report becomes a ruling**: The report becomes the Dispute Settlement Body’s ruling or recommendation within 60 days unless a consensus rejects it. Both sides can appeal the report (and in some cases both sides do).

**Appeals**

Either side can appeal a panel’s ruling. Sometimes both sides do so. Appeals have to be based on points of law such as legal interpretation — they cannot re-examine existing evidence or examine new issues.

Each appeal is heard by three members of a permanent seven-member Appellate Body set up by the Dispute Settlement Body and broadly representing the range of WTO membership. Members of the Appellate Body have four-year terms. They have to be individuals with recognized standing in the field of law and international trade, not affiliated with any government.

The appeal can uphold, modify or reverse the panel’s legal findings and conclusions. Normally appeals should not last more than 60 days, with an absolute maximum of 90 days. The Dispute Settlement Body has to accept or reject the appeals report within 30 days — and rejection is only possible by consensus.

**H. Scientific Evidence as Basis for WTO Engagements**

The proliferation and enhanced stringency of food safety and agricultural health standards is a source of concern among many developing countries and those promoting the increased integration of these countries into the world trading system. Reflecting wider changes in the
trade regime for various agricultural and food products, there is a presumption that food safety and agricultural health measures can (and will) be used as a protectionist tool, providing 'scientific' justifications for prohibiting imports of certain products altogether, or discriminating against imports by applying higher standards and/or more rigorous regulatory oversight than on domestic suppliers.

The SPS Agreement permitted measures that were ‘necessary to protect human, animal or plant life and health’, yet required regulators to: (1) base measures on a scientific risk assessment; (2) recognize that different measures can achieve equivalent safety outcomes; and (3) allow imports from distinct regions in an exporting country when presented with evidence of the absence or low incidence of pests or diseases.

Scientific justification is called for wherever standards are deemed to not be based on established international standards. Yet, complications are inevitable given the wide range of areas for which no agreed international standards exist and given broad (and emerging) areas for which the state of scientific knowledge is incomplete. Hence, many of the controversies which have occurred surround the legitimacy and appropriateness of measures in the context of scientific uncertainty.

I. Capacity of African Member States to Engage in WTO

Most African countries have not developed the capacity to demonstrate compliance of their fish products to international or regional standards. The imposition of scientifically unproven limits or disproportionate requirements on products originating from African countries has not been scientifically challenged due to low capacity of Member States in carrying out comparative research.

To establish and enforce appropriate standards requires building expertise and devoting additional resources to applied science and public management. To a great extent this effort can be left to private firms wishing to expand domestic and international sales, but there remains a role for government in light of the public-good nature of effective standards. In defining and implementing more effective standards, however, many poor countries will need technical assistance from international organizations and specialists with expertise (Hoekman et al., 2002).

The SPS and TBT agreements have set a bar that must be met by exporting firms in developing countries. These agreements strongly encourage importing nations to adopt product standards that are at least as rigorous as those developed by international standards-setting bodies. Over time, all WTO members can be expected to adopt such regulations, with the richer members choosing even stronger rules. Thus, developing economies have no choice but to meet recognized international standards, at least for exports. It is likely, however, that such standards would have to be applied to all production within each country simply to inspire confidence in importing markets that goods are produced safely by all potential supply sources.

In this context, problems relating to the implementation of obligations under the TBT and SPS agreements rank high among developing country concerns. Lack of modern technical infrastructure and capacity to engage in international standards development activities and to provide internationally recognized testing and certification procedures for products is a common constraint. Without the resources necessary for building and maintaining modern standards and conformity assessment systems, it is difficult either to ensure rights or to exercise responsibilities under existing WTO rules. If developing countries lack resources to access information on international standards or to participate in their development, a key link between the rule of law as specified in the WTO system and developing countries’ ability to fulfill their obligations and defend their rights is called into question.
Many countries are also concerned to clarify provisions regarding special and differential treatment in the TBT and SPS agreements. India, for example, has recommended extending the timeframe for compliance by developing country members with the existing provisions of WTO agreements referencing standards. In a related vein, a number of developing countries have cited problems with their ability to react to notifications of new TBT and SPS measures. A notification of intent to promulgate a new regulation, with a 60-day open comment rule, is of questionable value to developing countries that have no capacity to respond.

Concern over the use of environmental standards to restrict imports is also prevalent among developing countries. The use of trade measures to enforce environmental standards is viewed with serious alarm by many countries with regard to both manufactures and agricultural products. Among other issues, the lack of clear rules on the appropriate use of labels to indicate environmental impact and the rise in the use of standards for process and production measures in industrial countries have been noted in developing country submissions to the WTO.

Questions of how and under what circumstances mutual recognition agreements (MRAs) are best implemented to facilitate trade have also been raised. Such agreements are used to reduce the trade-impeding effect of technical barriers through mutual recognition of national product testing and certification procedures. To date, they have only been negotiated between industrial countries, although both the TBT and SPS agreements encourage all WTO members to enter into MRAs.

Developing countries may use the WTO dispute resolution mechanism to raise concerns about whether particular standards in import partners meet SPS and WTO rules. This situation likely means that WTO panels must give greater voice to scientific evidence and representations by members of civil society. Developing countries need to monitor the development of dispute settlement in this regard and assert their own interests. It must be recognized, however, that the WTO itself is not a standards-setting body; it has neither the expertise nor the resources for this purpose. Ultimately, the real concern of developing countries must be to influence the development of global standards in ways that at least pay attention to their concerns.

J. WTO and the North-South Politics

There are arguments that since SPS standards have the latitude of protecting the health and safety of human, plant and animal life, their adoption and enforcement tend to be less transparent, allowing ample room for tweaking them to make them stronger than necessary for achieving optimal levels of social protection and to twist the related testing and certification (conformity assessment) procedures to make competing imports less competitive (Athukorala et al., 2003).

An example is given of the 1998 EC regulation that reduced the maximum permissible level of aflatoxin in foodstuffs and animal feed to a lower level than international standards specified by the Codex Alimentarius (EEC, 1998). The results suggest that the EU standards, which would reduce health risk by approximately 1.4 death per billion a year would reduce exports by more than 60% or US$ 670 billion from 9 countries (Cameroon, the Dominican Republic, Ghana, Nicaragua, Nigeria, Sudan, Senegal, Tanzania and Zambia) (Athukorala et al., 2003), as compared with regulation based on the international (Codex) standard.

There is evidence of some instances where standards prohibit trade altogether (Athukorala et al., 2003:432). For example, a EU regulation requires that dairy products be manufactured from milk produced by cows kept on farms and milked mechanically. This regulation virtually precludes imports from many DCs where milk production is by and large a smallholder activity. The EU recently invoked this regulation to ban import of camel cheese from Mauritania, bringing hardship to a small enterprise, which developed the product at a
considerable cost (Athukorala et al., 2003). The EU also raised the issue that Mauritania is not free of foot-and-mouth disease, although there is little scientific evidence to suggest that camels (or, in particular, camel milk) can transmit the associated virus. An Australian quarantine regulation requires that chicken meat imported from Thailand must be heated at 70 Celsius for 143 minutes to avoid the possibility of carrying a certain disease. This has effectively closed the Australian market for Thai chicken exporter (It is said that the required heat treatment transforms chicken into paper!). In June 2002, Thai authorities provided the Australian government with a risk assessment report showing that the risk of introducing IBDV to backyard flocks through cooked chicken meat was negligible.

References
Food Safety Issues, Trade and WTO Rules: A Developing Country Perspective (Athukorala et al., 2003)

Food Standards and International Trade (Sheldon, 2013)

The Oxford Handbook of the Economics of Food Consumption and Policy (Lusk et al., 2013)

African Perspectives on the Need for Global Harmonisation of Food Safety Regulations (Anelich, 2014)

The Impact of Food Safety and Quality Standards on Developing Countries Agricultural Producers and Exports (Chemnitz, 2011)

Trade and Competitiveness in African Fish Exports: Impacts of WTO and EU Negotiations and Regulation (Ponte et al., 2005)

Trade and Fisheries: Key Issues for the World Trade Organization (Asche et al., 2009)

Kenyan Exports of Nile Perch: Impact of Food Safety Standards on an Export-Oriented Supply Chain (Henson et al., 2004)

Bridging the Standards Divide: Recommendations for Reform from a Development Perspective (Wilson, 2001)


The Role of Science in the Uruguay Round and NAFTA Trade Discipline (Wirth, 1994)

5.3.3 Exploration of Standards and Regulations Applicable to Fisheries and Aquaculture

A. Sample Types of Standards and Standards-Type Deliverables
   (i) Terminology /Glossary: standard listing definitions of terms used in a particular sector, field or discipline serving to make communication uniformly understood

   (ii) Codes of Practice: standard comprising recommendations for accepted good practice as followed by competent and conscientious practitioners, and which brings together the results of practical experience and acquired knowledge for ease of access and use of the information

   (iii) Specifications: standard that sets out detailed requirements, to be satisfied by
a product, material, process, service or system, and the procedures for checking conformity to these requirements. Quality, safety and health characteristics of fish products, equipment and systems, e.g., tuna loins, smoked fish, fishing nets and gears, etc.

(iv) **Methods of conformity assessment**: standard that gives a complete account of the way in which an activity is performed (and, where appropriate, of the equipment or tools required to perform it) and conclusions are reached, to a degree of precision appropriate to the stated purpose. Test methods for parameters such as heavy metals, pesticide residues, organoleptic properties, freshness, phycotoxins, presence of diseases through microbiological, virological indicators; and inspection methods.

(v) **Metrological characteristics**: Confirming the actual weights of the products to avoid fraud

(vi) **Water and environmental quality, health and safety** parameters for aquaculture and capture fisheries

(vii) **Guide**: standard that gives broad and general information about a subject, with background information where appropriate

(viii) **Classification**: standard comprising designations and descriptions of different grades of a product and that identifies and arranges data in hierarchical order

(ix) **Publicly Available Specification (PAS)**: provisional document, developed under broadly the same processes as a formal standard and published when standardization of a particular subject is urgently required, but further research or development is required before it can be published as a formal standard.

(x) **Technical Specifications**: these are normative documents prepared and published when the subject in question is still under development or where for any other reason there is the future but not immediate possibility of an agreement to publish an ordinary standard. A Technical Specification may be established with a view to serving for instance the purpose of:

(a) publishing aspects of a subject which may support the development and progress of the market but where an ordinary Standard is not feasible or not yet feasible;

(b) giving guidance to the market on or by specifications and related test methods;

(c) providing specifications in experimental circumstances and/or evolving technologies.

The decision to publish a technical specification may be the necessary where:

(d) there had been insufficient support at the enquiry stage for the work item to progress to an ordinary standard;

(e) no consensus can be reached on the submission of the work item within the given target date.
The maximum lifetime of a Technical Specification is 6 years (i.e. one three-year period and one confirmation).

(x) **Technical Reports:** When a technical committee has collected data of a different kind from that which is normally published as a Standard (this may include, for example, data obtained from a survey carried out among the national bodies, data on work in international organizations or data on the "state of the art" in relation to standards of national bodies on a particular subject), the technical committee may decide, by consensus, to publish such data in the form of a Technical Report. The document shall be entirely informative in nature and shall not contain matter implying that it is normative. It shall clearly explain its relationship to normative aspects of the subject which are, or will be, dealt with in standards related to the subject.

Crucially, the development of a TR cannot conflict with, or contradict, existing or draft work within the formal standards arena and must complement, not conflict with, any legislation in the subject area.

No time limit is specified for the lifetime of Technical Reports, but it is recommended that Technical Reports be regularly reviewed by the responsible technical body to ensure that they remain valid.

**B. Rationale for Preparing a Standard**

**B.1 Problem Statement**

Many products fail to achieve their expected performance commercially and/or technically with disastrous results for the producer and dissatisfaction or worse for the customer. Key problems encountered by producers include:

(i) insufficient knowledge of the market/target customer;
(ii) inadequate understanding between customer and producer;
(iii) inadequate profit margins;
(iv) the product being too expensive;
(v) failure to meet regulatory requirements;
(vi) failure to meet performance targets;
(vii) the time to market being too long;
(viii) development expenditure being too high;
(ix) insufficient in-house skills and knowledge to cover the process;
(x) excessive warranty, delivery or other commitments creating serious financial obligations.

The main benefit in dealing properly with these problems is a better product for which the commercial and technical risks have been assessed and eliminated or reduced to an acceptable level. The benefit to the producer can be significant both in reducing the cost of the product and/or in improving the quality, reliability and commercial viability of the product.
It is easy to become obsessed with an innovative idea, or a new technology, without looking dispassionately at its overall viability or other justification to pursue it. By gathering sufficient information to understand the potential product its viability can be properly assessed. Gathering this information in a disciplined way facilitates decision making, and also exposes conflicts or trade-offs, allowing them to be resolved at an early stage and so avoiding problems later.

The three main areas that need to be understood when making decisions about the development of a new product include:

(a) commercial considerations;
(b) attributes of product performance necessary to satisfy the customer; and
(c) regulatory requirements.

Only when all the requirements for a new product have been understood is it possible to ensure that the product is safe or to review or test it adequately. Thus the development of a specification is the precursor to assuring safety, quality and reliability.

B.2 Principles

A standard shall:
(a) be complete within the limits given in its scope clause;
(b) be consistent, accurate and unambiguous;
(c) take full account of the current state of technical development;
(d) provide a framework in which innovation can be accommodated and supported; and
(e) be readily comprehensible to those who might reasonably be expected to use it (i.e. its target audience).
(f) not make any requirement in respect of compliance with the law or discharge of legal obligations.

The type of standard used shall be selected as being the most appropriate for its purpose. Irrespective of its target audience, the provisions of a standard shall be drafted with due regard to the legitimate needs of the whole community, and, in particular, to those of the end users of its subject matter.

NOTE 1 With a very few exceptions, standards do not have force of law: the application of a standard is almost always voluntary, although standards are very often used in support of legislation, and compliance with a standard is sometimes quoted in legislation as offering a route to discharging legal obligations.

NOTE 2 It is a fundamental principle that standards never make requirements or recommendations for compliance with particular legislation. To do so would imply that such compliance is optional; standards users are expected to obey the law regardless of whether they comply with standards.

NOTE 3 Legislation is constantly changing and evolving, and no standard can be expected to keep pace with these changes. In order to prevent a particular standard being regarded as an authoritative statement of current legislation, it is rare for legislation to be quoted or listed extensively. However, it is good practice to draw readers’ attention to particular important pieces of legislation that might have an impact on the way in which a standard is applied.

NOTE 4 Standards are very often used as the basis for contracts and it is therefore particularly important that they are drafted sufficiently clearly and robustly as to be able to withstand legal scrutiny.
C. Nature of Standards — Specifications

Product specifications are particularly important in outlining the fit-for-use characteristics of products. They are prepared to specify requirements for performance and technical attributes of a product and to give guidance on the process of making and using a product. The preparation of standard should be preceded by gathering of the requisite information as outlined hereafter.

C.1 Overview: The information to be collected must be prioritized noting that arriving at the correct values is an iterative process throughout the initial stages of the specification. In the case of trade-offs, conflicting requirements, or where there is a need to prioritize issues, the use of quality function deployment (QFD) can be a useful tool to aid decision making.

It is important to consider the whole life-cycle of the product and not just to concentrate on operation by the user. This means thinking about the market, product development, production, packaging, distribution, use, training, maintenance, repair, reuse, recycling, disposal and how each of these phases might affect the design (see Figure 1).

In evaluating which criteria relate to an individual product, it is recommended not only to use the checklists given in this standard, but also to think laterally about any other issues crucial to the success of the product and the satisfaction of customers. However the information is acquired it should be recorded.

![Figure 36: Steps in identifying the criteria](image)

C.2 Researching and Understanding Customer Needs: In the preliminary phase information about customer requirements should be acquired. The criteria that are, or need to be, established should include those that will make the product a success. These are likely to
be expressed in general terms but any limits on parameters such as size, weight, noise, power, colour or appearance should be included wherever practicable. The concept of universal/accessible design should be embraced, considering the widest possible range of users, including children, older and disabled people. A key issue is to ensure that the “voice of the customer” is heard throughout the organization in particular by those contributing to the new product design.

Conducting market research helps to identify customer needs, new market niches and customer acceptability. Initiating prototype testing, user trials, focus groups and user groups, involving consumers where appropriate, assists in achieving final model acceptance. It is important to identify the customer.

C.3 Researching and Understanding the Market: In order to assess the commercial viability of the product the size of the market, the competition, budgetary requirements, financial resources, return on investment, the window of opportunity and time to market should be understood. This information leads to conclusions about how and where to sell the product, the time-scales required, reliability and quality. All of these conclusions are criteria to be included eventually, as applicable, in the specification.

C.4 Understanding the Potential Product: In this phase the preferred product design begins to emerge and it becomes clear how the concept is to be implemented. Decisions are made about the final look and feel of the product and its performance. Trade-offs quite often need to be made between the customer’s perceived needs and what is feasible within technical, financial and time constraints. Trade-offs might also be necessary in order to reach the best overall solution. Any relaxation of requirements should be checked for impact on the commercial or technical viability of the product.

C.5 Understanding which Legislation and Standards are Applicable: For many products national legislations are applicable and it is necessary to establish which legislation and thus which regulations and standards may have an impact on the design.

C.6 Understanding How to Manufacture the Product: Once the detailed design has emerged (realization phase) product parameters can be finalized in the specification. The product’s architecture and detailed design can now be recorded fully in the design documentation. Criteria for manufacturing should be established in as much detail as practicable including methods of manufacture and test. Manufacturing staff (including those from any major sub-contractors) should be involved in this. Any special criteria for bought-in parts or sub-assemblies should be recorded.

C.7 Understanding How to Verify, Test and Validate the Product: When establishing the process of product conformity it is important to distinguish between verification, production testing and validation.

(i) **Verification** establishes that the design meets its specification. This may be achieved, to a degree, during the design process through the use of design reviews, etc. This is then supported by a final record showing that the overall design meets all the requirements.

(ii) **Production testing** ensures that individual examples of the product function satisfactorily.

(iii) **Validation** in its simplest form establishes that the product meets customer needs while at the other extreme it ensures that the product is fully fit for its intended purpose.
In the verification and validation process all the attributes of the product should be considered. Production testing covers critical and/or safety-related aspects and is only a subset of the overall product performance. It is usually necessary to test examples of the product fully to acquire the data to satisfy the initial design verification. Validation will include physical testing of the complete product under operating conditions to ensure that it meets the needs of the customer. Validation will also include recording the data as evidence of the validation process. With some products, validation may only be achievable with on-site testing.

In addition to proving the design it is usually necessary to prepare a production test specification. The application of production testing ensures that in the unfortunate event that a non-conforming product is produced it is not released. A balance may have to be drawn between the cost and delay of testing and the risk of a faulty product being allowed through. It is common to concentrate on safety testing and basic functionality. For simpler products sampling inspection can be appropriate in which case an acceptable quality level (AQL) should be chosen. If sampling inspection is used there is a finite and predictable risk of a defective product reaching the customer. For this reason sampling inspection is not appropriate for some criteria or products. If it is used this should be made clear on any declaration of conformity.

C.8 Understanding How to Support the Product: Criteria for supporting the product should be established as early as practicable. The nature of the design itself and the thoroughness of any instructions for use can have a bearing on the amount of support customers need. Arrangements for dealing with warranty claims, criteria for associated costs, response times and helpdesk performance should all be established, as applicable.

D Recording the Criteria

D.1 Overview: All relevant criteria should be recorded formally to build up the product specification document. Where criteria are known to be relevant, but their values are not yet established, they should be recorded as, for example, “TBD” (to be determined). This will reduce the likelihood of issues being overlooked later.

Figure 2 illustrates how, as criteria are acquired, they can be documented. For clarity, the process is summarized as a sequence, but it is more likely to be iterative within each step, or even between steps. The approach can be tailored to suit an individual product. Criteria should be covered to an extent that all interested parties will be satisfied.

It is useful to distinguish between the criteria to be recorded in the specification document and the associated commercial intelligence. It is vital to collect, assimilate and communicate the latter but for confidentiality reasons it may be prudent to keep it segregated from the product specification, particularly if this will be released outside the organization. Commercial intelligence can form an annex to the product specification.

All staff involved in the design process should be given ready access to all technical information and as much commercial intelligence as practicable. The specification may be in the form of handwritten text, a word-processed document, a computer database, or any other appropriate medium. Whichever method is chosen, some form of revision control should be in place (e.g. at least a date), to ensure users are working to up-to-date information as the document grows.

It is useful to adopt a formal structure for the document including numbered sections and subsections, or even numbered individual lines of the specification, so that references or changes to it can be made unambiguously at a later date.
D.2 Some Practical Tips for Writing a Specification: The following are some practical tips for writing a specification.

(a) Start preparing the specification document very early on.

(b) Prepare it in a form that can easily be read and used by others.

(c) For complex products with multidisciplinary design, areas of the specification may be
compiled by different people or sub-groups. Each should be aware of what the other is
doing and the information brought together for review.

(d) Start by writing all the obviously applicable headings even if it is not yet possible to fill
in any details (see Annex F for some suggestions).

(e) Put down all salient and useable information but be concise.

(f) Where possible be quantitative rather than qualitative: put down numbers, with
tolerances where practicable.

(g) Avoid being unnecessarily restrictive: this can increase eventual product cost or limit
design options.

(h) Always involve all the relevant people: research has shown that people tend to put too
great an emphasis on areas of their own expertise and not enough on others. Multiple
inputs help to counteract this effect.

(i) Writing a specification is an iterative process but try not to change the specification too
often.

(j) Allow changes in the specification early on in order to refine it. However, changes will
eventually become disruptive, so later unnecessary changes should be discouraged.

(k) Eventually changing the specification has to stop so that design work can proceed in a
controlled way. It may be extremely wasteful to try to undertake detailed design while
the specification is still changing.

(l) Good management is necessary to know when to change the specification and when not
to: it will give stability to the subsequent design process. It is important to try to
minimize disruption but nevertheless to be willing to accommodate important changes if
they are necessary to keep the specification on target to produce a successful product.

(m) A good way of deciding if a change should be allowed late on is to consider the cost of
the change compared with the loss in profit from leaving the design unaltered. Whilst
impossible to assess accurately, prompting the person who wants the change to think
about the degree of benefit compared with the cost of the disruption, helps to filter out
unnecessary cosmetic or minor changes, while allowing those that affect the product’s
function or reliability.

E. Types of Specifications

E.1 General: Specifications are generally written for two purposes:

(a) to state unequivocally requirements concerning the performance and technical
attributes of a product;

(b) to give guidance on the process of making and using a product.

The requirements and guidance needed to define and implement a product may be
incorporated into one document, or exist in a whole series of inter-related documents. The
approach taken is usually dictated by the size and complexity of the product and the precepts
of the organization concerned. Figure 3 illustrates the relationship between the various kinds of
specification used during a typical product life cycle.
E.2 Triggers: An outline of the proposed product to be specified may be given in an initial brief that states the customer’s key requirements. This initial brief may be further developed into a business proposal, project brief, design brief and, if necessary, a full performance specification. These preliminary steps should be taken during the project’s conception and feasibility phases, before any work on its implementation is authorized or started.

E.3 Requirements: A performance specification should state the required attributes of the product, together with any constraints, without giving a detailed technical description. This information should then be used during the implementation phase as the basis for preparing a product specification that contains a full technical description of the product.

A product specification may describe in detail a new product designed to meet a particular customer’s requirement or general market requirement, or an existing product. Such specifications may be used for contractual purposes.

The product specification needs to give all the information required to realize the product and provide objective evidence that the product conforms to its performance specification (or, in the absence of a performance specification, to the client’s initial brief).

Product specifications may also describe an existing product to a prospective customer and may be supplied in the form of a brochure, catalogue entry, handbook or user manual. Such descriptive specifications, when accepted by the customer, place an onus on the supplier to provide a product that conforms to the description; thus descriptions can become firm requirements.

E.4 Processes: Process specifications (see Figure 4) should be developed where necessary to give detailed guidance on the technical and procedural aspects of product implementation. They should be concerned with the required output, invariably the delivery of a product that conforms to the performance specification.

The specification of processes should be broad and of a general nature, relying on internal and external standards without necessarily making reference to them. These specifications are often referred to simply as procedures and should describe the way in which a set of inter-related resources and activities transforms inputs into outputs.

E.5 Other Types of Specification: A small selection of commonly used kinds of specification and their purposes are described in Figure 4. These may specify products and/or processes; they may be prescriptive and/or descriptive.
Figure 38 — Order of Use of Specification Types
Primary purpose of the product that also gives essential instructions concerning such matters as style, grade, performance, appearance, characteristics, conditions of use, health and safety, packaging, conformity assessment, reliability and maintainability.

Requirements that are to be incorporated in the product design, such as compliance with standards, processes and management systems.

Process and precautions to be observed in withdrawing from service and discarding or otherwise dispensing with a product and any associated waste or redundant materials.

Requirements to ensure that the product can be moved and stored with adequate protection from damage to itself, the environment, property and people.

Process for examining the product to determine its conformity with requirements given in the product specification.

Process and detailed procedures for installing the product, including, if necessary, unpacking, preparation, assembly, commissioning, testing and hand-over to the customer.

Process and detailed procedures for the routine, preventive and corrective maintenance needed to keep the product operating in accordance with its performance specification.

Constituents of the product, including raw materials, finished components and all other items required for its construction.

Process and detailed procedures for bringing the product into use and then operating and maintaining it so that the requirements of the performance specification are fulfilled throughout its life cycle.

Methods and logistics of creating the product, including the materials, equipment, physical conditions, facilities, personnel, procedures and sequence of activities that contribute to the delivery of an end product that conforms to its specification.

Criteria that need to be met before the product is handed over to the customer.

Process and detailed procedures for testing the product, including, if necessary, the criteria for assessing the test results for compliance with the acceptance and/or performance specifications.

**Figure 39 — Some Types of Specifications**
F. Management of Specifications during Preparation

F.1 Related Documents, References and Duplication: Before starting to prepare a specification, it is advisable to search for existing documents that might serve the same purpose, either in part or in whole. The following types of publication may be relevant to the proposed specification:

(a) the organization’s internal specifications;
(b) general rule documents;
(c) national, RECs, African and international standards;
(d) standards issued by professional, industrial, commercial and public sector bodies;
(e) technical books, journals and product catalogues;
(f) statutory instruments, conditions of contract and other legal conditions;
(g) specifications issued by prospective purchasers or specifications of other organizations.

Even if a suitable document is not found, some of the information obtained may be relevant to the proposed specification and should be referenced or incorporated as necessary.

F.2 Drafting Procedures: The sequence of the work in drafting a specification may not correspond to the order in which the specification is presented. A six-stage procedure for drafting a typical specification is given in Figure 5. This procedure is iterative, but for clarity the feedback lines are omitted in the figure.

F.2.1 First draft: The subject for consideration should be nominated then the objectives agreed with those directly responsible before collecting the appropriate data, such as relevant regulations, standard procedures, suppliers and prices. National and trade standards need to be sought, suppliers' catalogues collected and examined and existing applications noted.

If an initial investigation shows that an existing standard does not exist and the subject is worth pursuing, discuss the objectives between interested parties and decide on the form of standard required. Is it design, process or quality control for example?

Prepare a first draft of the standard for discussion. Some of the many points to be agreed at this stage are outlined below.

(a) **Proposed scope.** Does it conform to established standards or regulations (international, national, company)? Is it adequate for possible future development? Are there too many sizes? Do the sizes follow a logical progression?

(b) **Application.** For what applications is the scope suitable or unsuitable? Is the new standard to be applied retrospectively or for future use only?

(c) **Quality.** Is the item/procedure specified in sufficient detail to ensure consistent application?

(d) **Availability.** Can the articles be obtained at the right price, right quantities and at the right time?

(e) **Health and safety.** Are all regulations observed?
Compliance with national and/or international standards will ensure that most of the above points have been considered. The final form of the standard will then emerge to be published for comment, and when approved will be distributed to all who may have occasion to use it.

**F.2.2 Editing:** Most of the early drafts need to be edited to conform to the corporate style, particularly with regard to layout. Illustrations should be used to reduce text. Information from another standard should be cross-referred to rather than repeated from another standard. Repeated information is difficult to keep updated.

*Be brief:* Do not overelaborate, the aim is to convey information without ambiguity.

*Avoid jargon:* Documents may have to be understood by non-specialists.

*Use illustrations:* Illustrations can be used to minimize text.

*Cross-refer:* Do not repeat information already quoted in another standard.

*Include instructions for use:* These may be quoted once rather than in every document.

*Be precise:* Avoid words such as "etcetera", "whenever possible" or "wherever practicable" “unless specified elsewhere”.

**F.2.3 Circulating for Comment:** All interested parties should be consulted about a specification and a consensus obtained before the draft is issued. This may take longer in a large business or if more than one section or department is involved. In a smaller organization it is possible to dispense with a formal structure of committees and working parties. Consensus does not mean everyone unequivocally agrees but that all reasonable arguments are withdrawn.

Draft specifications should be circulated to all interested parties and the comments considered before issuing a second draft.

An accompanying note should be circulated with the draft to explain briefly its aim and to give the reasons why it is being produced. The responders should be asked to quote the relevant clause number, indicate whether the comment is editorial or technical and each comment should be accompanied with a proposal for the changed wording plus a justification for the change. The process of circulating for comment should be repeated until consensus has been reached, then the specification should be submitted for signature to the approved signatories. The signatures make the document "legal" and it is then printed and distributed via the document control system.

**F.3 Authorization for Issue:** The completed specification should be checked for accuracy and suitability for issue by a person who was not involved in its preparation, but who is conversant with the subject.

The quality management system needs to specify the persons in the organization who are authorized to sign a document as approved prior to release. The authority of specifications should be clear. A document applicable to more than two departments is considered as a business standard and is signed by the managing director.

**F.4 Management of Issued Specifications**

**F.4.1 Primary Identification:** Each specification should be given an identifying code, title and issue number. The code should identify the class of subject matter or the objectives of the
document, to facilitate classification in a library. It should also permit quick reference and traceability.

**F.4.2 Availability and Storage:** Copies of the specification should be recorded, stored and controlled so that they are directly available to all authorized users.

Most organizations use and store other organizations’ specifications. One approach to the storage of a variety of external specifications is to classify them on receipt, giving them internal codes, so that they can be traced.

**F.4.3 Review:** All specifications should be reviewed at regular intervals and amended as necessary. The interval between each review should not exceed 5 years.

**F.4.4 Change Management and Disposal:** A regularized procedure should be used to issue new documents and amendments. Holders of handbooks and individual documents need to be identified and addressed each time an amendment is made. The instruction has to state clearly whether the document being issued is new, revised or withdrawn, and the name of the holder and the location should be identified. Holders of standards documents should be asked to acknowledge receipt of amendment instructions and should be pursued if they do not. The holder of a standards handbook should similarly record who made an amendment on an amendment record sheet in the front of each volume.

A copy of each issue of the specification should be permanently archived, together with any information concerning modifications. Reference to archived specifications may be necessary at any time in the future, for example, as evidence in disputes and litigation. All obsolete specifications in circulation should be retrieved to prevent their continued use. It may also be necessary to destroy these copies for security reasons. Advance information on changes should be made using the official change channels.

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**Figure 40 — Stages in the preparation of a specification**
Figure 41: Interrelationship of Product Documentation
G Research File and Documentation Supporting Specifications

The research process supporting the development of a product specification shall be documented in detail and clearly indicate references which support decisions to set limits for parameters and characteristics which define the quality, health, safety and environmental provisions in the standard. Standardization experts should demonstrate updated understanding of the research and technological developments in their field of standardization rather than appearing to arbitrarily fixing parameters in standards. A well-organized and referenced research file creates a crucial baseline from which reviews and product diversification can proceed as well as serving to address any legal claims and product liability issues.

Where this standard is applied to simpler products, or smaller organizations, a suggested method is to consolidate all the technical information into one product specification (as shown in the top left-hand circle in Figure 6) and confidential information into a commercial appendix or file. The consequence is that the specification becomes one or two evolutionary documents rather than the traditional series where the earliest becomes obsolete.

The design verification results and design validation results illustrated in Figure 6 are necessary in order to be able to demonstrate that the final product meets the requirements of the product specification.

H Typical Standards for Fisheries and Aquaculture

We are focusing on standards applicable through the value chains, such as:

(a) Responsible fisheries (capture fisheries
(b) Good agricultural practices
(c) Good manufacturing practices
(d) Sustainable fisheries
(e) Certification and conformity assessments
(f) Product specifications
(g) Product market presentations
(g) Traceability standards for fish products

References


Future Society and Standards (Kwon et al., 2007)

5.3.4 The Central Concern of Standards and Regulations

A. Food Safety Laws and Regulations

A.1 Food laws and regulations cover all stages of the production, processing and distribution of food and animal feed. The general objectives of food laws and regulations are:

(a) guarantee a high level of protection of human life and health and the protection of consumers’ interests;

(b) guarantee fair practices in food trade, taking into account animal health and welfare, plant health and the environment;

(c) ensure free movement of food and feed manufactured and marketed in national or regional jurisdictions;

(d) facilitate global trade of safe feed and safe, wholesome food by taking into account international standards and agreements.

A.2 Food safety regulations require food facilities to have a food safety plan that includes:

(i) hazard analysis, preventive controls;

(ii) oversight and management of preventive controls;

(iii) monitoring; corrections and corrective actions (documented); and

(iv) verification that preventive controls are implemented and effective.

B. Food Safety Standards

The fish products must meet safety and health standards and be suitable for human consumption.

Food safety standards help companies establish good manufacturing processes so they can produce safe products that comply with food safety legislation and meet quality levels expected by consumers.
While in developed countries compliance with public and private food safety standards focuses on public health, in underdeveloped countries, the emphasis is on economic development and how standards shape access to markets and what is their economic impact on producers.

C. Public and private regulation

Food safety touches upon issues of public regulation, private supply chain coordination, and international trade. More stringent food safety standards have emerged in the recent past as the result of several factors, including advances in hazard detection and epidemiology, high profile health scares, scientific and regulatory consensus on best approaches to risk management, and the recognition of global standards and approaches under the WTO. As a result there is a consensus “among nations about the basic components of an effective food safety system... the vision is of a farm-to-fork, risk-based, scientifically supported safety control system”.

Public standards constitute legal requirements for market entry, and can be used by governments to deny market access for exporting countries or firms that fail to comply. These standards may include requirements that must be met by public agencies in exporting countries as well as by private firms engaged in export. Public standards must meet World Trade Organization requirements for transparency, equal application to domestic and imported products, and must be based on scientific risk assessment. Typically such standards change only infrequently. Private standards are set by buyers (or a by a consortium of firms) and include both safety and quality specifications for particular market channels. While they may be de facto requirements for particular buyers, failure to comply with private standards will not, by itself, preclude entry into an importing country. Private standards change over time as buyers manage risks and reputation, and thus compliance must also evolve.

New regulations or standards can add to production costs. In high-income countries, such costs are weighed against the public health benefits from reduced foodborne illness. But in developing countries, studies have focused on how standards shape market participation, exports, and farm incomes. Higher public standards in importing countries reduce traded quantities, especially from low-income exporters. Higher standards can serve as catalysts for improved management, higher value added, and greater efficiency in production and marketing. The costs imposed by more stringent standards have elevated concern that food safety standards pose a barrier to market participation by small farms or firms. The high non-recurring costs of setting up a food safety quality control system might give an advantage to larger firms and farms that can employ economies of scale and exclude smaller competitors. In addition, buyers incur higher transaction costs when they have to monitor compliance from many small suppliers.

Failure to meet public standards imposed by high-income countries led to the exclusion from markets of some developing countries and firms as new standards came into force in the 1990s. Examples include European Union (EU) bans on imports of fishery products from Bangladesh in 1997; from Kenya in 1997-2000; and from Malaysia in 1998); and a U.S. ban on raspberries from Guatemala in 1997-98. Case studies document how bans led to substantial export revenue losses and how many banned firms, struggling to comply, went out of business or, if they survived, incurred high compliance costs. Public sector support in exporting countries was sometimes required to underwrite investments beyond the reach of individual firms. Such support enabled a resumption of exports as firms came into compliance, but at a lower and less profitable level than before. Even where countries maintained export market access and avoided product bans, compliance costs were substantial. Thus, exporter compliance with public standards imposed by importing countries increased costs and may have reduced trade. Compliance with public standards to achieve access to high-income markets may be a strategic priority for some governments, which suggests a public sector role in compliance.
References

Measuring the Impacts of Food Safety Regulations: A Methodological Review (Ragona et al., 2008)

Harmonization of Legislation and Regulations to Achieve Food Safety: US and Canada Perspective (Keener et al., 2014)

Hygiene Requirements, Controls and Inspections in the Fish Market Chain (Çakılı et al., 2013)

Assessment and Management of Seafood Safety and Quality: Current Practices and Emerging Issues (Ryder et al., 2014)

Ensuring Safe Food: From Production to Consumption (NAS, 1997)

Safe Food Australia: A Guide to the Food Safety Standards (ANZFA, 2001)

Safety and Quality Issues in Fish Processing (Bremner, 2002)

Quality Control and Quality Assurance for Seafood (Sylvia et al., 1994)


5.3.5 Value Addition: Product Development and Innovation in Fisheries and Aquaculture

A Fresh, Frozen and Cured Fish and Aquaculture Products

Fresh and frozen whole finfish
Fresh and frozen whole bivalves

B Value Added Fishery Products

B.1 Breaded and battered products (including fried)
   (1) Shrimp breaded and battered
   (2) Squid breaded and battered
   (3) Cuttlefish breaded and battered
   (4) Octopus breaded
   (5) Clams breaded
   (6) Breaded fish fingers
   (7) Breaded crab cakes

B.2 Pickle, curry, meal kit. etc.,
   (1) Shrimp prepared products
   (2) Shrimp pickle
   (3) Shrimp curry
   (4) Squid prepared products
   (5) Cuttlefish prepared products
   (6) Fish pickle
   (7) Fish curry
   (8) Mussel / clam meat pickle

B.3 Surimi based products
   (1) Surimi products (Analogues)
B.4 **Freeze dried products**
1. AFD shrimp, AFD shrimp powder
2. AFD squid
3. AFD Cuttlefish
4. AFD Octopus

B.5 **Shrimp IQF products and Tray/pouch packs**
1. Shrimp IQF raw
2. Shrimp IQF blanched / cooked
3. Shrimp in tray / pouch packs
4. Shrimp IQF headon
5. Shrimp nobashi

B.6 **Squid IQF and its products and Tray/pouch packs**
1. Squid IQF raw
2. Squid IQF blanched cooked
3. Squid tube / rings

B.7 **Cuttlefish IQF / IF and its products and Tray/pouch packs**
1. Cuttlefish IQF/IF raw
2. Cuttlefish IQF blanched / cooked
3. Cuttlefish and its products in tray/pouch packs

B.8 **Octopus IQF / IF and its products**
1. Octopus IQF raw / whole cleaned
2. IQF / IF Octopus blanched / cooked

B.9 **Frozen Fish fillets / loins / steaks, chunks, portions etc. in tray / vacuum pack or in tray / pouches (except tuna)**

B.10 **Lobster whole cooked / half cut IQF / packed in tray /pouches**

B.11 **Stuffed crab, Raw crabmeat / soft shell crab**

B.12 **Tuna products and precooked loins and other such prepared products.**
1. Frozen yellow fin tuna (sashimi grade)
2. Frozen big eye tuna (sashimi grade)
3. Frozen tuna fillet and other tuna meat (whether or not minced)
4. Precooked loins and other such prepared products

B.13 **Canned seafood and canned / retort pouch products.**
1. Canned seafood
2. Retort pouch seafood products

C **Standards for Grades of Fishery Products**

(1) **Grades of Whole or Dressed Fish**
- Whole or Dressed Fish
- Frozen Headless Dressed Whiting

(2) **Grades of Fish Steaks**
- Frozen Halibut Steaks
- Frozen Salmon Steaks
(3) **Grades of Fish Fillets**

Fish Fillets  
Cod Fillets  
Flounder & Sole Fillets  
Haddock Fillets  
Ocean and Pacific Perch Fillets

(4) **Grades of Frozen Fish Blocks and Products Made Therefrom**

Frozen Fish Fillet Blocks  
Frozen Minced Fish Blocks  
Frozen Raw Fish Portions  
Frozen Raw Breaded Fish Sticks  
Frozen Raw Breaded Fish Portions  
Frozen Fried Fish Sticks  
Frozen Fried Fish Portions

(5) **Grades of Crustacean Shellfish**

Fresh and Frozen Shrimp  
Frozen Raw Breaded Shrimp

(6) **Grades of Molluscan Shellfish**

Frozen Raw Scallops  
Frozen Raw Breaded Scallops and Frozen Fried Scallops

(7) **Freshwater Catfish and Products made Therefrom**

Catfish

**References**


*Barriers to Compliance with International HACCP Regulations: A Whole Chain Approach to the National Fisheries Food Safety Management System in Sierra Leone* (Sheriff, 2013)

*Fish and Fishery Products Hazards and Controls Guidance* (FDA, 2011b)

*Handbook of Seafood and Seafood Products Analysis* (Nollet et al., 2010)

*Fish Handling, Quality and Processing: Training and Community Trainers Manual* (Ward et al., 2011)

*Adding Value to Local Fishery and Aquaculture Products* (FARNET, 2011)

*Background Paper on the Economics of Food Loss and Waste* (Segrè et al., 2014)

*Fish Processing: Sustainability and New Opportunities* (Hall, 2011)

*A Guide to Canning, Freezing, Curing, and Smoking Meat, Fish, and Game* (Eastman, 2002)
5.3.6 Preview of Processing Technologies and Innovation of Fish Products

(a) Cooking Fish (Frying or Boiling/Poaching)

Cooking provides short-term preservation of fish and it is usually a few days before any deterioration becomes noticeable.

A range of methods are used for cooking fish but the principle of the process remains the same. The flesh of the fish softens, enzymes become inactivated and the process kills many of the bacteria present on the surface of the fish.

Boiling and poaching both involve cooking the fish in hot water whereas frying uses hot oil. The advantage of these techniques is they are very simple and require no more than basic household equipment and are therefore suitable for small-scale production.

Cooked fish products are most usually for immediate consumption and require no sophisticated packaging. The shelf-life can be extended for a few days by using refrigerated storage and the product should be covered to prevent recontamination.

(b) Canning Fish and Fish Products

(i) Principles of canning

• Thermal destruction of fish-borne bacteria
• Quality, health and safety criteria for thermally processed fish

(ii) Packaging materials

• Glass jars
• Rigid metal containers
• Rigid plastic containers
• Flexible containers (pouches)
• Environmental issues related to packaging materials

(iii) Processing operations

• Pre-processing operations
• Heat-processing operations
• Post-processing operations
• Environmental issues and process optimization

(iv) Canning for specific species

Small pelagics
Preservation by Curing (Dried fish; Dried and salted fish; Dry-salted and smoked fish; Brined) and smoked fish

Curing involves the techniques of drying, dry salting/brining (soaking in salt solution) or smoking. These may be used alone or in various combinations to produce a range of products with a long shelf-life. For example:

- Drying - Smoking - Drying
- Brining - Smoking - Drying
- Salting - Drying
- Salting - Dry-salting - Smoking

Techniques such as these reduce the water content in the flesh of the fish, and thereby prevent the growth of spoilage microorganisms.

Dried fish
The heat of the sun and movement of air remove moisture which causes the fish to dry. In order to prevent spoilage, the moisture content needs to be reduced to 25 per cent or less. The percentage will depend on the oiliness of the fish and whether it has been salted.

Traditionally, whole small fish or split large fish are spread in the sun on the ground, or on mats, nets, roofs, or on raised racks. Sun-drying does not allow very much control over drying times, and it also exposes the fish to attack by insects or vermin and allows contamination by sand and dirt. Such techniques are totally dependent upon the weather conditions. The ideal is dry weather with low humidity and clear skies.

Alternatives to sun-drying involve the use of solar or artificial dryers. There has been a great deal of research on the development of solar dryers as an improved method of drying fish. This has shown that by achieving increased drying temperatures and reduced humidities, solar dryers can increase drying rates and produce a lower moisture content in the final products, with improvements in fish quality compared with the traditional sun-drying techniques.

Both solar and artificial dryers try to overcome the difficulties posed by sun-drying during the rainy season. With these dryers it is possible to minimize drying times and to increase the product quality. It should however, be pointed out that it is only advantageous to use such dryers if there is a market for a higher-quality product or if the fish would otherwise be lost.

Salted fish
Most food poisoning bacteria cannot live in salty conditions and a concentration of 6-10 per cent salt in the fish tissue will prevent their activity. The product is preserved by salting and will have a longer shelf-life. However, a group of microorganisms known as 'halophilic bacteria' are salt-loving and will spoil the salted fish.
fish even at a concentration of 6-10 per cent. Further removal of the water by drying is needed to inhibit these bacteria.

During salting or brining two processes take place simultaneously:

- water moves from the fish into the solution outside
- salt moves from the solution outside into the flesh of the fish.

Salting requires minimal equipment, but the method used is important. Salt can be applied in many different ways. Traditional methods involve rubbing salt into the flesh of the fish or making alternate layers of fish and salt (recommended levels of salt usage are 30-40 per cent of the prepared weight of the fish). There is often the problem, however, that the concentration of salt in the flesh is not sufficient to preserve the fish, as it has not been uniformly applied. A better technique is brining. This involves immersing the fish into a pre-prepared solution of salt (36 per cent salt). The advantage is that the salt concentration can be more easily controlled, and salt penetration is more uniform. Brining is usually used in conjunction with drying.

Ultimately the effectiveness of salting for preservation depends upon:

- uniform salt concentration in the fish flesh
- concentration of salt, and time taken for salting
- whether or not salting is combined with other preservation methods such as drying.

**Smoked fish**

The preservative effect of the smoking process is due to drying and the deposition in the fish flesh of the natural chemicals of wood smoke. Smoke from the burning wood contains a number of compounds which inhibit bacteria. Heat from the fire causes drying, and if the temperature is high enough, the flesh becomes cooked. Both of these factors prevent bacterial growth and enzyme activity which may cause spoilage.

Fish can be smoked in a variety of ways, but as a general principle, the longer it is smoked, the longer its shelf-life will be.

Smoking can be categorized as:

- **Cold smoking.** In this method, the temperature is not high enough to cook the fish. It is not usually higher than 35°C.

- **Hot smoking.** In this method, the temperature is high enough to cook fish.

Hot smoking is often the preferred method. This is because the process requires less control than cold processing and the shelf-life of the hot-smoked product is longer, because the fish is smoked until dry. Hot smoking does, however, have the disadvantage that it consumes more fuel than the cold-smoking method.

Traditionally, the fish would be placed with smouldering grasses or wood. Alternatively, fish may be laid or hung on bamboo racks in the smoke of a fire.

**Smoking fish traditionally**

There are various types of kiln available in different parts of the world, which are used for smoking. Although traditional kilos and ovens have low capital costs,
they commonly have an ineffective air-flow system, which results in poor economy of fuelwood and lack of control over temperature and smoke density. Improved smokers include the oil drum smoker and the chorker smoker.

As well as improved smokers, there are also improved techniques which involve either pre-salting the fish, so that the moisture content is reduced prior to smoking. Alternatively there are a range of improved kiln and oven designs (for details refer to the equipment catalogue section).

Production of cured fish products

The table below outlines the stages in the production of a range of products:

<table>
<thead>
<tr>
<th>Process/product</th>
<th>Gut</th>
<th>Wash</th>
<th>Treat with salt</th>
<th>Dry</th>
<th>Smoke</th>
<th>Dry</th>
<th>Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dried fish</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Dried and salted fish</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Dry-salted and smoked fish</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Brined and smoked fish</td>
<td>+</td>
<td>+</td>
<td>+ Brine solution</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Equipment required

<table>
<thead>
<tr>
<th>Processing stage</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gut</td>
<td>Cutting equipment</td>
</tr>
<tr>
<td>Wash</td>
<td>Weighing and measuring equipment</td>
</tr>
<tr>
<td>Salt</td>
<td>Brine meter</td>
</tr>
<tr>
<td>Smoke</td>
<td>Smoking equipment</td>
</tr>
<tr>
<td>Dry</td>
<td>Solar dryer</td>
</tr>
<tr>
<td></td>
<td>Fuel-fired dryer</td>
</tr>
<tr>
<td></td>
<td>Electric dryer</td>
</tr>
<tr>
<td>Pack</td>
<td>Packaging materials</td>
</tr>
<tr>
<td></td>
<td>Sealing machine</td>
</tr>
</tbody>
</table>

Packaging of cured fish products

The most important concerns regarding packaging for these products are to prevent moisture pick-up and to prevent recontamination by insects and microorganisms. Traditional packaging materials include cane baskets, leaves, and jute bags. Alternatives include flexible packaging such as polythene bags, or wooden and cardboard packs. Indeed, the two may be combined, as in a polythene bag enclosed in an outer cardboard pack.

Applicable Standards

CODEX STAN 311:2013, Standard for Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish

(d) Freezing and Chilling of Fish and Fish Products

The spoilage of fish is directly related to temperature. The higher the temperature, the faster the spoilage up to around 40°C, above which heat will...
destroy bacteria and enzymes. Any reduction in the temperature prior to processing will maintain the quality of the fish for longer.

Fish can be kept cool by covering it with clean, damp sacking and placing it in the shade. Although this method is simple and requires no special equipment, the fish still begins to deteriorate within a few hours.

An alternative is to pack the fish with ice. This is an effective method and preserves the fish for a longer period of time. Obtaining ice, however, can be difficult for the following reasons:

- Most ice-making machines are power-operated and therefore require some kind of fuel. Obtaining fuel can often be difficult and the machines may prove expensive to operate.

- A great deal of ice is required and often the cost of the ice is greater than the actual cost of the fish.

Freezing is an alternative method for cooling fish. This technique provides long-term preservation, but it is relatively expensive in terms of equipment and operating costs. In view of this it is not recommended for the majority of small-scale fisheries.

(e) **Surimi and Fish Mince Products**

- Introduction
  - Fish muscle proteins
  - Important protein properties in surimi processing
  - Appropriate species for surimi production
  - Surimi quality and sustainability

- The surimi process
  - Basic process elements
  - Energy consumption
  - Water consumption
  - By-product development

- Fish mince processing

Typically the resulting paste, depending on the type of fish and whether it was rinsed in the production process, is tasteless and must be flavoured artificially. According to the United States Department of Agriculture National Nutrient Database, fish surimi contains about 76% water, 15% protein, 6.85% carbohydrate, and 0.9% fat.
In North America and Europe, surimi also alludes to fish-based products manufactured using this process. A generic term for fish-based surimi in Japanese is “fish-puréed products”.

The fish used to make surimi include:

- Alaska pollock (*Theragra chalcogramma*)
- Atlantic cod (*Gadus morhua*)
- Big-head pennah croaker (*Pennahia macrocephalus*)
- Bigeyes (*Priacanthus arenatus*)
- Golden threadfin bream (*Nemipterus virgatus*)
- Milkfish (*Chanos chanos*)
- Pacific whiting (*Merluccius productus*)
- Various shark species
- Swordfish (*Xiphias gladius*)
- Tilapia
  - *Oreochromis mossambicus*
  - *Oreochromis niloticus niloticus*
- Black bass
  - Smallmouth bass (*Micropterus dolomieu*)
  - Largemouth bass (*Micropterus salmoides*)
  - Florida black bass (*Micropterus floridanus*)

**Fermented Fish Products** (fish which retains its original texture; pastes; liquids/sauces)

Fermentation is a process by which beneficial bacteria are encouraged to grow. These bacteria increase the acidity of the fish and therefore prevent the growth of spoilage and food-poisoning bacteria. Additionally, salt is used to prevent the action of spoilage bacteria and allow the fish enzymes and the beneficial acid-producing bacteria to soften (break down) the flesh. Fermentation is therefore the controlled action of the desirable micro-organisms in order to alter the flavour or texture of the fish and extend the shelf-life.

The use of fermentation as a low-cost method of fish preservation is commonly practiced all over the world. There are many different types of fermented products and their nature depends largely on the extent of fermentation which has been allowed to take place. They can be categorized as:

- fish which retains its original texture
- pastes
- liquids/sauces.

As with salting, there is little need for equipment other than pans and containing vessels, and the process may easily be carried out on a small scale.

The table below outlines stages in the production of a typical fermented-fish product.

*Fish paste (bagoong)*

This is a product from Eastern Asia. It is made from whole or ground fish, fish roe, or shellfish. It is reddish brown in colour, although this will depend on the raw materials used, and is slightly salty with a cheese-like odour.
Equipment required

<table>
<thead>
<tr>
<th>Processing stage</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash</td>
<td>Clean water</td>
</tr>
<tr>
<td>Drain</td>
<td>Cutting equipment</td>
</tr>
<tr>
<td>Gut</td>
<td></td>
</tr>
<tr>
<td>Add salt (approx 5 per cent)</td>
<td>Weighing and measuring equipment</td>
</tr>
<tr>
<td>Leave to ferment (for several months)</td>
<td>Fermentation bin</td>
</tr>
<tr>
<td>Add colouring (optional)</td>
<td></td>
</tr>
<tr>
<td>Pack</td>
<td>Sealing machines</td>
</tr>
</tbody>
</table>

Packaging of fermented fish

There are almost as many traditional methods of packaging fermented fish as there are ways of making it - such as earthenware pots, oil cans, drums and glass bottles. In the past, the latter have been used because of their low cost, but nowadays, cheaper plastic containers tend to replace the traditional types. The most important function of packaging for fermented fish products is that the containers should be air-tight, helping to develop and maintain the airless conditions required for good fermentation and storage. As the major advantage of these products is their low cost, the type of packaging is necessarily restricted. Glass bottles are often used for the better-quality products, but earthenware pots and even plastic bags are used.

Suitability for small-scale production

Although traditional processing represents a low-cost option for many small-scale producers, there may be large losses in terms of wasted fish. Improved technologies are usually techniques that require little in the way of expensive equipment, but at the same time increase the quality and the efficiency of the process. Often all that is needed to improve the process and the quality of the final product is the provision of clean water, education and training facilities, simple equipment, or basic materials.

It is important, as with all food processing ventures, to ensure that there is a market for the processed fish. Unfortunately, in areas where fresh fish is a more desirable commodity, small-scale fish processors, with their less-preferred cured products, may face fierce competition from larger-scale processors who have access to refrigeration and transport facilities.

Quality and standards of fermented fish products

Salting procedures; Micro-organisms; Fish enzymes; Temperature during fermentation; Nutritional issues; Flavour; Presence of lipids; Colour

Safety issues related to fermented fish products

Pathogenic bacteria; Parasites; Histamine and other biogenic amines

Fish Meal and Fish Oil Production

- Introduction
  - Fishmeal production
  - Conversion efficiency of fishmeal and fish oil
  - Nutritional value of fishmeal and fish oil
- The fishmeal process
  - Raw material unloading
  - The cooker
  - The press
  - The decanter
— Separators and purifiers
— Evaporators
— The drier
— Post-production operations
— Conclusions

• Sustainability issues
  — Energy
  — Water
  — Effluents
  — By-products
  — Cleaner production
  — Life cycle assessment of the fishmeal and fish oil process

• Alternatives to fishmeal
  — Fish silage
  — Fish protein hydrolysates
  — Plant-based alternatives to fishmeal

(h) Utilization of Fish Processing By-products for Bioactive Compounds

• Introduction
• Raw material chemical composition
• Protein hydrolysates and peptides
  — General aspects and production
  — FPH composition and use as food ingredient
  — FPH and peptide applications
  — Therapeutic and health-promoting properties

• Collagen and gelatin
  — Extraction conditions of fish collagens and gelatins
  — Functional properties
  — Therapeutic properties

• Omega-3 polyunsaturated fatty acid in fish
  — Composition
  — Extraction
  — Therapeutic properties

References
Fish Processing: Sustainability and New Opportunities (Hall, 2011)

5.3.7 Packaging and Labelling as the Weak Link in Fisheries Marketing

A. The Rationale for Packaging Fish Products

A.1 Packaging can be defined in several ways, including the following (Paine et al., 1992):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>A coordinated system of preparing goods for transport, distribution, storage, retailing and end-use</td>
</tr>
<tr>
<td>(2)</td>
<td>A means of ensuring safe delivery to the ultimate consumer in sound condition at minimum overall cost</td>
</tr>
<tr>
<td>(3)</td>
<td>A techno-economic function aimed at minimizing costs of delivery while maximizing sales (and hence profits)</td>
</tr>
</tbody>
</table>
Table 24 lists three of the more fundamental; (1) and (2) indicate that packaging contains and protects during transport and has an economic aspect. To ensure delivery, the package must at least provide information as to the address of the recipient, describe the product and perhaps explain how to handle the package and use the product. A little more thought and we recognize that packaging is part of the marketing process (Figure 42).

Marketing may be defined as the identification, anticipation and satisfaction of customer need profitably.

The basic function of food packaging is to identify the product and ensure that it travels safely through the distribution system to the consumer. Packaging designed and constructed solely for this purpose adds little or nothing to the value of the product; it merely preserves farm or processor freshness or prevents physical damage. Cost effectiveness is the sole criterion for success. If, however, the packaging facilitates the use of the product, is reusable or has an after use, some extra value can be added to justify extra cost and promote sales.

Packaging has also been described as a ‘complex, dynamic, scientific, artistic and controversial segment of business’. Packaging is certainly dynamic and is constantly changing. New
Thus, at its most fundamental, packaging contains, protects and preserves, and informs. At its most sophisticated, it provides two more functions—those of selling and convenience. In a world where the quality of products is high, in many instances almost the only difference between competitive brands lies in the packaging, and only packaging influences the selling operations. The last definition in Table 24 states: ‘packaging is a techno-economic function aimed at minimizing costs of delivery while maximizing sales (and hence profits)’. At this level, the value of—or even the need for—the added functions is controversial, and as a result opinions vary as to whether packaging is a waste of material and energy, or is properly utilized for the conservation of goods and reduction of labour. Containment, protection and information will always be essential in any packaging and these functions are basically conservational. How much we should spend on the ‘selling’ and ‘convenience’ functions and how far they are regarded as necessary, is a matter for discussion.

A.2 The Need for Packaging

A.2.1 Efficient packaging is a necessity for every kind of food, whether it is fresh or processed. It is an essential link between the food producer and the consumer, and unless performed correctly the standing of the product suffers and customer goodwill is lost. All the skill, quality and reliability built into the product during development and production is wasted unless care is taken to see that the consumer gets it in prime condition. Proper design is the main way of providing ‘a package which protects what it sells and sells what it protects’.

A.2.2 Thus, the packaging functions require specialized knowledge and skills, in addition to specific machinery and facilities, to produce a package which will provide most, if not all, of a number of basic requirements of which the following are the most important: containment; protection and preservation; communication; suitability for the packaging line, i.e. machinability; convenience in shape, size, and weight for handling and storage; adapted for the use of the product it contains; environmentally friendly in respect of manufacture, use and disposal. Moreover, these basics must be provided at one or all of the three levels of packaging usually employed, namely the primary pack, the secondary package or shipping container and the unit load.

A.2.3 These basic needs must now be examined in more detail together with some less important options.

1. **Containment.** Obviously, the package must keep its contents secure between the end of the packaging line and the time when all the food has been eaten.

2. **Protection and preservation.** The packaging must protect the food from both mechanical damage during handling and deterioration by the climate(s) through which the package will pass during distribution and storage in the home.

3. **Communication.** All food packaging must communicate. Not only must the contents be identified and the legal requirements of labelling be met, but often the packaging is an important factor in promoting sales. Also, the unit load and the shipping container must inform the carrier about its destination, provide instructions about the handling and storage of the food and inform the retailer about the method of opening the package and possibly even of the best way to display the product.

4. **Machinability.** The majority of modern retail packages and many transport packages are today erected, filled, closed and collated on machinery operating at speeds of 1000 units
or more per minute. They must therefore perform without too many stoppages or the process will be wasteful of material and uneconomic. Even when the numbers concerned are small and the items specialized, the need for a good performance in filling and closing operations is still important.

(5) 

Convenience and use. The most common impressions of convenience in retail packaging for foods are those of providing easy opening, dispensing and/or after use. Easy opening must be tempered by seal integrity. We must avoid the trap of producing an opening device which fails in transit, or of failing to provide sufficient control on the packaging line to ensure the device works 99% of the time. However, the provision of convenience is much wider than just these impressions. The shipping container as well as the primary packaging must provide convenience at all stages from the packaging line, through warehousing to distribution, as well as satisfying the needs of the user of the product.

A.2.4 We must also fit the packaging to the needs of the food and this involves answering questions such as:

- What age groups are we concerned with? Are they well informed, impulsive or irrational?
- What kind of packaging is used by the competition? Should we follow the general line or be different?
- What do distributors and retailers want from the packaging? Have they criticisms of our or the competition’s packaging?
- Is the relationship between packaging cost and the selling price of the food correct or does it give a wrong impression of the position in the market?
- Is the possibility of pilfering, tampering or stealing such as to make an impact on the design of package?
- Is the possibility of an after use for the packaging worth considering as a sales incentive and will the packaging be generally considered as environmentally responsible?
- Do we want a strong brand identity?
- Is there a range of related products that might form a family resemblance in the packaging?
- How will the packages be set out on retail shelves, etc.?

Such considerations will obviously differ according to the food concerned and the customers who are expected to buy. They can only be answered by a well conducted survey of the market.

A.2.5 To be effective, therefore, packaging must make the maximum contribution to the success of the marketing and distribution operations of which it forms a vital part, while at the same time be regarded as environmentally responsible. In general, technical developments in the packaging of any food product arise from changes in four main areas:

(a) Availability of newer materials and improved constructions, e.g. improved flexible barriers through metallizing and co-extrusion and changes in thermoforming techniques, etc.
(b) Developments in food processing and/or packaging machinery such as aseptic processing and modified atmosphere packaging as well as faster and more accurate computer control of machines.

(c) Changes in methods of storage and distribution.

(d) Improvements in methods of management and control, such as the use of bar codes and just-in-time (JIT) deliveries.

A.2.6 Developments in marketing also influence packaging. If we define marketing as ‘the identification, anticipation and satisfaction of customer need profitably’ we realize the influence that customer lifestyles could have on the packaging of food. In many instances improved packaging can promote a marketing response to customer demands or even change lifestyles, and in the food area consumers have reacted strongly to such influences as:

(a) Malicious tampering, whether for blackmailing retailers or other reasons.

(b) Green issues such as organic farming, more acceptable methods of animal husbandry and the reuse and/or recycling of packaging before final disposal.

(c) Health lobbies (low fat and sugar diets; elimination of artificial colourings and reduction in preservatives, etc.).

(d) A desire to reduce meal preparation time to a minimum.

A.3 Designing successful packaging

A.3.1 In order to design successful packaging four sets of facts must be considered:

- Product assessment
- The hazards of distribution
- Marketing requirements
- Packaging materials selection and machinery considerations.

A.3.2 All we need here are the answers to the question: How can the product be damaged or deteriorate? Some of these are obvious from a visual examination, some can be ascertained by simple measurements, whilst other information must be supplied by the designer and producer. The more important facts required are:

(a) The nature of the product—the materials from which it is made and the manner in which these can deteriorate.

(b) Its size and shape.

(c) Its weight and density.

(d) Its weaknesses—which parts will break, bend, move about, become loose, scratched or abraded easily.

(e) Its strengths—which parts will withstand loads or pressures and which might be suitable for locating the product in the pack.
(f) The effect of moisture and temperature changes on the product, and whether it will absorb moisture or corrode.

(g) Compatibility—whether the product is likely to be affected by any of the possible packaging materials, which items can be packed together, with protection if necessary, and which items must not be packed together under any circumstances.

(h) Possibilities for dismantling complex products, how far stripping down may be carried out to reduce the package size to a minimum, and whether the required assembly, installation and use instructions will be such that the customer can handle them.

B. Food Safety and Packaging Materials

B.1 Barone et al. (2015) reports that the connection between food safety and food packaging materials (FPM) is one of the most debated arguments in the modern world of food production. FPM is generally seen as a sort of accessory structure by inexperienced subjects with reference to the real edible content. On these bases, it could be inferred that FPs are not responsible for the use of FPM and related consequences: in fact, containers are clearly non-edible!

Food safety regulations recognize that packaging materials are active components of the so-called integrated food product (IFP) when used by food producers (FP). In other words, the FP is surely responsible for its own product, including the use and the management of food containers and similar components. These packaging materials are certainly able to determine and influence the safety and integrity of the packaged product with distinctive advantages, but the possibility of damages for the consumer has to be considered at the same time.

B.2 Chemical Food Safety

B.2.1 Chemical food safety deals with all aspects of chemical risks in food, which the World Health Organization introduces as follows: The contamination of food by chemical hazards is a worldwide public health concern and is a leading cause of trade problems internationally. Contamination may occur through environmental pollution of the air, water and soil, such as the case with toxic metals, PCBs and dioxins, or through the intentional use of various chemicals, such as pesticides, animal drugs and other agrochemicals. Food additives and contaminants resulting from food manufacturing and processing can also adversely affect health (Brimer, 2011).

B.2.2 Generally, the chemical risk is coincident with the concept of chemical contamination. In other words, the possible occurrence of apparent or clearly defined chemical hazards occurs if the designed IFP is not correlable with the planned chemical composition. One or more of the below-mentioned situations can occur:

1. Diffusion of foreign but edible contaminants in the inner and/or external layers, including the superficial area

2. Diffusion of foreign and non-edible contaminants in the inner and/or external layers, including the superficial area

3. Transformation of one or more original components of the final IFP because of predictable or unknown factors, with active influence of FPM
(4) Transformation of one or more original components of the final IFP because of predictable or unknown factors under incorrect storage conditions, without active influence of FPM

(5) Transformation of one or more original components of the final IFP because of predictable or unknown factors under incorrect storage conditions, with active influence of FPM

(6) Apparent transformation of sensorial features because of predictable or unknown factors under normal or incorrect storage conditions, with or without FPM ruptures or other damages.

B.2.3 The concept of chemical interaction between packed food and FPM is widely accepted in the scientific world and the recent regulatory has evidenced the attention of the national legislator in a number of countries. Anyway, three conditions have to be respected in relation to the possible migration of chemical substances from FPM to packed foods (the inverse migration is always possible). The following can be affirmed:

(a) The human safety cannot be compromised

(b) The chemical composition of packed foods cannot be modified in an unacceptable way in reference to the original product (these conditions state IFP and packed foods are two different concepts)

(c) Sensorial features of the IFP cannot be altered (for example, texture and colour are either correlable with packed foods and FPM at the same time).

B.2.4 As a result, the migration of potentially toxic or harmful substances from FPM to food products has to be carefully evaluated, with or without the modification of chemical compositions and sensorial features. Actually, every chemical or physical modification of IFP is important because of the intrinsic meaning of ‘warning light’: sometimes, food hygiene alerts may be highlighted by apparently strange or grotesque phenomena on the organoleptic viewpoint.

B.2.5 Metal Contamination and Toxicology

B.2.5.1 Metals are the most abundant group of chemical elements on the earth’s crust, and they are found in all foods. Some of these elements, such as iron, calcium, potassium and zinc, are present in nature and are considered essential when speaking of human diet at least, within certain specific tolerances. On the other hand, metals, such as lead, cadmium, arsenic and mercury, may be detected in foods and other commodities as contaminants and pose serious risks to the human health because of different factors, including the known bioaccumulation. By a general viewpoint, the detection of metals in preserved foods can have three main causes:

(i) Presence in raw materials used in the preparation of preserved foods. Metallic elements may be naturally present in raw materials. On the other hand, the detection of metals may depend on environmental contamination

(ii) Presence in food preparations before of the final packaging. The cause(s) can be originated on one or more of processing steps. Examples: contact with metal parts of processing plant (tubes, thanks, valves and electrodes)

(iii) Contamination of preserved foods during packing and especially during storage steps.
**B.2.5.2** Depending on the level of contamination, several corrective actions have to be put in place including (a) analyses of raw materials, (b) evaluation of production steps and (c) the examination of packaging and/or distribution processes (Barone *et al.*, 2015).

1. **Aluminium:** At present, there is no indication of any adverse health effects caused by released aluminium from packaging material, when speaking of packaged food products. The Joint FAO/WHO Expert Committee on Food Additives (JEFCA) of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) has established a ‘Provisional Tolerable Weekly Intake’ (PTWI) of 1 mg/kg body weight (b.w.) for aluminium in 2006. This limit applies to all aluminium compounds in food, including additives.

2. **Tin:** At present, there is no indication of a chronic toxicity of Sn in humans because this element does not accumulate in the organism (traces in the bones > soft tissues). The acute toxicity of Sn is rather low: according to a recently published study, tin levels up to 267 mg/kg in foodstuff do not cause any harm to the health of adults. It should be noted that there is a great variation in the sensitivity of individuals to Sn. Different levels for chronic and acute toxicity of Sn could be established.

3. **Lead:** The human exposure to Pb causes a variety of health effects with particular relation to children. People are exposed to Pb through the air they breathe, through water and through food/ingestion. Toxic effects are usually due to long-term exposure. The maximum limit for Pb in canned tomato paste is 1.0 mg/kg according to the Codex Standard 193-1995.

4. **Cadmium:** Oral exposure to Cd may determine adverse effects on a number of human tissues, including also the immune system, and the cardiovascular system. The intake of Cd from the diet is usually about 0.0004 mg/kg/day, roughly ten times lower than the typical amount needed to cause kidney damage by this route. With reference to this metal, the Codex Alimentarius Commission has defined a limit of 0.05 mg/kg.

5. **Arsenicum:** Inorganic As is well known as a notable human carcinogen; in addition, children can suffer other health problems in later life. Available data have shown that inorganic As causes cancer of the lung and urinary bladder, in addition to skin damages. There are no limits for As in most foods with relation to the USA, but the recognised standard value for drinking water is 10 ppb. With concern to the European viewpoint, the EFSA has recommended that the dietary exposure to inorganic As should be lowered in comparison with the JECFA PTWI of 15 μg/kg b.w.

<table>
<thead>
<tr>
<th>Fish product</th>
<th>Average values (mg/kg)</th>
<th>Max. allowed limits (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lead</td>
<td>Cadmium</td>
</tr>
<tr>
<td>Tuna in olive oil</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Mackerel filet in olive oil</td>
<td>&lt;0.03</td>
<td>&lt;0.03</td>
</tr>
</tbody>
</table>

**Table 25: Fish products in lacquered metallic cans: metal contamination**

**C. Chemical and Microbiological Aspects of the Interaction between Food and Food Packages**

1. Packages are an integral part of packaged foods; these necessary 'accessories' are designed to function as a protective barrier for foods in terms of quantity and preservation. However, it has been estimated that packages can represent also
C.2 At present, the packaging market appears to be dominated by plastic-made containers and objects. Modern environmental requirements force food packaging manufacturers to modify basic materials with the aim of supplying easily biodegradable packages. On the other hand, this type of packaging can also create good or acceptable conditions for the development of food degrading microflora.

C.3 In relation to the evaluation of the impact of packages on foods, an important element is the observation of the microbial behaviour when micro-organisms are in contact with packaging surfaces. The interaction between packages and microflora can influence food products in terms of safety and quality.

C.4 Microbes in contact with packaging materials may, after a more or less prolonged contact, inhibit their development. On the other side, there is a possibility of penetration into packaged foods. Microflora can also (a) adhere to both surfaces of the same package and (b) form biofilms. In detail, a remarkable modification in the development stage of micro-organisms in concomitant contact with packages and foods may occur. Subsequently, the microbial spreading can occur in packaged products with the typical metabolism of degrading micro-organisms. Sometimes, the contact of micro-organisms with packages is responsible for similar reactions; the delamination of laminates used for food packaging can occur.

D. Major Microbial Hazards Associated with Packaged Seafood

Kerry (2012) details that for most pathogens associated with seafood, cooking by the end user to an adequate temperature for a specific time will be suitable control to prevent illness. If, however, there is temperature abuse, heat-stable toxins may be formed or pathogens may have time to reproduce. Further, if seafood is harvested from waters contaminated by sewage (of either human or animal origin) or inadequate sanitation is followed at any of the unit operations from harvest to table, there will be greater opportunity for the development of seafood-borne illness. Obviously, it is undesirable to bring any seafood heavily contaminated by bacteria, viruses or amoeba into a processing facility due to the potential for contamination of ‘clean’ species and/or the potential for cross contamination. Furthermore, a seafood processor’s HACCP plan is written for events that are reasonably likely to occur – not any eventuality. There are never any guarantees that a raw seafood will be free of pathogens; however, it is critical to have some assurance from the harvester, receiving dock or wholesaler that species have been harvested from waters of purity acceptable within that locale. In the United States, waters are certified by state officials, while waters further than three miles from shore are overseen by the National Marine Fisheries Service (NMFS), an agency within the National Oceanic and Atmospheric Administration. Waters for growing aquacultured species should have similar assurances of purity, although they are geographically variable and have become a topic of regular reporting in the popular press.

E. Fish Product Labelling Requirements

E.1 Protection of consumers from misleading or inaccurate description and labelling of foods exists in most national jurisdictions and regional legislations have been harmonized protect citizens and to facilitate trade. These legislations require that any labelling,
advertisement or presentation of the food should not be misleading to the purchaser to a material degree, particularly:

- as to the characteristics of the food, and, in particular, as to its nature, identity, properties, composition, quantity, durability, origin or provenance, method of manufacture or production process
- by attributing to the food effects or properties that it does not possess
- by suggesting that the food possesses special characteristics when, in fact, all similar foods possess such characteristics.

E.2 Mandatory information required for pre-packed food which includes:

- the name of the food
- a list of ingredients
- the quantity of certain ingredients or category of ingredients
- the net weight of the food
- an indication of the durability of the food
- any special storage conditions or conditions of use
- the name and address of the manufacturer or packer, or EU seller
- lot identification
- place of origin, if omission would mislead to a material degree with regard to its true origin of provenance
- instructions for use if appropriate use of the food could not be made of the product without those instructions

Non pre-packed foods: Foods sold loose or just overwrapped, even in a tray, do not have to give all the mandatory information required for pre-packed foods. Only the name of the food needs to be given and the category of the class of additive, if used in the food. If the food is described by a legal name, then it still has to conform to the requirements associated with that name.

- Nutritional information: Unless a nutritional claim is stated – for example, low fat – then, nutritional information is given on a voluntary basis.
- Allergen labelling: ingredients known to cause allergies or intolerances need to be labelled.

E.3 Controls on Labelling of Fish and Shellfish

- the commercial designation of the fish/shellfish (i.e., an agreed commercial name for that species)
- the production method (i.e., whether it is farmed or wild, and, if wild, whether caught at sea or inland waters)
the catch area (i.e., an area of the ocean in the case of sea-caught fish, or country of production in the case of farmed fish or fish caught in inland waters).

References

A Handbook of Food Packaging (Paine et al., 1992)
Chemical Food Safety (Brimer, 2011)
Handbook of Seafood Quality, Safety and Health Applications (Alasalvar et al., 2011)
Advances in Meat, Poultry and Seafood Packaging (Kerry, 2012)
Food Packaging Hygiene (Barone et al., 2015)
Handbook of Fermented Meat and Poultry (Toldrá et al., 2007)
A Pocket Guide to the EU’s New Fish and Aquaculture Consumer Labels (EC DG-MAF, 2014)
Economics of Food Labeling (Golan et al., 2000)

5.3.8 Eco-Labelling and Sustainability Standards for Fisheries

In the standardization field, policy objectives are placed at the highest hierarchy and should inform the targets set be achieved by standards and conformity assessment. Owing to the dynamisms and imperatives of trade, it is recognized that in many situations policies are formulated as a response to the exigent state of play. Indubitably, the exigent state of play that informed the eco-labelling standards and certification regimes operating in Africa derived their mandate exogenously and are predominantly oriented towards satisfying the requirements formulated by marketing and retail chains in Europe and North America. In their original formulation, these standards and schemes were intended to satisfy European and North American consumers that the products, predominantly food were:

(a) Safe and healthy
(b) Produced in an environmentally sustainable manner which secured future supplies

In response to food safety scares of the 1990s, many governments in North America and Europe established mandatory requirements for firms to introduce Hazard Analysis and Critical Control Point (HACCP) food safety management systems (Washington et al., 2011). Private standards schemes in fisheries and aquaculture have emerged in areas where there is a perception that public regulatory frameworks are failing to achieve desired outcomes, such as sustainability and responsible fisheries management, or to ensure food safety, quality and environmental sustainability in the growing aquaculture industry. The two main types of private standards which affect fish trade relate to:

(a) “Ecolabels” which focus on sustainability of fish stocks and are designed to incentivize responsible fisheries practices and to influence the procurement policies of large retailers and brand owners, as well as the purchasing decisions of consumers.
Food safety and quality fish and seafood private standards which seek to offer guarantees related to quality, safety, environmental impacts, social responsibility, traceability, and transparency of production processes.

UNEP-TDIE (2009) recognizes that much of the interest in certification as a market-based initiative stems from the fact that certified products can be traded globally, and the value of international seafood trade has been growing rapidly in recent years. Resulting improvements in fisheries management from certification could result not just in the environmental benefits which are the main motivation for those establishing environmental certification schemes, but also potentially in significant contributions to both poverty alleviation and food security in developing countries through guaranteeing the long-term availability of fish stocks, increased long-term value-added and improved trade. Certification and ecolabelling thus have the potential to generate environmental, social, and economic benefits (UNEP-TDIE, 2009).

The concept of an African Ecolabelling Mechanism (AEM) was supported by UNEP under the African 10 Year Framework Programme (10YFP) on Sustainable Consumption and Production. The relevance of the AEM to African countries were highlighted in the background assessment report (Janisch, 2007) as follows:

1. **Environmental requirements:** Increasingly being used to define commercial relationships between producers and buyers by way of eco-labels.
2. **Market competitiveness:** Make African products competitive in destination markets and improve environmental and social aspects of production.
3. **Rationalize and unify eco-labels:** Reduce the need for individual green claims and avoid ‘label fatigue’ and ‘label clutter’.
4. **Locally relevant certification process with internationally-recognized standards:** Facilitate exports market for high-value sectors.
5. **Raise awareness on mitigating environmental impact in Africa.**
6. **Communicate the message of African sustainability:** Communicate the accurate message of sustainability that accounts for the African circumstances.
7. **Emphasise that an African Eco-label assures genuine benefits:** In particular that the label is part of providing institutional, environmental, social and economic wellbeing (poverty reduction) in Africa on a sustainable basis as opposed to existing eco-labels which offer partial solutions.
8. **Expanding Africa’s market access:** Evidence is strong that eco-labels have a role to play in expanding Africa’s market access and assuring customers that current issues of concern such as environmental degradation and greenhouse gas emissions are mitigated by compliance with the African eco-label.

These objectives helped to shape the African Ecolabelling Standards (ARS/AES). The African Eco-Labeling Mechanism (AEM) was formally established in 2010 to coordinate the development of sustainability standards and conformity assessment of the same with a view to issuing Eco-Labeling Certification for goods and services complying with these standards. A quick-win strategy was to develop a benchmarking scheme with a view to creating a mutual recognition arrangement for the various eco-labelling and sustainability schemes operating in Africa. While in the course of developing these standards there were strong voices arguing for the direct adoption of existing eco-labelling standards which already had international visibility.
and presence, or completely abandoning the African initiative in favour of giving recognition to existing schemes.

References

Ecolabelling and Certification in Capture Fisheries and Aquaculture (NAAS, 2012)

Ecolabelling and Fisheries Management (Gardiner et al., 2004)

Eco-Labelling and Sustainable Fisheries (Deere, 1999)

Eco-Label Conveys Reliable Information on Fish Stock Health to Seafood Consumers (Gutiérrez et al., 2012)

Fisheries and Aquaculture Certification: Implications for Southeast Asia (Wilkins, 2012)

Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Capture Fisheries (FAO, 2011b)

Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries (FAO, 2009)

Product Certification and Ecolabelling for Fisheries Sustainability (Wessells et al., 2001)

Private Standards and Certification in Fisheries and Aquaculture: Current Practice and Emerging Issues (Washington et al., 2011)

Is Certification a Viable Option for Small Producer Fish Farmers in the Global South? Insights from Vietnam (Marschke et al., 2014)

5.3.9 Introduction to ARS/AES 02:2014, Fisheries — Sustainability and Eco-Labelling — Requirements

This African standard originated from the realization that existing eco-labelling schemes and standards operating in Africa and across the world had specific biases with respect to the sustainability pillars. The current standard, ARS/AES 2:2014 takes into account Africa’s circumstances with the aim of ensuring that fisheries and aquaculture operations translate to genuine benefits for African operators and host communities rather than only satisfying the perceptions of foreign customers. It is important to recognize that ARS/AES 2 was developed in parallel with the PFRS and therefore some aspects of the PFRS may not be aligned. Below are the highlights of ARS/AES 2:2014.

ARS/AES 2 employs eight key principles which together with criteria and indicators address the sustainability perspectives:

(a) Principle 1: Legal compliance
(b) Principle 2: Respect human rights
(c) Principle 3: Respect labour rights
(d) Principle 4: Maintain fisheries resources and rebuild depleted fish stocks
(e) Principle 5: Maintain ecosystems integrity
(f) Principle 6: Contribute to the mitigation and adaptation to the detrimental effects of climate change.
(g) Principle 7: Responsible waste management
(h) Principle 8: Efficient use of resources

These eight (8) principles are detailed within the following outline:

(a) Governance and policy
   (i) Legal compliance
   (ii) Management systems
   (iii) Incentives for sustainable fishing
   (iv) Fishing methods and gear
   (v) Information for research
   (vi) Customary rights

(b) Social aspect
   (i) Universal Declaration of Human Rights
   (ii) Labour rights

(c) Fisheries resources
   (i) Fish stocks status
   (ii) Reference point
   (iii) Stock rebuilding
   (iv) Harvest strategy
   (v) Harvest control rules and tools

(d) Ecosystem approach
   (i) Fishing operations
   (ii) Retained species
   (iii) Bycatch species
   (iv) Endangered, threatened and protected (ETP) species
   (v) Habitats
   (vi) Ecosystem

(e) Climate change aspect
   (i) Climate change mitigation and adaptation
   (ii) Reduction of ozone layer depleting compounds

(f) Environmental Management

(g) Waste Management

(h) Resource Management
   (i) Energy Management

The standard is structured to support large scale as well as small-scale fisheries. The standard was optimized for inland and marine capture fisheries operations.

Reference
A printed or electronic copy of ARS/AES 02:2014, Fisheries — Sustainability and eco-labelling — Requirements to be provided.
5.3.10 Regional Trade Arrangements and Mutual Recognition of Standards and Conformity Assessment

Regional integration essentially refers to the process in which countries enter into a regional agreement in order to enhance regional cooperation through regional institutions and rules in various sectors. Many of the regional integration initiatives are driven by political, economic and security considerations leading to a wide range of forms of integration involving many African countries. The following are the common forms and characteristics of regional integration:

(a) **Preferential Trade Area (PTA):** Agreement of preferential conditions, such as lower customs duties or higher import quotas for certain goods.

(b) **Free Trade Area (FTA):** Extensive reduction of trade restrictions between the member states, usually covering the overall trade in goods.

(c) **Customs Union (CU):** Elimination of internal trade restrictions and introduction of common external tariffs, often in connection with the reduction of additional impediments, such as administrative barriers.

(d) **Common Market (CM):** Expansion of the freedom of movement of goods to the elimination of obstacles in other areas, such as free movement of capital, services and labour.

(e) **Economic Union:** Establishment of a uniform internal market, including the harmonization of national policies and of the economic framework.

Miesner (2009) reports that FTAs dominate regional integration schemes with 139 of the 152 WTO notified Regional Trade Agreements (RTAs) being defined as Free Trade Agreements (FTAs) whereas Customs Unions only account for 13 cases. Moreover, the establishment of regional economic communities is influenced by a range of economic, political and security-related considerations which may be summarized as follows (Crawford *et al.*, 2005):

(i) Exploiting economies of scale and benefits from specialization by expanding the domestic market and developing new markets

(ii) Attracting foreign direct investments, particularly for countries with low labour costs and a preferential access to larger markets

(iii) Enhancing integration processes in areas that are currently only insufficiently covered by multilateral agreements, such as investments, competition, environment or labour standards

(iv) Supporting the negotiating power in multilateral agreements by forming regional blocks and strengthening geopolitical alliances

(v) Consolidating peace processes and promoting violent-free solutions to conflicts by a regional cooperation on security issues

The elimination of technical barriers to trade (TBTs) constitutes one of the fundamental requirements of any regional integration. These TBTs arise due to the discrepancy of national standards of trading partners from international standards and they have the following consequences for international trade:
(i) products, processes and systems are subject to different mandatory requirements and may therefore violate legal regulations of the trading partner,

(ii) testing procedures that assess the conformity of products, processes and systems against defined requirements may not be recognized,

(iii) conformity assessment bodies of the trading partner which cannot prove their competence against agreed standards may not be trusted.

WTO (2005) highlights the importance of standards in trade by stating that it is through sharing a common standard that anonymous partners in a market can communicate, can have common expectations on the performance of each other’s product, and can trust the compatibility of their joint production. Thus, standards are necessary for the smooth functioning of anonymous exchanges – and therefore, for the efficient functioning of the market. It is for this reason that the issue of a quality infrastructure has always been a key part of regional trade agreements. Recent reports indicate that over 80% of the global trade is already affected by standards and technical regulations (Gonçalves et al., 2011). This means that for a regional integration agreement to function smoothly, there must be a robust quality infrastructure to underpin it. Miesner (2009) explains that the contributions of the quality infrastructure to regional economic integration depends on the selected form of integration and include:

1. **Removal of technical barriers to trade**: Regional economic integration aims at reducing trade barriers between the member states. A quality infrastructure is fundamental to the harmonization and mutual recognition of standards, technical regulations and conformity assessments, thus providing the basis to overcome non-tariff trade barriers.

2. **Improvement of competitiveness of enterprises**: Regional economic integration creates larger domestic markets and promotes the establishment of transnational value chains. A quality infrastructure increases the compatibility between suppliers and customers, reduces transaction costs, provides developing countries with an easier access to international good practices and improves the competitiveness of small and medium-sized enterprises in particular.

3. **Strengthening of socio-economic coherence**: Regional economic integration is often characterized by cooperation in the field of individual sector policies, such as environmental and health policies. A quality infrastructure provides the technical framework for establishing common limiting values and other regulatory requirements and provides capacities for the effective implementation of those requirements.

4. **Safeguarding of interests from other regional economic blocks**: Regional economic integration leads to the creation of economic blocks that significantly shape the global economic framework. A quality infrastructure combines the available technical know-how of its member states and channels the input into multilateral negotiation processes in order to safeguard regional interests.

5. **Strengthening the negotiating position in trade disputes**: Regional economic integration requires a common position in trade disputes with other economic blocks that will often involve the interpretation of TBT-related facts and findings (such as bans on the import of contaminated food products). A quality infrastructure supports trade policy dialogues with the aid of scientific-technical insights based on recognized test results.
(6) **Consolidating the regional technological autonomy:** Regional economic integration facilitates the bundling of regional resources in order to establish competitive institutions for research and development. A quality infrastructure helps to utilize existing national know-how, to develop specialized networks, and to enhance the technological emancipation of the region.

The degree of contributions of the quality infrastructure to regional integration must be coupled with the other fundamental structures such as the condition of regional transport and communications networks and the development stage of local production facilities as well as the quality of technical, administrative and political institutions in general.

**References**

*The Answer to the Global Challenge: A National Quality Infrastructure* (Sanetra et al., 2007)

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*Standards Harmonisation in ASEAN: Progress, Challenges and Moving Beyond 2015* (Pettman, 2013)


*Quality Systems and Standards for a Competitive Edge* (Guasch et al., 2007)

**5.3.11 Hygiene and Food Safety in Fisheries and Aquaculture**

Key considerations include the following:

**A. Risks associated with seafood consumption**

**B. Structural, equipment and process requirements**

**B.1 Primary Production**

**B.1.1 Fishing And Harvesting Vessels**

**B.1.1.1 Fishing Vessels And Fish Handling Equipment**

**B.1.2 Factory Vessels**

**B.1.2 Aquaculture Production**

**B.1.3 Landing Centres**

**B.2 Fishery Establishments**

**B.2.1 Processing Plants**
B.2.2 Freezer And Processing Vessels

B.3 Fish Markets

B.3.1 Wholesale Markets

B.3.2 Retail Sales Markets

B.3.3 Mobile Sales

C. Operational hygiene requirements for safe seafood

C.1 Safety Of Water, Ice And Steam

C.2 Cleaning And Sanitation

C.3 Hand Washing, Hand Sanitizing And Toilet Facilities

C.4 Prevention Of Cross-Contamination

C.5 Pest Control

C.6 Waste Management

C.7 Personal Hygiene And Control Of Workers’ Health Conditions

C.8 Transportation And Storage

C.9 Labelling, Product Information, Traceability, Training, Recall Procedures

References

Hygiene Requirements, Controls and Inspections in the Fish Market Chain (Çaklı et al., 2013)

Handbook of Fermented Meat and Poultry (Toldrá et al., 2007)


5.3.12 Compliance with Standards and Certification as a Tool for Market Access

Standards are increasingly critical for global trade competitiveness and becoming more decisive at the domestic level in all countries. Trends indicate that even for domestic markets, standards will increasingly represent the rules of the game. This is especially true for higher-value and perishable products including fruit, vegetables, seafood, dairy, and meat products. Standards, like the markets they serve, are dynamic and rapidly evolving. They pose very substantial challenges, especially for smaller producers. Yet, within the challenge of standards there are a host of opportunities. Governments should look beyond the immediate costs to the prospects and the catalytic role that standards offer both for national competitiveness and
environmental sustainability. For developing countries, these standards provide competitive options with higher-value products, especially sustainability standards such as organics whose process management and traceability can aid market entry and whose application methods are well suited to small-farm conditions.

References
Voluntary Sustainability Standards and Economic Rents: The Economic Impacts of Voluntary Sustainability Standards Along the Coffee, Fisheries and Forestry Value Chain (Sexsmith et al., 2009)

Standards and Market Access Under EPAs: Implications and Way Forward for EAC (Otieno et al., 2009)

Standards and Market Access: Opportunities and Challenges for East African Exports into European Union (CUTS, 2009)
6. University Students Working on Standards and Research Work

6.1 Methodology of Delivery

This module is designed to introduce university students into the processes involved in standardization, trade facilitation, the real-world state of play in fish trade, the application of standards in research and innovation and the development dimensions of fisheries and aquaculture. The session is expected to be two weeks during which the students should be able to develop an outline of a standards development proposal.

The mode of delivery is expected to be PowerPoint presentations with substantive papers prepared and bound for ease of reference. Additional materials will be provided in electronic format.

6.2 Institutional Coordination

ARSO will be primarily responsible for ensuring effective delivery of the workshop. Coordination with the departments of fisheries, national WTO TBT and SPS coordinators, national standards bodies, fish processors and traders associations, PAQI and individual consultants will be considered.

6.3 Content Outlines: University Students

The content outline seeks to relate fisheries and aquaculture resources to standards, regulations and conformity assessment as market access tools and socioeconomic development. The purpose is to establish a firm foundation for the students to develop basic skills of approaching fisheries and aquaculture with high level of understanding the quality infrastructure necessary to support a sustainable fisheries and aquaculture nationally and regionally. This ties in well with ARSO’s programme of introducing Education about Standards (EaS) in the education system of African countries.

6.3.1 Fisheries and Aquaculture Resource Endowments of Africa: A Review

A. Introduction

The fisheries resources in Member States include the following depending on the geographical positioning:

(a) Marine capture fisheries
(b) Inland capture fisheries and
(c) Aquaculture

B. Marine Capture Fisheries

This is practiced both at artisanal and industrial scales. Key fish species include:

(1) Hake
(2) Horse mackerel
(3) Anchovy
(4) Pilchards
(6) Lobsters
(7) Tunas: Bluefin tuna; Southern albacore; Yellowfin; Bigeye; Skipjack
(8) Shrimps and prawns
(9) Demersal fish: breams; Groupers, and Snappers
(10) Octopuses
(11) Scallops and clams

C. Inland Capture Fisheries

This is practiced both at artisanal and industrial scales. Key fish species include:

(1) Nile perch: *Lates niloticus* and *L. macropthalmus*
(2) Tilapias:
(3) Small pelagic fishes: *Rastrineobola argentea* (Dagaa/Omena/Mukene), *Stolothrissa tanganicae* and *Limnothrissa moidon* (Kapenta), *Poecilothrissa muweruensis* and *Bangueluensis* (Engraulicypris moeruensis) (Chisense) *Neobola bredoi* (Muziri) and *Brycinus nurse* (Ragoogi)
(4) African Lungfish
(5) African catfish: *Clarias gariepinus*
(6) Common Shrimp: *Caridina nilotica*
(7) *Stolothrissa tanganicae*: Lake Tanganyika sprat — Chilwe, Kapenta, Nsembe (Zambia); Ndagala (Burundi); Dagaa, Ndagala, Ndakala (Tanzania); Ndagala (DR Congo).

Table 26: Some Common Fish Species in African Water Bodies

<table>
<thead>
<tr>
<th>Lakes</th>
<th>Coverage (km²)/Countries</th>
<th>Production</th>
<th>Main species</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>68.800 km² Kenya, Tanzania and Uganda</td>
<td>900000 (2010)</td>
<td><em>Lates niloticus</em> (Nile Perch) <em>Rastrineobola argentea</em> (Dagaa), <em>Oreochromis niloticus</em> (Tilapia) <em>Haplochromis</em>, <em>Bagrus</em>, <em>Clarias</em>, <em>Synodontis</em>, <em>Protopterus</em></td>
<td>Dagaa (60%), Lates (30%) and Oreochromis (7%) 194,172 fishers and 65758 fishing crafts (2010)</td>
</tr>
<tr>
<td>Tanganyika</td>
<td>32.900 km² Burundi, DRC (45%) Tanzania (41%) Zambia</td>
<td>200.000 tons in (2011)</td>
<td><em>Stolothrissa tanganicae</em> and <em>Limnothrissa moidon</em> (Kapenta) <em>Lates stappersii</em> (Bukabuka Mukeke) <em>Lates angustifrons</em> (Capitaine) <em>lates Marie</em> (Ngonzi, Sangala) <em>Lates microlepis</em> (Nonzi/Nyunvi) Tilapine</td>
<td>About 94,800 active fishers (2011). Kapenta contributes 60% to total catch and lates stappersii 30%</td>
</tr>
<tr>
<td>Malawi/Nyasas</td>
<td>29600 km² Malawi, Tanzania and Mozambique</td>
<td>50.600 (2007)</td>
<td><em>Haplochronis spp.</em> (Mbuna), <em>Copadichromis spp.</em> (Utaka), <em>Preochromis spp.</em> (Chambo), <em>Rhamphochromis spp.</em> (Ncheni), <em>Engraulicypris sandella</em> (Usipa), <em>Barbus paludinosus</em> (Matemba), <em>Bagrus meridionalis</em> (Kapango) and <em>Clarius, gariepinus</em> (Mlamba)</td>
<td>About 50.000 fishers and over 350000 fish processors, traders etc in Malawi</td>
</tr>
<tr>
<td>Turkana (Rudolf)</td>
<td>7200(7570) km² Kenya and Ethiopia</td>
<td>2.493 (2005)</td>
<td>Nile perch, Tilapia, Labeo, bagrus, Barbus, Citharinus, Distichodus, Clusius, Symodontis, Hydrocynus forskali</td>
<td>New Supplier to regional trade for DRC</td>
</tr>
<tr>
<td>Albert</td>
<td>5270 km² DRC 46% and Uganda 54 %</td>
<td>More than 150.000 (in 2010)</td>
<td><em>Alestes baremose</em> (Ngaarin), <em>Hydrocynus forskali</em> (Ngaarin), <em>Lates niloticus</em>, <em>L. macrophthalmus</em>, <em>Brycinus nurse</em> (53 %), <em>Neobola</em> (j22% Bagrus bayad)</td>
<td>The small pelagic (Ragoogi and Muziri) catch is over 60 % of the Lake in Uganda Production data is for Uganda only</td>
</tr>
<tr>
<td>Lakes</td>
<td>Coverage (km²)/Countries</td>
<td>Production</td>
<td>Main species</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------</td>
<td>------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mweru-Luapula</td>
<td>4580 km² Zambia 58% and DRC 42%</td>
<td>More than 22,000 (in 2010)</td>
<td>Poecilothrissa mweruensis and Bangeluensis (Chisesnse) Oreochromis macrochir (Tilapia) Hydrocynus vitattus (Tiger fish)</td>
<td>About 25000 fishers in Zambian waters</td>
</tr>
<tr>
<td>Edward</td>
<td>2325 km² Uganda 29% and DRC 71%</td>
<td>10,000 (2010)</td>
<td>Tilapia, bagrus, barbus, Protopterus. Clarias, Haplochromis</td>
<td>516 fishers (No. of fishers, boats, fishing gears are controlled/set in Uganda)</td>
</tr>
<tr>
<td>Kariba</td>
<td>5400 km² Zimbabwe and Zambia</td>
<td>23226 (in 2001)</td>
<td>Limnothysa miodon Oreochromis spp. Tilapia rondalli, Labeo hydrocynus vittatus, Mormyrdis, Clarias gariepinus</td>
<td>Lake Kariba is famous for Cage Fish farming. Kapenta</td>
</tr>
<tr>
<td>Kivu</td>
<td>2370 km² Rwanda 42% and DRC 58%</td>
<td>7000 (1991)</td>
<td>Oreochromis niloticus, (Ingerge), Stolothrysissa tanganicae and Limnothysa miodon (Kapenta) Barbus spp., Clarias spp. Haplochromis spp.</td>
<td>About 6500 fishers Kapenta (Limnothysa contribute over 80% of the total catch)</td>
</tr>
</tbody>
</table>

**D. Aquaculture Fisheries**

African aquaculture can broadly be divided into two: community based aquaculture which is promoted by international organizations, aid agencies and governments as part of their efforts to alleviate poverty, create livelihoods and improve the food supply situation; and commercial aquaculture, which is mainly privately financed and export oriented. Key fish species include:

1. African catfish (*Clarias gariepinus*)
2. Trouts
3. Tilapias (*Oreochromis niloticus, O. andersonii, O. macrochir, and Tilapia rendalli* especially)
4. Common carp (*Cyprinus carpio*)
5. Freshwater prawns (*Machrobraccium rosenbergii*)
6. Marine species include the Black Tiger prawn (*Penaeus monodon*)
7. Oysters (primarily the Pacific Oyster *Crassostria gigas*)
8. Abalone

**E. Non-Fish Aquatic Resources**

There is a markedly significant farming of the Nile crocodile (*Crocodylus niloticus*) in some African countries for skin and meat.

**F. Economic Contribution of African Fisheries and Aquaculture**

A recent study by de Graaf *et al.* (2014) estimates the value added by the fisheries sector as a whole in 2011 to be more than US$24 billion, 1.26 percent of the GDP of all African countries. Detailed figures by subsector highlight the relevance of marine artisanal fisheries and related processing, and also of inland fisheries, which contribute one-third of the total catches in African countries. Aquaculture is still developing in Africa and is mostly concentrated in a few countries but it already produces an estimated value of almost US$3 billion per year. As data on licence fees paid by foreign fleets were not easily available to the national experts participating in this study, an attempt was also made to estimate the value of fisheries agreements with Distant Water Fishing Nations (DWFNs) fishing in the exclusive economic zones of African States. Considering that 25 percent of all marine catches around Africa are still by non-African countries, if also these catches were caught by African States in theory they could generate an additional value of US$3.3 billion, which is eight times higher than the current US$0.4 billion African countries earn from fisheries agreements.
According to the new estimates produced by the study, the fisheries sector as a whole employs 12.3 million people as full-time fishers or full-time and part-time processors, representing 2.1 percent of Africa’s population of between 15 and 64 years old. Fishers represent half of all people engaged in the sector, 42.4 percent are processors and 7.5 percent work in aquaculture. About 27.3 percent of the people engaged in fisheries and aquaculture are women, with marked differences in their share among fishers (3.6 percent), processors (58 percent), and aquaculture workers (4 percent).

Table 27: Fisheries and Aquaculture Contribution to GDP in the Whole Africa by Subsector

<table>
<thead>
<tr>
<th>Gross Value Added (US$ millions)</th>
<th>Contribution to GDP %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total GDPs African countries</strong></td>
<td>1,909,514</td>
</tr>
<tr>
<td><strong>Total Fisheries and Aquaculture</strong></td>
<td>24,030</td>
</tr>
<tr>
<td><strong>Total Inland Fisheries</strong></td>
<td>6,275</td>
</tr>
<tr>
<td>Inland fishing</td>
<td>4,676</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>1,590</td>
</tr>
<tr>
<td>Local licences</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total Marine Artisanal Fisheries</strong></td>
<td>8,130</td>
</tr>
<tr>
<td>Marine artisanal fishing</td>
<td>5,246</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>2,870</td>
</tr>
<tr>
<td>Local licences</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total Marine Industrial Fisheries</strong></td>
<td>6,849</td>
</tr>
<tr>
<td>Marine industrial fishing</td>
<td>4,670</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>1,878</td>
</tr>
<tr>
<td>Local licences</td>
<td>302</td>
</tr>
<tr>
<td><strong>Total Aquaculture</strong></td>
<td>2,776</td>
</tr>
</tbody>
</table>

(de Graaf et al., 2014)

In West Africa fishing activities, mostly in the marine artisanal subsector, are a major contributor to GDP with high overall contributions in Ghana, Mauritania and Sierra Leone. In Central Africa, inland fisheries is the major contributor to GDP with high overall contributions by the Democratic Republic of the Congo and Uganda. In Southern Africa, marine industrial fisheries is the major contributor to GDP.

The total GDPA is compiled by the national statistical offices according to the International Standard Industrial Classification (ISIC). It includes “Agriculture, livestock, hunting, forestry, and fishing” but excludes processing, which is covered under “Manufacture of Food Products”. Therefore, the contribution of fisheries to GDPA can be only calculated as the share of fishing and aquaculture economic activities in the agriculture production but excluding the value generated by post-harvest.

Total value added of fishing and aquaculture in Africa is US$17.4 billion. With a total GDPA of US$288.4 billion, the fisheries sector contributes 6 percent of the GDPA for the whole of Africa. The highest contribution is from marine artisanal fishing contributing 1.82 percent of total
GDPA, whereas inland fishing and marine industrial fishing have the same contribution of 1.62 percent, and aquaculture contributes almost 1 percent.

References
The Value of African Fisheries (de Graaf et al., 2014)
A Fishery Manager's Guidebook (Cochrane et al., 2009)
Harnessing Fishery Resources: Swimming the Tide to Africa’s Development (UNECA, 2012)
Mariculture in the WIO Region: Challenges and Prospects (Troell et al., 2011)
A Complete Guide to the Freshwater Fishes of Southern Africa (Skelton, 2001)
A Guide to the Common Sea Fishes of Southern Africa (Van der Elst, 1993)
Field Identification Guide to the Living Marine Resources of Kenya (Anam et al., 2012)
Maximizing Utilization of Pelagic Fish Resources (Hariono et al., 2006)

6.3.2 The Role of the Quality Infrastructure in Facilitating Industrialization, Trade and Development

Regional integration essentially refers to the process in which countries enter into a regional agreement in order to enhance regional cooperation through regional institutions and rules in various sectors. Many of the regional integration initiatives are driven by political, economic and security considerations leading to a wide range of forms of integration involving many African countries. The following are the common forms and characteristics of regional integration:

(a) **Preferential Trade Area (PTA):** Agreement of preferential conditions, such as lower customs duties or higher import quotas for certain goods.
(b) **Free Trade Area (FTA):** Extensive reduction of trade restrictions between the member states, usually covering the overall trade in goods.
(c) **Customs Union (CU):** Elimination of internal trade restrictions and introduction of common external tariffs, often in connection with the reduction of additional impediments, such as administrative barriers.
(d) **Common Market (CM):** Expansion of the freedom of movement of goods to the elimination of obstacles in other areas, such as free movement of capital, services and labour.
(e) **Economic Union:** Establishment of a uniform internal market, including the harmonization of national policies and of the economic framework.
Miesner (2009) reports that FTAs dominate regional integration schemes with 139 of the 152 WTO notified Regional Trade Agreements (RTAs) being defined as Free Trade Agreements (FTAs) whereas Customs Unions only account for 13 cases. Moreover, the establishment of regional economic communities is influenced by a range of economic, political and security-related considerations which may be summarized as follows (Crawford et al., 2005):

(i) Exploiting economies of scale and benefits from specialization by expanding the domestic market and developing new markets

(ii) Attracting foreign direct investments, particularly for countries with low labour costs and a preferential access to larger markets

(iii) Enhancing integration processes in areas that are currently only insufficiently covered by multilateral agreements, such as investments, competition, environment or labour standards

(iv) Supporting the negotiating power in multilateral agreements by forming regional blocks and strengthening geopolitical alliances

(v) Consolidating peace processes and promoting violent-free solutions to conflicts by a regional cooperation on security issues

The elimination of technical barriers to trade (TBTs) constitutes one of the fundamental requirements of any regional integration. These TBTs arise due to the discrepancy of national standards of trading partners from international standards and they have the following consequences for international trade:

(i) products, processes and systems are subject to different mandatory requirements and may therefore violate legal regulations of the trading partner,

(ii) testing procedures that assess the conformity of products, processes and systems against defined requirements may not be recognized,

(iii) conformity assessment bodies of the trading partner which cannot prove their competence against agreed standards may not be trusted.

WTO (2005) highlights the importance of standards in trade by stating that it is through sharing a common standard that anonymous partners in a market can communicate, can have common expectations on the performance of each other’s product, and can trust the compatibility of their joint production. Thus, standards are necessary for the smooth functioning of anonymous exchanges – and therefore, for the efficient functioning of the market. It is for this reason that the issue of a quality infrastructure has always been a key part of regional trade agreements. Recent reports indicate that over 80% of the global trade is already affected by standards and technical regulations (Gonçalves et al., 2011). This means that for a regional integration agreement to function smoothly, there must be a robust quality infrastructure to underpin it. Miesner (2009) explains that the contributions of the quality infrastructure to regional economic integration depends on the selected form of integration and include:

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- Standards Harmonisation in ASEAN: Progress, Challenges and Moving Beyond 2015 (Pettman, 2013)

- Quality Systems and Standards for a Competitive Edge (Guasch et al., 2007)
6.3.3 Standards: Their Nature, Types and Applications

The criteria for classification of standards include sectors, key actors and targets of enactment, scope of application, and binding force. Standards may be divided into humanities and society standards and science and technology standards. Science and technology standards are subdivided into documentary standards, measurement standards, and reference standards. Humanities and society standards are subdivided into language, signs, laws and regulations, aptitude, attitude, behavioural norms, responsibilities, tradition, customs, values, rights, obligations, etc. (Kwon et al., 2007).

Documentary standards refer to documented regulations, specifications, terminologies, symbol and signs which are applied either voluntarily or compulsorily to enhance overall understanding, safety, effectiveness, and economic efficiency in all sectors (i.e. production, distribution, consumption, transport, communication, service, health, education, administration, national defense, construction, environment and people's daily lives) of the state and society. Science and technology standards like these are called industrial standards in a broad sense of the word.

Measurement standards are standards indicating seven base units of International System of Unit (SI), two supplementary units, and derived units composed of their combination commonly used worldwide to indicate physical amount and size, such as length and time. They include basic criteria, measuring units, and standard reference materials.

Reference standards refer to quantitative information associated with measurable physical or chemical property whose reliability is stringently assessed. Their leading examples are standard reference data, (SRD), such as physical and chemical constants, observed data, statistical data, etc. That is to say, SRD refers to data provided by a relevant standardization organization for wide use in all sectors of society after certifying their accuracy and reliability through analysis and review of materials and the material world whose composition and structure is known.

The standards under consideration in this report refer specifically to the fisheries and aquaculture sector and cover the following aspects:

(i) **Terminology /Glossary:** standard listing definitions of terms used in a particular sector, field or discipline serving to make communication uniformly understood

Examples of standards in this category include:


(ii) **Codes of Practice:** standard comprising recommendations for accepted good practice as followed by competent and conscientious practitioners, and which brings together the results of practical experience and acquired knowledge for ease of access and use of the information

Examples of standards in this category include:

1. CAC/RCP 1:1969(2003), *General Principles of Food Hygiene*
2. CAC/RCP 8:1976(2008), *Code of Practice for the Processing and Handling of Quick Frozen Foods*
3. CAC/RCP 52:2003(2013), *Code of Practice for Fish and Fishery Products*
(iii) **Specifications**: standard that sets out detailed requirements, to be satisfied by a product, material, process, service or system, and the procedures for checking conformity to these requirements. Quality, safety and health characteristics of fish products, equipment and systems, e.g., tuna loins, smoked fish, fishing nets and gears, etc.

(1) CODEX STAN 1:1985(2010), *General Standard for the Labelling of Prepackaged Foods*

(2) CODEX STAN 3:1981(2011), *Standard for Canned Salmon*


(4) CODEX STAN 37:1991(2013), *Standard for Canned Shrimps or Prawns*

(5) CODEX STAN 70:1981(2013), *Standard for Canned Tuna and Bonito*


(7) CODEX STAN 92:1981(2014), *Standard for Quick Frozen Shrimps or Prawns*

(8) CODEX STAN 94:1981(2013), *Standard for Canned Sardines and Sardine-Type Products*

(9) CODEX STAN 95:1981(2014), *Standard for Quick Frozen Lobsters*

(10) CODEX STAN 165:1989(2014), *Standard for Quick Frozen Blocks of Fish Fillets, Minced Fish Flesh and Mixtures of Fillets and Minced Fish Flesh*

(11) CODEX STAN 166:1989(2014), *Standard for Quick Frozen Fish Sticks (Fish Fingers), Fish Portions and Fish Fillets - Breaded or in Batter*


(13) CODEX STAN 222:2001(2013), *Standard for Crackers from Marine and Freshwater Fish, Crustaceans and Molluscan Shellfish*

(14) CODEX STAN 236:2003, *Standard for Boiled Dried Salted Anchovies*

(15) CODEX STAN 244:2004(2013), *Standard for Salted Atlantic Herring and Salted Sprat*

(16) CODEX STAN 311:2013, *Standard for Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish*

(17) CODEX STAN 312:2013, *Standard for Live Abalone and for Raw Fresh Chilled or Frozen Abalone for Direct Consumption or for further Processing*

(iv) **Methods of conformity assessment**: standard that gives a complete account of the way in which an activity is performed (and, where appropriate, of the equipment or tools
required to perform it) and conclusions are reached, to a degree of precision appropriate to the stated purpose. Test methods for parameters such as heavy metals, pesticide residues, organoleptic properties, freshness, phycotoxins, presence of diseases through microbiological, virological indicators; and inspection methods.

(1) ISO 12875:2011, *Traceability of finfish products — Specification on the information to be recorded in captured finfish distribution chains*

(2) ISO 12877:2011, *Traceability of finfish products — Specification on the information to be recorded in farmed finfish distribution chains*

(3) ISO 16488:2015, *Marine finfish farms — Open net cage — Design and operation*

(4) ISO 16541:2015, *Methods for sea lice surveillance on marine finfish farms*

(5) ISO 21570:2005, *Foodstuffs — Methods of analysis for the detection of genetically modified organisms and derived products — Quantitative nucleic acid based methods*

(6) ISO 21571:2005, *Foodstuffs — Methods of analysis for the detection of genetically modified organisms and derived products — Nucleic acid extraction*

(7) ISO 24276:2006, *Foodstuffs — Methods of analysis for the detection of genetically modified organisms and derived products — General requirements and definitions*


(9) ISO 4831:2006, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of coliforms — Most probable number technique*

(10) ISO 4832:2006, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coliforms — Colony-count technique*

(11) ISO 4833-1:2013, *Microbiology of the food chain — Horizontal method for the enumeration of microorganisms — Part 1: Colony count at 30 degrees C by the pour plate technique*

(12) ISO 4833-2:2013, *Microbiology of the food chain — Horizontal method for the enumeration of microorganisms — Part 2: Colony count at 30 degrees C by the surface plating technique*

(13) AOAC Official Method 937.07, *Fish and Marine Products Treatment and Preparation of Sample*

(14) AOAC Official Method 977.13, *Histamine in Seafood: Fluorometric Method*

(15) AOAC Official Method 999.1, *Volatile Bases in Fish: Ammonia Ion Selective Electrode Method*

(v) **Metrological characteristics:** Confirming the actual weights of the products to avoid fraud

(1) OIML R79:1997, *Labelling requirements for prepackaged products*
(2) OIML R87:2004, Quantity of product in prepackages

(vi) Water and environmental quality, health and safety parameters for aquaculture and capture fisheries


(3) ISO 23893-1:2007, Water quality — Biochemical and physiological measurements on fish — Part 1: Sampling of fish, handling and preservation of samples

(vii) Guide: standard that gives broad and general information about a subject, with background information where appropriate

Examples of standards in this category include:

(1) CAC/GL 1:1979(2009), General Guidelines on Claims

(2) CAC/GL 2:1985 (2015), Guidelines on Nutrition Labelling

(3) CAC/GL 14:1991, Guide for the Microbiological Quality of Spices and Herbs Used in Processed Meat and Poultry Products


(6) CAC/GL 20:1995, Principles for Food Import and Export Inspection and Certification


(9) CAC/GL 27:1997(2006), Guidelines for the Assessment of the Competence of Testing Laboratories Involved in the Import and Export Control of Food

(10) CAC/GL 30:1999(2014), Principles and Guidelines for the Conduct of Microbiological Risk Assessment

(11) CAC/GL 31:1999, Guidelines for the Sensory Evaluation of Fish and Shellfish in Laboratories

(12) CAC/GL 48:2004, Model Certificate for Fish and Fishery Products

(14) CAC/GL 73:2010, *Guidelines on the Application of General Principles of Food Hygiene to the Control of Pathogenic Vibrio Species in Seafood*


(viii) **Classification**: standard comprising designations and descriptions of different grades of a product and that identifies and arranges data in hierarchical order

(1) *US Standards for Grades of Whole or Dressed Fish*, 1977(1986)


(3) *US Standards for Grades of Fresh and Frozen Shrimp*, 2000

(ix) **Publicly Available Specification (PAS)**: provisional document, developed under broadly the same processes as a formal standard and published when standardization of a particular subject is urgently required, but further research or development is required before it can be published as a formal standard.

(1) PAS 220:2008, *Prerequisite programmes on food safety for food manufacturing*

(2) PAS 223:2011, *Prerequisite programmes and design requirements for food safety in the manufacture and provision of food packaging*

(3) ISO /PAS 22399:2007 *Societal Security – Guideline for Incident Preparedness and Operational Continuity Management*

(x) **Technical Specifications**: these are normative documents prepared and published when the subject in question is still under development or where for any other reason there is the future but not immediate possibility of an agreement to publish an ordinary standard. A Technical Specification may be established with a view to serving for instance the purpose of:

(a) publishing aspects of a subject which may support the development and progress of the market but where an ordinary Standard is not feasible or not yet feasible;

(b) giving guidance to the market on or by specifications and related test methods;

(c) providing specifications in experimental circumstances and/or evolving technologies.

The decision to publish a technical specification may be the necessary where:

(d) there had been insufficient support at the enquiry stage for the work item to progress to an ordinary standard;

(e) no consensus can be reached on the submission of the work item within the given target date.

The maximum lifetime of a Technical Specification is 6 years (i.e. one three-year period and one confirmation). Examples include the following:
Technical Reports: When a technical committee has collected data of a different kind from that which is normally published as a Standard (this may include, for example, data obtained from a survey carried out among the national bodies, data on work in international organizations or data on the “state of the art” in relation to standards of national bodies on a particular subject), the technical committee may decide, by consensus, to publish such data in the form of a Technical Report. The document shall be entirely informative in nature and shall not contain matter implying that it is normative. It shall clearly explain its relationship to normative aspects of the subject which are, or will be, dealt with in standards related to the subject.

Crucially, the development of a TR cannot conflict with, or contradict, existing or draft work within the formal standards arena and must complement, not conflict with, any legislation in the subject area.

No time limit is specified for the lifetime of Technical Reports, but it is recommended that Technical Reports be regularly reviewed by the responsible technical body to ensure that they remain valid.


6.3.4 Standards and Food Safety Regulations: Exploring the Intersections

A. Food Safety Laws and Regulations

A.1 Food laws and regulations cover all stages of the production, processing and distribution of food and animal feed. The general objectives of food laws and regulations are:

(a) guarantee a high level of protection of human life and health and the protection of consumers’ interests;

(b) guarantee fair practices in food trade, taking into account animal health and welfare, plant health and the environment;

(c) ensure free movement of food and feed manufactured and marketed in national or regional jurisdictions;
facilitate global trade of safe feed and safe, wholesome food by taking into account international standards and agreements.

A.2 Food safety regulations require food facilities to have a food safety plan that includes:

(i) hazard analysis, preventive controls;
(ii) oversight and management of preventive controls;
(iii) monitoring; corrections and corrective actions (documented); and
(iv) verification that preventive controls are implemented and effective.

B. Food Safety Standards

The fish products must meet safety and health standards and be suitable for human consumption.

Food safety standards help companies establish good manufacturing processes so they can produce safe products that comply with food safety legislation and meet quality levels expected by consumers.

While in developed countries compliance with public and private food safety standards focuses on public health, in underdeveloped countries, the emphasis is on economic development and how standards shape access to markets and what is their economic impact on producers.

C. Public and private regulation

Food safety touches upon issues of public regulation, private supply chain coordination, and international trade. More stringent food safety standards have emerged in the recent past as the result of several factors, including advances in hazard detection and epidemiology, high profile health scares, scientific and regulatory consensus on best approaches to risk management, and the recognition of global standards and approaches under the WTO. As a result there is a consensus “among nations about the basic components of an effective food safety system... the vision is of a farm-to-fork, risk-based, scientifically supported safety control system”.

Public standards constitute legal requirements for market entry, and can be used by governments to deny market access for exporting countries or firms that fail to comply. These standards may include requirements that must be met by public agencies in exporting countries as well as by private firms engaged in export. Public standards must meet World Trade Organization requirements for transparency, equal application to domestic and imported products, and must be based on scientific risk assessment. Typically such standards change only infrequently. Private standards are set by buyers (or a by a consortium of firms) and include both safety and quality specifications for particular market channels. While they may be de facto requirements for particular buyers, failure to comply with private standards will not, by itself, preclude entry into an importing country. Private standards change over time as buyers manage risks and reputation, and thus compliance must also evolve.

New regulations or standards can add to production costs. In high-income countries, such costs are weighed against the public health benefits from reduced foodborne illness. But in developing countries, studies have focused on how standards shape market participation, exports, and farm incomes. Higher public standards in importing countries reduce traded quantities, especially from low-income exporters. Higher standards can serve as catalysts for improved management, higher value added, and greater efficiency in production and marketing. The costs imposed by more stringent standards have elevated concern that food
safety standards pose a barrier to market participation by small farms or firms. The high non-recurring costs of setting up a food safety quality control system might give an advantage to larger firms and farms that can employ economies of scale and exclude smaller competitors. In addition, buyers incur higher transaction costs when they have to monitor compliance from many small suppliers.

Failure to meet public standards imposed by high-income countries led to the exclusion from markets of some developing countries and firms as new standards came into force in the 1990s. Examples include European Union (EU) bans on imports of fishery products from Bangladesh in 1997; from Kenya in 1997-2000; and from Malaysia in 1998); and a U.S. ban on raspberries from Guatemala in 1997-98. Case studies document how bans led to substantial export revenue losses and how many banned firms, struggling to comply, went out of business or, if they survived, incurred high compliance costs. Public sector support in exporting countries was sometimes required to underwrite investments beyond the reach of individual firms. Such support enabled a resumption of exports as firms came into compliance, but at a lower and less profitable level than before. Even where countries maintained export market access and avoided product bans, compliance costs were substantial. Thus, exporter compliance with public standards imposed by importing countries increased costs and may have reduced trade. Compliance with public standards to achieve access to high-income markets may be a strategic priority for some governments, which suggests a public sector role in compliance.

References
Measuring the Impacts of Food Safety Regulations: A Methodological Review (Ragona et al., 2008)

Harmonization of Legislation and Regulations to Achieve Food Safety: US and Canada Perspective (Keener et al., 2014)

Hygiene Requirements, Controls and Inspections in the Fish Market Chain (Çaklı et al., 2013)

Assessment and Management of Seafood Safety and Quality: Current Practices and Emerging Issues (Ryder et al., 2014)

Ensuring Safe Food: From Production to Consumption (NAS, 1997)

Safe Food Australia: A Guide to the Food Safety Standards (ANZFA, 2001)

Safety and Quality Issues in Fish Processing (Bremner, 2002)

Quality Control and Quality Assurance for Seafood (Sylvia et al., 1994)


6.3.5 The Process of Standards Development: African Standards Harmonization Model (ASHAM), the National and International Processes

A. Standardization: Principles

- Openness
- Transparency
- Impartiality
- Effectiveness and relevance
B. Stages in the harmonization process

B.1 General

B.1.1 A complete list of project stages, together with the designations of the associated documents, is given in Table 1.

<table>
<thead>
<tr>
<th>Project stage</th>
<th>Associated document</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0: Preliminary stage</td>
<td>Preliminary Work Item</td>
<td>PWI</td>
</tr>
<tr>
<td>1: Proposal stage</td>
<td>New work Item proposal</td>
<td>NWIP</td>
</tr>
<tr>
<td>2: Preparatory stage</td>
<td>Working draft(s)</td>
<td>WD</td>
</tr>
<tr>
<td>3: Committee stage</td>
<td>Committee draft(s)</td>
<td>CD</td>
</tr>
<tr>
<td>4: Enquiry stage</td>
<td>Draft African standard</td>
<td>DARS</td>
</tr>
<tr>
<td>5: Ballot Stage</td>
<td>Final Draft African Standard</td>
<td>FDARS</td>
</tr>
<tr>
<td>6: Approval stage</td>
<td>Final Draft African Standard</td>
<td>FDARS</td>
</tr>
<tr>
<td>Published Standard</td>
<td>African Standard</td>
<td>ARS</td>
</tr>
</tbody>
</table>

B.1.2 Examples for the numbering of projects are given B.5.1.

B.1.3 Wherever possible, source documents shall be international standards (ISO, IEC, CODEX) and ARSO Standards (in case of revision). Where this is not possible, source documents, such as existing REC standards, shall be such that they do not refer normatively to standards that are not readily obtainable or to legislation that is of no legal force or effect in all African countries.

The possible sources references for African Standards is contained in the ASHAM Model indicated in Figure 1.

B.1.4 In cases where an existing International Standard (ISO/IEC) is proposed for harmonization as an African Standard, the process may commence, subject to the approval of the responsible THC/SC, with Stage 4, i.e. the standard proposed for adoption may be circulated to the THC/SC directly as a DARS, accompanied by a NWIP.

B.1.5 After the Approval Stage, the text of the ARS is available to each NSB for adoption and implementation within its system of national standards. Each ARS adopted as a national standard within an African Member State shall bear an indication on its cover page or foreword to the effect that the standard is an African Standard.

B.2 Preliminary stage (Stage 0)

B.2.1 The preliminary stage is intended to be used as a vehicle for a THC/SC to introduce into its work programme PWIs that are not sufficiently mature for further processing. An example would be a PWI for a standard in an emerging technology, where the need for an African Standard is recognised, but the corresponding international standards body has yet to develop an International Standard.
B.2.2 No target dates can be allocated to a work item at the preliminary stage.

B.2.3 The THC/SC shall regularly review all PWIs to remain abreast of the need for resources, etc.

B.2.4 At the appropriate time, a PWI can progress to the Proposal Stage (Stage 1).

**Figure 1 — African Standards Harmonisation Model**

**LEGEND:**
ARSO: African Organisation for Standardisation
ARSO CS: ARSO Central Secretariat
ARSO TMC: ARSO Technical Management Committee
AU: African Union
IS: International Standard
R/SRSG: Regional/ Sub-Regional Stakeholder Groupings
SRHS: Sub-Regional Harmonised Standard
SRSB: Sub-Regional Standardisation Bodies
UPSR: Unique Product Standard Route

B.3 Proposal stage (Stage 1)

B.3.1 The proposal stage is the stage at which the THC/SC receives, and either accepts or rejects a proposal for a new work item.

B.3.2 An NWIP may be originated by any person or body in a Member State or by an external organization in liaison with ARSO Central Secretariat (for example, another regional or international standards body).
B.3.3 The NWIP shall be sent out by the THC Secretariat for a 3 months vote, in the case of a project that will require preparatory and/or committee stages, and for 5 months if accompanying an ISO/IEC standard for direct entry into the process at Stage 4 (Enquiry stage).

B.3.4 The criteria for acceptance of an NWIP shall be as follows:

(a) in the case of a project that requires preparatory and/or committee stages, approval by a simple majority of [P] members voting, plus at least three (3) members willing to participate actively in the project, i.e. to make an effective contribution at the preparatory stage (if relevant), by nominating technical experts and by commenting on WDs.

(b) in the case of an NWIP circulated together with an international or REC standard for direct entry into the process at Stage 4 (Enquiry stage), the criteria for acceptance applicable to the enquiry stage shall apply, i.e. 2/3 of [P] members voting to be in favour, and no more than 25 % of the votes cast to be negative.

NOTE A member may change status only once a year by notifying the THC Secretariat in writing. This change of status may affect the participation and if this has a negative effect on the progress of the project, the TMC will take a decision on the way forward.

B.3.5 Once accepted, a new work item becomes part of the work programme of the THC/SC, and has target dates allocated to it for all subsequent stages. The inclusion of a new work item in the programme of work concludes the proposal stage.

B.4 Preparatory stage (Stage 2)

B.4.1 The preparatory stage covers the preparation of a WD.

B.4.2 The THC Secretariat shall appoint a Project Leader, (who may be the THC Secretary himself/herself) who shall liaise with and invite expert assistance from the [P] members, who shall each nominate a national expert to assist the Project Leader. Should it be necessary to formally constitute this group as a Working Group, the Project Leader shall arrange for this via the THC Secretariat, and shall be responsible for convening any meeting(s).

B.4.3 The Project Leader shall prepare and circulate to the experts for comment, any number of WDs as are necessary, until the Project Leader informs the THC Secretariat that draft is considered fit for presentation to the THC/SC as a CD.

B.4.3 The preparatory stage concludes when the first CD is available for the THC Secretariat to send to the full THC/SC.

NOTE Where possible, the CD shall be made available by the THC Secretariat in English, French and Portuguese.

B.5 Committee stage (Stage 3)

B.5.1 Upon acceptance of the NWIP and WD by the Member States, the draft shall be elevated to a Committee Draft and assigned a first draft number CD by the TC Secretariat. The CD shall indicate the country of origin/unique identification number/year of drafting (e.g. CD/BU/123/2012 if originating from Burundi, CD/MW/123/2012 if originating from Malawi, CD/EG/123/2012 if originating from Egypt, CD/MZ/123/2012, originating from Mozambique and CD/SD/123/2012 originating from Sudan.)
With respect to the adoption of international standards Members States shall be encouraged to use their national procedures for adoption of the same and report to the TMC for coordination purposes.

B.5.2 The committee stage is the principal stage at which comments from national bodies are taken into consideration, with a view to reaching consensus on the technical content. National bodies shall therefore carefully study the texts of committee drafts and submit all pertinent comments at this stage.

B.5.3 As soon as it is available, a committee draft shall be circulated by the THC Secretariat to all National Members for consideration together with the comment template, giving the 1 month to comment.

B.5.4 No more than 4 weeks after the closing date for submission of replies, the secretariat shall prepare the compilation of comments and arrange for its circulation to all National Members. When preparing this compilation, the secretariat shall indicate its proposal, made in consultation with the chairman of the Technical Harmonization Committee or subcommittee and, if necessary, the project leader, for proceeding with the project, either:

(a) to discuss the committee draft and comments at the next meeting, or

(b) to circulate a revised committee draft for consideration, or

(c) to register the committee draft for the enquiry stage

In the case of (b) and (c), the secretariat shall indicate in the compilation of comments the action taken on each of the comments received. This shall be made available to all National Members, if necessary by the circulation of a revised compilation of comments, no later than in parallel with the submission of a revised CD for consideration by the committee (case (b)) or simultaneously with the submission of the finalized version of the draft to the ARSO Central Secretariat for registration for the enquiry stage (case (c)).

If, within 2 months from the date of dispatch, 2 or more of the Members disagree with proposal (b) or (c) of the secretariat, the committee draft shall be discussed at a meeting.

B.5.5 If a committee draft is considered at a meeting but agreement on it is not reached on that occasion, a further committee draft incorporating decisions taken at the meeting shall be distributed within 3 months for consideration. A period of 3 months shall be available to national bodies to comment on the draft and on any subsequent versions.

B.5.6 The committee stage ends when all technical issues have been resolved by consensus and a CD is accepted to advance to the enquiry stage as a DARS.

B.6 Enquiry stage (Stage 4)

B.6.1 Within 5 days of completion of the CD stage, the THC Secretariat shall acquire the DARS number from the ARSO Central Secretariat for advancing the document to the enquiry stage.

B.6.2 At the enquiry stage, the enquiry draft (public review draft) (DARS) together with the comment template shall be circulated by the THC secretariat to all national bodies for public comment for a period of 60 days and received comments reviewed by the Technical Harmonization Committee secretariat in order to deal with unresolved harmonization issues and to advance the document for balloting by the partner states.
National bodies shall be advised of the date by which national comments are to be received by the Technical Harmonization Committee secretariat. Comments received after the closing date are submitted to the Technical Harmonization Committee or subcommittee secretariat for consideration at the time of the next review of the African Standard.

**B.6.3** On receipt of any comments, the chairman of the Technical Harmonization Committee or subcommittee, in cooperation with its secretariat and the project leader, shall take one of the following courses of action:

(a) when the approval criteria of B.6.5 below are met, to register the enquiry draft, as modified, as a Final Draft African Standard (FDARS), or

(b) in the case of an enquiry draft where the comments are only editorial in nature or no comments are received, to proceed to the Final Draft African Standard, or

(c) when the approval criteria of B.6.5 below are not met;

(1) to circulate a revised enquiry draft, or

NOTE A revised enquiry draft will be circulated for commenting period 60 days.

(2) to circulate a revised committee draft for comments, or

(3) to discuss the enquiry draft and comments at the next meeting.

**B.6.5** The acceptance criteria of the DARS shall be when all comments have been resolved. Failure to submit within the prescribed timelines shall be deemed to be an acceptance of the DARS.

The Enquiry stage ends when all received comments have been resolved and a DARS is accepted to advance to the balloting stage as an FDARS.

**B.7 Ballot stage (Stage 5)**

**B.7.1** At the ballot stage, the Final Draft African Standard (FDARS) shall be distributed by the THC Secretariat together with the ballot form within 1 month to all national bodies for a 1 month vote.

National bodies shall be advised of the date by which ballots are to be received.

**B.7.2** Votes submitted by national bodies shall be explicit: positive, negative, or abstention.

If a national body votes affirmatively, it shall not submit any comments. If a national body finds an FDARS unacceptable, it shall vote negatively and state the technical reasons. It shall not cast an affirmative vote that is conditional on the acceptance of modifications.

**B.7.3** The acceptance criteria of the FDARS shall be a positive vote on the FDARS by all NSB Partner States. Abstentions are excluded when the votes are counted, as well as negative votes not accompanied by technical reasons. Where at least one Partner State votes in the affirmative and the rest abstain, it shall be deemed that the FDARS has been accepted. Failure to vote within the prescribed timelines shall be deemed to be an acceptance of the FDARS.

**B.7.4** The secretariat of the Technical Harmonization Committee or subcommittee has the responsibility of bringing any errors that may have been introduced in the preparation of the
draft to the attention of TMC by the end of the voting period; further editorial or technical amendments are not acceptable at this stage.

**B.7.5** Within 2 weeks after the end of the voting period, the THC Secretariat shall circulate to all TMC National Members and the ARSO Secretariat a report using the ballot results Form showing the result of voting and indicating either the formal approval by national bodies to issue the African Standard or formal rejection of the FDARS.

**B.7.6** The ballot stage ends when all received ballot results have been ratified by TMC during its next meeting and an FDARS is accepted to advance to the approval stage as an African Standard.

**B.7.7** If the FDARS is not approved in accordance with the conditions B.7.3, the document shall be referred back to the Technical Harmonization Committee or subcommittee concerned for reconsideration in the light of the technical reasons.

The committee may decide to:

- resubmit a modified draft as a committee draft, enquiry draft or, FDARS;
- publish a Technical Specification, PAS, TR;
- cancel the project.

**B.8 Approval stage (Stage 6)**

The approval stage is the stage at which the Final Draft African Standard is approved by the TMC on the basis of due process. The Approval stage ends when a Final Draft African Standard is approved by the TMC to advance to the adoption and approval by the ARSO Council as an African Standard.

**B.9 Procedure for adoption of international/regional standards**

**B.9.1** The TMC may through the National standards body, adopt International or Regional Standards as African Standards.

**B.9.2** Only standards identified to be suitable for use without any modification may be adopted and such International or Regional Standards shall enter the procedure at the enquiry stage (Stage 4) for consideration for the suitability for application without modification.

**B.9.3** The acceptance criteria shall be when at least 2/3 of the Member States who are P members of the respective THC accept to use the international or regional standard without modification. Failure to submit a position within the prescribed timelines shall be deemed to be an acceptance of the international or regional standard.

If the standard is found to be acceptable by at least 2/3 of the Member States who are P members of the respective THC, it is advanced to approval and declaration stages for endorsement for adoption.

**B.9.4** If the international standard (IS) or regional standard (RS) is not approved in accordance with the conditions in B.9.3, the document shall be referred back to the technical committee or subcommittee concerned for reconsideration in the light of the technical reasons submitted in support of the non-acceptance.
The TC / SC may decide to submit a fresh NWIP with the IS or RS being used as reference information at Stage 1.

B.9.5 Upon acceptance of adoption proposal the THC Chairperson shall prepare and present to the TMC a report of the technical committee indicating the list of the International/regional standards which are suitable for use in Africa.

B.9.6 The TMC considers all the reports presented by the various THC Chairpersons and verifies that the due process has been followed. The TMC will also verify that the final text of the FDARS is available with ARSO Secretariat.

B.9.7 The TMC compiles a list of international/regional standards that are ready for endorsement for adoption and use as African Standards. This list is then circulated to the NSBs and the ARSO Secretariat.

The Chairperson of the TMC presents to the ARSO Council, the list of International/regional standards recommended for endorsement.

The TMC compiles the list of international/regional standards that are recommended for endorsement.

B.9.8 The ARSO Secretariat presents the list to the ARSO Council for endorsement and recommendations for adoption at National level.

B.9.9 If the Council for some reason does not endorse the adoption of any international/regional standard, the ARSO Secretariat shall refer back the standard to the THC for further action.

B.9.10 The ARSO Secretariat shall upon endorsement publish the titles and standard numbers of the endorsed international or regional standards for adoption by the Member States.

C Time periods allowed for commenting and voting

C.1 The time periods allowed for commenting and voting at the various stages of the progress of a project are shown in Table 2.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Time period allowed for commenting/voting</th>
<th>Adoptions from ISO, IEC, REC Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Preliminary stage</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>1</td>
<td>Proposal stage / NWIP</td>
<td>1 Month</td>
<td>2 months</td>
</tr>
<tr>
<td>2</td>
<td>Preparatory stage / WD</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>3</td>
<td>Committee stage / CD</td>
<td>4 months</td>
<td>Not applicable</td>
</tr>
<tr>
<td>4*</td>
<td>Enquiry stage / DARS</td>
<td>2 months</td>
<td>1 month</td>
</tr>
<tr>
<td>5</td>
<td>Ballot Stage (FDARS)</td>
<td>1 Month</td>
<td>2 months</td>
</tr>
<tr>
<td>6</td>
<td>Approval stage and Publication</td>
<td>Not applicable</td>
<td>1 month</td>
</tr>
</tbody>
</table>
NOTE The TMC shall proactively encourage the publication of alternative deliverables or cancellation of projects that are running significantly overtime, and/or which appear to lack sufficient support.

Table 3 — Maximum timelines allowed for each stage

<table>
<thead>
<tr>
<th>SL</th>
<th>STAGE</th>
<th>NORMAL TIME</th>
<th>ADOPTION TIME (ISO, IEC, REC STANDARDS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Circulation NWI</td>
<td>4 Months</td>
<td>2 Months</td>
</tr>
<tr>
<td>1</td>
<td>Committee Draft</td>
<td>8 Months</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Internal Commenting</td>
<td>1 Month</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Enquiry Stage Including Preparation</td>
<td>4 Months</td>
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<tr>
<td>4</td>
<td>Preparation For Balloting</td>
<td>4 Months</td>
<td>1 Month</td>
</tr>
<tr>
<td>5</td>
<td>Balloting</td>
<td>1 Month</td>
<td>2 Months</td>
</tr>
<tr>
<td>6</td>
<td>Approval And Publishing</td>
<td>2 Months</td>
<td>1 Month</td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>24 months</strong></td>
<td><strong>6 months</strong></td>
</tr>
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</table>

D Technical corrigenda and amendments

D.1 General

Technical corrigenda and amendments can fall into three categories:

(a) those that are made in a national standard or REC Standard that implements the approved normative text of an African Standard;
(b) those that are made to a source document, that is an adopted international standard; and
(c) those that are made to a African Standard developed source document.

D.2 Those that occur in a national or REC standard

D.2.1 In general, technical corrigenda and amendments can be used in a national or REC standard to correct a situation where the normative text has inadvertently been allowed to deviate from that which has been approved for the African Standard.

D.2.2 Where, however, a national technical corrigendum or amendment has the effect of causing the national standard to deviate from the approved normative text of the African Standard, the national standard by definition ceases to be an African Standard, and the NSB concerned shall immediately notify the ARSO Central Secretariat to this effect.

D.3 Those that occur in an adopted standard or in an African developed source document

D.3.1 Technical corrigenda

The responsible THC shall circulate the technical corrigendum to all members with a request that it be included in an appropriate format in each affected national standard. No voting is required.

D.3.2 Amendments

An amendment to either an international standard or to an African developed source document shall be circulated by the THC Secretariat in exactly the same way as a new project, but shall automatically enter the process at Stage 4 (Enquiry stage).
E. Systematic review of African Standard

E.1 A review shall be undertaken, at intervals not exceeding 5 years, of the continued suitability and applicability of each African Standard. The review shall take the form of a questionnaire (see Form H), which shall be circulated to all relevant THCs and AU members by the ARSO Central Secretariat for a six months vote.

E.2 The review shall include an assessment of the degree of adoption and implementation within the standards regimes in individual AU Member states.

E.3 By a simple majority of the [P] members voting, the ARSO Central Secretariat shall take the decision to

(a) reaffirm the text as an African Standard for a further 5 years;
(b) initiate a revision of the text; or
(c) withdraw the text’s status as an African Standard.

NOTE The ARSO Central Secretariat shall formally notify the relevant THC Secretariat of the results of each review.

E.4 In the case of adopted standards, the review shall be done parallel to the review of the source standard or the timing of the review shall be such as to follow closely after the review of the source standard.

Whenever ARSO members are reviewing their national standards which have been used as source documents for harmonized text, they shall inform the responsible THC Secretariat through the ARSO Central Secretariat.

E.5 When the decision, following a review, is to undertake a revision, a new project shall be initiated.

References


Future Society and Standards (Kwon et al., 2007)


Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries (FAO, 2009)
6.3.6 Standards as Products of Scientific Knowledge and Research

A standard is defined as a “document established by consensus and approved by a recognized body, that provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context”. It follows be inference that standards should be based on the consolidated results of science, technology and experience, and aimed at promotion of the optimum community benefits.

It is the obligation for agencies setting standards to provide scientifically supported evidence whenever establishing limits and tolerances, codes of practice and testing methods. Global and regional trade agreements emphasize the “scientific proof” concept in order to avoid creation of unnecessary barriers to trade.

References
WTO Agreement on Technical Barriers to Trade (WTO, 1995a)
WTO Agreement on the Application of Sanitary and Phytosanitary Measures (WTO, 1995b)

6.3.7 Standards as Catalysts for Research and Innovation

Innovation is a major source for countries’ competitiveness and growth, but also the key to solving many of today’s big challenges such as climate change, scarcity of natural resources, health and security. Standards serve as a knowledge base and catalyst for innovation. Standardization has a positive effect on the entire innovation process, from fundamental research to marketing of new products. Norms and standards are a source of knowledge for research and development, for they reflect the current state of technology as a result of the participation of numerous experts in the relevant fields.

Research and innovation processes with its various feedback loops depend to a degree on standards (see Figure 18.1). Here the roles of different types of standards are highlighted, within different phases of the research process and innovation cycle (Blind and Gauch, 2008).

Terminology standards are required in basic research investigating new technologies; nanotechnology for example. They facilitate efficient communication, and also play a crucial role in the transfer of knowledge from basic to applied research, where measurement and testing standards are required. The gap between applied research and experimental development of new products and processes is bridged by interface standards, which allow interoperability between products. Compatibility standards ensure interoperability between products or whole systems, and quality standards guarantee that the products comply with minimum safety regulations.

Requirements such as quality and safety standards are either set by a regulator through technical regulation or directives or are demanded by lead users and early adopters. The diffusion of new products is fostered by variety-reducing standards which allow the exploitation of economies of scale and by compatibility standards generating positive network externalities among users.
In general, standardization engenders the self-regulation of actors in the innovation system and promotes further progress within existing trajectories of technologies, but only in some exceptional cases is an instrument to push radical innovation, i.e., completely new technologies. The involvement of all relevant stakeholder groups leads to a consensus of interests, taking the preferences of all involved parties into account.

Quoting Swann (2000), Blind (2013) notes that standards and standardization are related to innovation in the following aspects:

(i) Standardization helps to build focus, cohesion and critical mass in the emerging stages of technologies and markets

(ii) Standards for measurements and tests help innovative companies to demonstrate to the customer that their innovative products possess the features they claim to have, but also acceptable levels of risks for health, safety and the environment

(iii) Standards codify and diffuse state of the art in science and technology and best practice

(iv) Open standardization processes and standards enable a competition between and within technologies and contribute therefore to innovation-led growth.

However, despite the openness of standardization processes, weak stakeholders like consumers and small to medium sized enterprises still struggle to participate adequately in these processes (EC DG E&I, 2012). Special support of such entities is necessary to avoid the development of specifications biased to the preferences of dominant players, and working to the detriment of innovation.

This concept of “regulatory capture” is a major obstacle to standardization bodies and refers to powerful technology producers’ ability to influence the direction of a standard’s development in such a way as to ensure that its design works in their favour. This diverts the benefits of standardization from consumers to producers and understandably decreases social welfare.

In summary, standards are crucial infrastructure underpinning research, development and innovation on the one hand. On the other hand, they are also a channel and outlet for the
broad dissemination and therefore implementation of new insights from science and technology. If both functions are effectively coordinated, e.g. by integrating standardization in research programmes and projects, the performance of national innovation systems will be significantly improved in the long term (O'Sullivan et al., 2012a).

Businesses looking to commercialise emerging technologies are part of a developing business ‘ecosystem’, and the stronger they can exploit the networks within the ecosystem, the faster the market for their products will grow.

The development of standards can help an emerging technology ecosystem rally round the issues to promote successful commercialisation of new products. This is why standards can make such a difference to the success of innovative businesses: they create a common framework for innovation and establish the ‘rules of the game’. Standards set the framework by defining common vocabularies, establishing the essential characteristics of a product or service, and by identifying the best practice within the ecosystems that will ensure successful outcomes.

Once these rules are in place, the pace of innovation will be accelerated and success will be much more likely.

**The difference a ‘set of rules’ makes**

(a) You’re less likely to duplicate what’s already been produced, allowing you to concentrate on the activities within your business and product that really add value.

(b) Your product or service will more easily be integrated with the rest of the ecosystem.

(c) Investors have more confidence that the innovation will be successful.

New standards are being developed all the time as new sectors, markets and business models emerge, and the sooner these standards are in place, the faster and more efficiently growth occurs.

**Adding efficiency to innovation**

Standards also provide a tried and tested framework for taking new ideas from the drawing board or development bench all the way to commercial production. They define the essential parameters, the safety considerations, testing processes, and how to move to prototyping and scale-up.

**Thriving in a world of complex innovation networks**

The commercial exploitation of emerging technologies is seen today as key to the future success of the manufacturing sector. This is a new kind of high value manufacturing, and it operates very differently from the traditional supply chain-based manufacturing model.

Today’s high value manufacturing sector is a complex global system, with large numbers of different businesses each operating across a number of industrial sectors. These businesses interact with each other in highly complex and interlinked value chains, trading not just raw materials and components, but also data and services.

In this world success depends on the number of successful connections and interactions a business can establish, and the connections in turn depend on ‘interoperability’, or the ability to work to the same set of rules or within the same framework.

Standards are a key tool to surviving in a fast moving, highly complex 21st century global economy.
6.3.8 The Socioeconomic Impact of Standardization: Impacts, Networks and State of Play

(1) Better utilization of resources.
(2) Better communication.
(3) Variety control.
(4) Fitness for purpose.
(5) Interchangeability.
(6) Compatibility.
(7) Safety.
(8) Health.
(9) Prevention of trade barriers.
(10) Facilitation of technology transfer and technological cooperation.
(11) Promote efficient and effective public procurement.
(12) Encourage item standardization.
(13) Improve specifications.
(14) Reduce inspection and testing.
(15) Establish a single Government-wide language of item identification.
(16) Permit employment of uniform financial accounting systems.
(17) Environmental protection/conservation/restoration.

References
The Economics of Standardization: An Update (Swann, 2010)

6.3.9 Value Addition and Product Development and Innovation in Fisheries and Aquaculture: Role of Standards and Conformity Assessment

A Fresh, Frozen and Cured Fish and Aquaculture Products

Fresh and frozen whole finfish
Fresh and frozen whole bivalves

B Value Added Fishery Products

B.1 Breaded and battered products (including fried)
(1) Shrimp breaded and battered
(2) Squid breaded and battered
(3) Cuttlefish breaded and battered
(4) Octopus breaded
(5) Clams breaded
(6) Breaded fish fingers
(7) Breaded crab cakes

B.2 Pickle, curry, meal kit. etc.,
(1) Shrimp prepared products
(2) Shrimp pickle
(3) Shrimp curry
(4) Squid prepared products
(5) Cuttlefish prepared products
(6) Fish pickle
(7) Fish curry
(8) Mussel / clam meat pickle

B.3 **Surimi based products**
(1) Surimi products (Analogues)

B.4 **Freeze dried products**
(1) AFD shrimp, AFD shrimp powder
(2) AFD squid
(3) AFD Cuttlefish
(4) AFD Octopus

B.5 **Shrimp IQF products and Tray/pouch packs**
(1) Shrimp IQF raw
(2) Shrimp IQF blanched / cooked
(3) Shrimp in tray / pouch packs
(4) Shrimp IQF headon
(5) Shrimp nobashi

B.6 **Squid IQF and its products and Tray/pouch packs**
(1) Squid IQF raw
(2) Squid IQF blanched cooked
(3) Squid tube / rings

B.7 **Cuttlefish IQF / IF and its products and Tray/pouch packs**
(1) Cuttlefish IQF/IF raw
(2) Cuttlefish IQF blanched / cooked
(3) Cuttlefish and its products in tray/pouch packs

B.8 **Octopus IQF / IF and its products**
(1) Octopus IQF raw / whole cleaned
(2) IQF / IF Octopus blanched / cooked

B.9 **Frozen Fish fillets / loins / steaks, chunks, portions etc. in tray / vacuum pack or in tray / pouches (except tuna)**

B.10 **Lobster whole cooked / half cut IQF / packed in tray / pouches**

B.11 **Stuffed crab, Raw crabmeat / soft shell crab**

B.12 **Tuna products and precooked loins and other such prepared products.**
(1) Frozen yellow fin tuna (sashimi grade)
(2) Frozen big eye tuna (sashimi grade)
(3) Frozen tuna fillet and other tuna meat (whether or not minced)
(4) Precooked loins and other such prepared products

B.13 **Canned seafood and canned / retort pouch products.**
(1) Canned seafood
(2) Retort pouch seafood products
C Standards for Grades of Fishery Products

(1) Grades of Whole or Dressed Fish
   Whole or Dressed Fish
   Frozen Headless Dressed Whiting

(2) Grades of Fish Steaks
   Frozen Halibut Steaks
   Frozen Salmon Steaks

(3) Grades of Fish Fillets
   Fish Fillets
   Cod Fillets
   Flounder & Sole Fillets
   Haddock Fillets
   Ocean and Pacific Perch Fillets

(4) Grades of Frozen Fish Blocks and Products Made Therefrom
   Frozen Fish Fillet Blocks
   Frozen Minced Fish Blocks
   Frozen Raw Fish Portions
   Frozen Raw Breaded Fish Sticks
   Frozen Raw Breaded Fish Portions
   Frozen Fried Fish Sticks
   Frozen Fried Fish Portions

(5) Grades of Crustacean Shellfish
   Fresh and Frozen Shrimp
   Frozen Raw Breaded Shrimp

(6) Grades of Molluscan Shellfish
   Frozen Raw Scallops

   Frozen Raw Breaded Scallops and Frozen Fried Scallops

(7) Freshwater Catfish and Products made Therefrom
   Catfish

References

Barriers to Compliance with International HACCP Regulations: A Whole Chain Approach to the National Fisheries Food Safety Management System in Sierra Leone (Sheriff, 2013)

Fish and Fishery Products Hazards and Controls Guidance (FDA, 2011b)

Handbook of Seafood and Seafood Products Analysis (Nollet et al., 2010)
6.3.10 Conformity Assessment for Fisheries Products: Quality Assurance, Testing, Inspection and Certification

A wide range of parameters are tested with respect to fish products including the following:

1. Quality Assessment of Fish and Fishery Products by Colour Measurement
2. Instrumental Texture Measurement
3. Aroma
4. Quality Index Methods
5. Sensory evaluation of seafood: general principles and guidelines
6. Sensory Descriptors
7. Sensory Aspects of Heat-Treated Seafood
8. Assessment of Seafood Spoilage and the Microorganisms Involved
9. Detection of Fish Spoilage
10. Detection of the Principal Foodborne Pathogens in Seafoods and Seafood-Related Environments
11. Parasites
12. Techniques of Diagnosis of Fish and Shellfish Virus and Viral Diseases
13. Marine Toxins
14. Detection of Adulterations: Addition of Foreign Proteins
15. Detection of Adulterations: Identification of Seafood Species
16. Veterinary Drugs
17. Differentiation of Fresh and Frozen-Thawed Fish
(18) Spectrochemical Methods for the Determination of Metals in Seafood
(19) Food Irradiation and Its Detection
(20) Analysis of Dioxins in Seafood and Seafood Products
(21) Environmental Contaminants: Persistent Organic Pollutants
(22) Biogenic Amines in Seafood Products
(23) Residues of Food Contact Materials
(24) Detection of GM Ingredients in Fish Feed
(25) Traceability as a tool

References
Quality and Quality Changes in Fresh Fish (Huss, 1995)
Fishery Products: Quality, Safety and Authenticity (Rehbein et al., 2009)
Handbook of Seafood Quality, Safety and Health Applications (Alasalvar et al., 2011)
Handbook of Seafood and Seafood Products Analysis (Nollet et al., 2010)
Fish Inspection, Quality Control, and HACCP: A Global Focus (Martin et al., 1998)

6.3.11 Standards for Fisheries and Aquaculture: Identification of Standardization Needs, Stakeholders and Networks

A. Sample Types of Standards and Standards-Type Deliverables
   (i) Terminology /Glossary: standard listing definitions of terms used in a particular sector, field or discipline serving to make communication uniformly understood
   (ii) Codes of Practice: standard comprising recommendations for accepted good practice as followed by competent and conscientious practitioners, and which brings together the results of practical experience and acquired knowledge for ease of access and use of the information
   (iii) Specifications: standard that sets out detailed requirements, to be satisfied by a product, material, process, service or system, and the procedures for checking conformity to these requirements. Quality, safety and health characteristics of fish products, equipment and systems, e.g., tuna loins, smoked fish, fishing nets and gears, etc.
   (iv) Methods of conformity assessment: standard that gives a complete account of the way in which an activity is performed (and, where appropriate, of the equipment or tools required to perform it) and conclusions are reached, to a degree of precision appropriate to the stated purpose. Test methods for parameters such as heavy metals, pesticide residues, organoleptic properties, freshness, phycotoxins, presence of diseases through microbiological, virological
indicators; and inspection methods.

(v) **Metrological characteristics:** Confirming the actual weights of the products to avoid fraud

(vi) **Water and environmental quality, health and safety** parameters for aquaculture and capture fisheries

(vii) **Guide:** standard that gives broad and general information about a subject, with background information where appropriate

(viii) **Classification:** standard comprising designations and descriptions of different grades of a product and that identifies and arranges data in hierarchical order

(ix) **Publicly Available Specification (PAS):** provisional document, developed under broadly the same processes as a formal standard and published when standardization of a particular subject is urgently required, but further research or development is required before it can be published as a formal standard.

(x) **Technical Specifications:** these are normative documents prepared and published when the subject in question is still under development or where for any other reason there is the future but not immediate possibility of an agreement to publish an ordinary standard. A Technical Specification may be established with a view to serving for instance the purpose of:

(a) publishing aspects of a subject which may support the development and progress of the market but where an ordinary Standard is not feasible or not yet feasible;

(b) giving guidance to the market on or by specifications and related test methods;

(c) providing specifications in experimental circumstances and/or evolving technologies.

The decision to publish a technical specification may be the necessary where:

(d) there had been insufficient support at the enquiry stage for the work item to progress to an ordinary standard;

(e) no consensus can be reached on the submission of the work item within the given target date.

The maximum lifetime of a Technical Specification is 6 years (i.e. one three-year period and one confirmation).

(xi) **Technical Reports:** When a technical committee has collected data of a different kind from that which is normally published as a Standard (this may include, for example, data obtained from a survey carried out among the national bodies, data on work in international organizations or data on the “state of the art” in relation to standards of national bodies on a particular subject), the technical committee may decide, by consensus, to publish such data in the form of a Technical Report. The document shall be entirely informative in nature and shall not contain matter implying that it is normative.
It shall clearly explain its relationship to normative aspects of the subject which are, or will be, dealt with in standards related to the subject.

Crucially, the development of a TR cannot conflict with, or contradict, existing or draft work within the formal standards arena and must complement, not conflict with, any legislation in the subject area.

No time limit is specified for the lifetime of Technical Reports, but it is recommended that Technical Reports be regularly reviewed by the responsible technical body to ensure that they remain valid.

B. Rationale for Preparing a Standard

B.1 Problem Statement
Many products fail to achieve their expected performance commercially and/or technically with disastrous results for the producer and dissatisfaction or worse for the customer. Key problems encountered by producers include:

(i) insufficient knowledge of the market/target customer;
(ii) inadequate understanding between customer and producer;
(iii) inadequate profit margins;
(iv) the product being too expensive;
(v) failure to meet regulatory requirements;
(vi) failure to meet performance targets;
(vii) the time to market being too long;
(viii) development expenditure being too high;
(ix) insufficient in-house skills and knowledge to cover the process;
(x) excessive warranty, delivery or other commitments creating serious financial obligations.

The main benefit in dealing properly with these problems is a better product for which the commercial and technical risks have been assessed and eliminated or reduced to an acceptable level. The benefit to the producer can be significant both in reducing the cost of the product and/or in improving the quality, reliability and commercial viability of the product.

It is easy to become obsessed with an innovative idea, or a new technology, without looking dispassionately at its overall viability or other justification to pursue it. By gathering sufficient information to understand the potential product its viability can be properly assessed. Gathering this information in a disciplined way facilitates decision making, and also exposes conflicts or trade-offs, allowing them to be resolved at an early stage and so avoiding problems later.

The three main areas that need to be understood when making decisions about the development of a new product include:

(a) commercial considerations;
attributes of product performance necessary to satisfy the customer; and

regulatory requirements.

Only when all the requirements for a new product have been understood is it possible to ensure that the product is safe or to review or test it adequately. Thus the development of a specification is the precursor to assuring safety, quality and reliability.

B.2 Principles

A standard shall:

(a) be complete within the limits given in its scope clause;

(b) be consistent, accurate and unambiguous;

(c) take full account of the current state of technical development;

(d) provide a framework in which innovation can be accommodated and supported; and

(e) be readily comprehensible to those who might reasonably be expected to use it (i.e. its target audience).

(f) not make any requirement in respect of compliance with the law or discharge of legal obligations.

The type of standard used shall be selected as being the most appropriate for its purpose. Irrespective of its target audience, the provisions of a standard shall be drafted with due regard to the legitimate needs of the whole community, and, in particular, to those of the end users of its subject matter.

NOTE 1 With a very few exceptions, standards do not have force of law: the application of a standard is almost always voluntary, although standards are very often used in support of legislation, and compliance with a standard is sometimes quoted in legislation as offering a route to discharging legal obligations.

NOTE 2 It is a fundamental principle that standards never make requirements or recommendations for compliance with particular legislation. To do so would imply that such compliance is optional; standards users are expected to obey the law regardless of whether they comply with standards.

NOTE 3 Legislation is constantly changing and evolving, and no standard can be expected to keep pace with these changes. In order to prevent a particular standard being regarded as an authoritative statement of current legislation, it is rare for legislation to be quoted or listed extensively. However, it is good practice to draw readers’ attention to particular important pieces of legislation that might have an impact on the way in which a standard is applied.

NOTE 4 Standards are very often used as the basis for contracts and it is therefore particularly important that they are drafted sufficiently clearly and robustly as to be able to withstand legal scrutiny.

C. Nature of Standards — Specifications

Product specifications are particularly important in outlining the fit-for-use characteristics of products. They are prepared to specify requirements for performance and technical attributes of a product and to give guidance on the process of making and using a product. The preparation of standard should be preceded by gathering of the requisite information as outlined hereafter.

C.1 Overview: The information to be collected must be prioritized noting that arriving at the correct values is an iterative process throughout the initial stages of the specification.
In the case of trade-offs, conflicting requirements, or where there is a need to prioritize issues, the use of quality function deployment (QFD) can be a useful tool to aid decision making.

It is important to consider the whole life-cycle of the product and not just to concentrate on operation by the user. This means thinking about the market, product development, production, packaging, distribution, use, training, maintenance, repair, reuse, recycling, disposal and how each of these phases might affect the design (see Figure 1).

In evaluating which criteria relate to an individual product, it is recommended not only to use the checklists given in this standard, but also to think laterally about any other issues crucial to the success of the product and the satisfaction of customers. However the information is acquired it should be recorded.

**C.2 Researching and Understanding Customer Needs:** In the preliminary phase information about customer requirements should be acquired. The criteria that are, or need to be, established should include those that will make the product a success. These are likely to be expressed in general terms but any limits on parameters such as size, weight, noise, power, colour or appearance should be included wherever practicable. The concept of universal/accessible design should be embraced, considering the widest possible range of users, including children, older and disabled people. A key issue is to ensure that the “voice of the customer” is heard throughout the organization in particular by those contributing to the new product design.

Conducting market research helps to identify customer needs, new market niches and customer acceptability. Initiating prototype testing, user trials, focus groups and user groups, involving consumers where appropriate, assists in achieving final model acceptance. It is important to identify the customer.

**C.3 Researching and Understanding the Market:** In order to assess the commercial viability of the product the size of the market, the competition, budgetary requirements, financial resources, return on investment, the window of opportunity and time to market should be understood. This information leads to conclusions about how and where to sell the product, the time-scales required, reliability and quality. All of these conclusions are criteria to be included eventually, as applicable, in the specification.

**C.4 Understanding the Potential Product:** In this phase the preferred product design begins to emerge and it becomes clear how the concept is to be implemented. Decisions are made about the final look and feel of the product and its performance. Trade-offs quite often need to be made between the customer’s perceived needs and what is feasible within technical, financial and time constraints. Trade-offs might also be necessary in order to reach the best overall solution. Any relaxation of requirements should be checked for impact on the commercial or technical viability of the product.

**C.5 Understanding which Legislation and Standards are Applicable:** For many products national legislations are applicable and it is necessary to establish which legislation and thus which regulations and standards may have an impact on the design.

**C.6 Understanding How to Manufacture the Product:** Once the detailed design has emerged (realization phase) product parameters can be finalized in the specification. The product’s architecture and detailed design can now be recorded fully in the design documentation. Criteria for manufacturing should be established in as much detail as practicable including methods of manufacture and test. Manufacturing staff (including those from any major sub-contractors) should be involved in this. Any special criteria for bought-in parts or sub-assemblies should be recorded.


C.7 Understanding How to Verify, Test and Validate the Product: When establishing the process of product conformity it is important to distinguish between verification, production testing and validation.

(i) Verification establishes that the design meets its specification. This may be achieved, to a degree, during the design process through the use of design reviews, etc. This is then supported by a final record showing that the overall design meets all the requirements.

(ii) Production testing ensures that individual examples of the product function satisfactorily.

(iii) Validation in its simplest form establishes that the product meets customer needs while at the other extreme it ensures that the product is fully fit for its intended purpose.

In the verification and validation process all the attributes of the product should be considered. Production testing covers critical and/or safety-related aspects and is only a subset of the overall product performance. It is usually necessary to test examples of the product fully to acquire the data to satisfy the initial design verification. Validation will include physical testing of the complete product under operating conditions to ensure that it meets the needs of the customer. Validation will also include recording the data as evidence of the validation process. With some products, validation may only be achievable with on-site testing.

In addition to proving the design it is usually necessary to prepare a production test specification. The application of production testing ensures that in the unfortunate event that a
non-conforming product is produced it is not released. A balance may have to be drawn between the cost and delay of testing and the risk of a faulty product being allowed through. It is common to concentrate on safety testing and basic functionality. For simpler products sampling inspection can be appropriate in which case an acceptable quality level (AQL) should be chosen. If sampling inspection is used there is a finite and predictable risk of a defective product reaching the customer. For this reason sampling inspection is not appropriate for some criteria or products. If it is used this should be made clear on any declaration of conformity.

C.8 Understanding How to Support the Product: Criteria for supporting the product should be established as early as practicable. The nature of the design itself and the thoroughness of any instructions for use can have a bearing on the amount of support customers need. Arrangements for dealing with warranty claims, criteria for associated costs, response times and helpdesk performance should all be established, as applicable.

D Recording the Criteria

D.1 Overview: All relevant criteria should be recorded formally to build up the product specification document. Where criteria are known to be relevant, but their values are not yet established, they should be recorded as, for example, “TBD” (to be determined). This will reduce the likelihood of issues being overlooked later.

Figure 2 illustrates how, as criteria are acquired, they can be documented. For clarity, the process is summarized as a sequence, but it is more likely to be iterative within each step, or even between steps. The approach can be tailored to suit an individual product. Criteria should be covered to an extent that all interested parties will be satisfied.

It is useful to distinguish between the criteria to be recorded in the specification document and the associated commercial intelligence. It is vital to collect, assimilate and communicate the latter but for confidentiality reasons it may be prudent to keep it segregated from the product specification, particularly if this will be released outside the organization. Commercial intelligence can form an annex to the product specification.

All staff involved in the design process should be given ready access to all technical information and as much commercial intelligence as practicable. The specification may be in the form of handwritten text, a word-processed document, a computer database, or any other appropriate medium. Whichever method is chosen, some form of revision control should be in place (e.g. at least a date), to ensure users are working to up-to-date information as the document grows.

It is useful to adopt a formal structure for the document including numbered sections and subsections, or even numbered individual lines of the specification, so that references or changes to it can be made unambiguously at a later date.

D.2 Some Practical Tips for Writing a Specification: The following are some practical tips for writing a specification.

(a) Start preparing the specification document very early on.

(b) Prepare it in a form that can easily be read and used by others.

(c) For complex products with multidisciplinary design, areas of the specification may be compiled by different people or sub-groups. Each should be aware of what the other is doing and the information brought together for review.

(d) Start by writing all the obviously applicable headings even if it is not yet possible to fill
in any details (see Annex F for some suggestions).

(e) Put down all salient and useable information but be concise.

(f) Where possible be quantitative rather than qualitative: put down numbers, with tolerances where practicable.

(g) Avoid being unnecessarily restrictive: this can increase eventual product cost or limit design options.

(h) Always involve all the relevant people: research has shown that people tend to put too great an emphasis on areas of their own expertise and not enough on others. Multiple inputs help to counteract this effect.

(i) Writing a specification is an iterative process but try not to change the specification too often.

(j) Allow changes in the specification early on in order to refine it. However, changes will eventually become disruptive, so later unnecessary changes should be discouraged.

(k) Eventually changing the specification has to stop so that design work can proceed in a controlled way. It may be extremely wasteful to try to undertake detailed design while the specification is still changing.

(l) Good management is necessary to know when to change the specification and when not to: it will give stability to the subsequent design process. It is important to try to minimize disruption but nevertheless to be willing to accommodate important changes if they are necessary to keep the specification on target to produce a successful product.

(m) A good way of deciding if a change should be allowed late on is to consider the cost of the change compared with the loss in profit from leaving the design unaltered. Whilst impossible to assess accurately, prompting the person who wants the change to think about the degree of benefit compared with the cost of the disruption, helps to filter out unnecessary cosmetic or minor changes, while allowing those that affect the product’s function or reliability.

E. Types of Specifications

E.1 General: Specifications are generally written for two purposes:

(a) to state unequivocally requirements concerning the performance and technical attributes of a product;

(b) to give guidance on the process of making and using a product.

The requirements and guidance needed to define and implement a product may be incorporated into one document, or exist in a whole series of inter-related documents. The approach taken is usually dictated by the size and complexity of the product and the precepts of the organization concerned. Figure 3 illustrates the relationship between the various kinds of specification used during a typical product life cycle.

E.2 Triggers: An outline of the proposed product to be specified may be given in an initial brief that states the customer’s key requirements. This initial brief may be further developed into a business proposal, project brief, design brief and, if necessary, a full performance
specification. These preliminary steps should be taken during the project’s conception and feasibility phases, before any work on its implementation is authorized or started.

Figure 44: How Acquiring Criteria Builds up the Documentation

E.3 Requirements: A performance specification should state the required attributes of the product, together with any constraints, without giving a detailed technical description. This information should then be used during the implementation phase as the basis for preparing a product specification that contains a full technical description of the product.
A product specification may describe in detail a new product designed to meet a particular customer’s requirement or general market requirement, or an existing product. Such specifications may be used for contractual purposes.

The product specification needs to give all the information required to realize the product and provide objective evidence that the product conforms to its performance specification (or, in the absence of a performance specification, to the client’s initial brief).

Product specifications may also describe an existing product to a prospective customer and may be supplied in the form of a brochure, catalogue entry, handbook or user manual. Such descriptive specifications, when accepted by the customer, place an onus on the supplier to provide a product that conforms to the description; thus descriptions can become firm requirements.

**E.4 Processes:** Process specifications (see Figure 4) should be developed where necessary to give detailed guidance on the technical and procedural aspects of product implementation. They should be concerned with the required output, invariably the delivery of a product that conforms to the performance specification.

The specification of processes should be broad and of a general nature, relying on internal and external standards without necessarily making reference to them. These specifications are often referred to simply as procedures and should describe the way in which a set of inter-related resources and activities transforms inputs into outputs.

**E.5 Other Types of Specification:** A small selection of commonly used kinds of specification and their purposes are described in Figure 4. These may specify products and/or processes; they may be prescriptive and/or descriptive.

**F. Management of Specifications during Preparation**

**F.1 Related Documents, References and Duplication:** Before starting to prepare a specification, it is advisable to search for existing documents that might serve the same purpose, either in part or in whole. The following types of publication may be relevant to the proposed specification:

(a) the organization’s internal specifications;

(b) general rule documents;

(c) national, RECs, African and international standards;

(d) standards issued by professional, industrial, commercial and public sector bodies;

(e) technical books, journals and product catalogues;

(f) statutory instruments, conditions of contract and other legal conditions;

(g) specifications issued by prospective purchasers or specifications of other organizations.

Even if a suitable document is not found, some of the information obtained may be relevant to the proposed specification and should be referenced or incorporated as necessary.

**F.2 Drafting Procedures:** The sequence of the work in drafting a specification may not correspond to the order in which the specification is presented. A six-stage procedure for
drafting a typical specification is given in Figure 5. This procedure is iterative, but for clarity the feedback lines are omitted in the figure.

Figure 45 — Order of Use of Specification Types
Primary purpose of the product that also gives essential instructions concerning such matters as style, grade, performance, appearance, characteristics, conditions of use, health and safety, packaging, conformity assessment, reliability and maintainability.

Requirements that are to be incorporated in the product design, such as compliance with standards, processes and management systems.

Process and precautions to be observed in withdrawing from service and discarding or otherwise dispensing with a product and any associated waste or redundant materials.

Requirements to ensure that the product can be moved and stored with adequate protection from damage to itself, the environment, property and people.

Process for examining the product to determine its conformity with requirements given in the product specification.

Process and detailed procedures for installing the product, including, if necessary, unpacking, preparation, assembly, commissioning, testing and hand-over to the customer.

Process and detailed procedures for the routine, preventive and corrective maintenance needed to keep the product operating in accordance with its performance specification.

 Constituents of the product, including raw materials, finished components and all other items required for its construction.

Process and detailed procedures for bringing the product into use and then operating and maintaining it so that the requirements of the performance specification are fulfilled throughout its life cycle.

Methods and logistics of creating the product, including the materials, equipment, physical conditions, facilities, personnel, procedures and sequence of activities that contribute to the delivery of an end product that conforms to its specification.

Criteria that need to be met before the product is handed over to the customer.

Process and detailed procedures for testing the product, including, if necessary, the criteria for assessing the test results for compliance with the acceptance and/or performance specifications.

Figure 46 — Some Types of Specifications
F.2.1 First draft: The subject for consideration should be nominated then the objectives agreed with those directly responsible before collecting the appropriate data, such as relevant regulations, standard procedures, suppliers and prices. National and trade standards need to be sought, suppliers’ catalogues collected and examined and existing applications noted.

If an initial investigation shows that an existing standard does not exist and the subject is worth pursuing, discuss the objectives between interested parties and decide on the form of standard required. Is it design, process or quality control for example?

Prepare a first draft of the standard for discussion. Some of the many points to be agreed at this stage are outlined below.

(a) **Proposed scope.** Does it conform to established standards or regulations (international, national, company)? Is it adequate for possible future development? Are there too many sizes? Do the sizes follow a logical progression?

(b) **Application.** For what applications is the scope suitable or unsuitable? Is the new standard to be applied retrospectively or for future use only?

(c) **Quality.** Is the item/procedure specified in sufficient detail to ensure consistent application?

(d) **Availability.** Can the articles be obtained at the right price, right quantities and at the right time?

(e) **Health and safety.** Are all regulations observed?

Compliance with national and/or international standards will ensure that most of the above points have been considered. The final form of the standard will then emerge to be published for comment, and when approved will be distributed to all who may have occasion to use it.

F.2.2 Editing: Most of the early drafts need to be edited to conform to the corporate style, particularly with regard to layout. Illustrations should be used to reduce text. Information from another standard should be cross-referred to rather than repeated from another standard. Repeated information is difficult to keep updated.

**Be brief:** Do not overelaborate, the aim is to convey information without ambiguity.

**Avoid jargon:** Documents may have to be understood by non-specialists.

**Use illustrations:** Illustrations can be used to minimize text.

**Cross-refer:** Do not repeat information already quoted in another standard.

**Include instructions for use:** These may be quoted once rather than in every document.

**Be precise:** Avoid words such as "etcetera", "whenever possible" or "wherever practicable" "unless specified elsewhere".

F.2.3 Circulating for Comment: All interested parties should be consulted about a specification and a consensus obtained before the draft is issued. This may take longer in a large business or if more than one section or department is involved. In a smaller organization it is possible to dispense with a formal structure of committees and working parties.
Consensus does not mean everyone unequivocally agrees but that all reasonable arguments are withdrawn.

Draft specifications should be circulated to all interested parties and the comments considered before issuing a second draft.

An accompanying note should be circulated with the draft to explain briefly its aim and to give the reasons why it is being produced. The responders should be asked to quote the relevant clause number, indicate whether the comment is editorial or technical and each comment should be accompanied with a proposal for the changed wording plus a justification for the change. The process of circulating for comment should be repeated until consensus has been reached, then the specification should be submitted for signature to the approved signatories. The signatures make the document “legal” and it is then printed and distributed via the document control system.

F.3 Authorization for Issue: The completed specification should be checked for accuracy and suitability for issue by a person who was not involved in its preparation, but who is conversant with the subject.

The quality management system needs to specify the persons in the organization who are authorized to sign a document as approved prior to release. The authority of specifications should be clear. A document applicable to more than two departments is considered as a business standard and is signed by the managing director.

F.4 Management of Issued Specifications

F.4.1 Primary Identification: Each specification should be given an identifying code, title and issue number. The code should identify the class of subject matter or the objectives of the document, to facilitate classification in a library. It should also permit quick reference and traceability.

F.4.2 Availability and Storage: Copies of the specification should be recorded, stored and controlled so that they are directly available to all authorized users.

Most organizations use and store other organizations’ specifications. One approach to the storage of a variety of external specifications is to classify them on receipt, giving them internal codes, so that they can be traced.

F.4.3 Review: All specifications should be reviewed at regular intervals and amended as necessary. The interval between each review should not exceed 5 years.

F.4.4 Change Management and Disposal: A regularized procedure should be used to issue new documents and amendments. Holders of handbooks and individual documents need to be identified and addressed each time an amendment is made. The instruction has to state clearly whether the document being issued is new, revised or withdrawn, and the name of the holder and the location should be identified. Holders of standards documents should be asked to acknowledge receipt of amendment instructions and should be pursued if they do not. The holder of a standards handbook should similarly record who made an amendment on an amendment record sheet in the front of each volume.

A copy of each issue of the specification should be permanently archived, together with any information concerning modifications. Reference to archived specifications may be necessary at any time in the future, for example, as evidence in disputes and litigation. All obsolete specifications in circulation should be retrieved to prevent their continued use. It may also be
necessary to destroy these copies for security reasons. Advance information on changes should be made using the official change channels.

**Figure 47 — Stages in the preparation of a specification**

### G Research File and Documentation Supporting Specifications

The research process supporting the development of a product specification shall be documented in detail and clearly indicate references which support decisions to set limits for parameters and characteristics which define the quality, health, safety and environmental provisions in the standard. Standardization experts should demonstrate updated understanding of the research and technological developments in their field of standardization rather than appearing to arbitrarily fixing parameters in standards. A well-organized and referenced research file creates a crucial baseline from which reviews and product diversification can proceed as well as serving to address any legal claims and product liability issues.

Where this standard is applied to simpler products, or smaller organizations, a suggested method is to consolidate all the technical information into one product specification (as shown in the top left-hand circle in Figure 6) and confidential information into a commercial appendix or file. The consequence is that the specification becomes one or two evolutionary documents rather than the traditional series where the earliest becomes obsolete.

The design verification results and design validation results illustrated in Figure 6 are necessary in order to be able to demonstrate that the final product meets the requirements of the product specification.
Figure 48: Interrelationship of Product Documentation
H Typical Standards for Fisheries and Aquaculture

We are focusing on standards applicable through the value chains, such as:

(a) Responsible fisheries (capture fisheries
(b) Good agricultural practices
(c) Good manufacturing practices
(d) Sustainable fisheries
(e) Certification and conformity assessments
(f) Product specifications
(g) Product market presentations
(g) Traceability standards for fish products

References
Future Society and Standards (Kwon et al., 2007)
Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries (FAO, 2009)
Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Capture Fisheries (FAO, 2011b)
Standards and Global Trade: A Voice for Africa (Wilson et al., 2003)

6.3.12 Utilization of Standards for Regulation

A. Role of Standards in Regulation Setting

A.1 National standards bodies should promote efficient and effective voluntary standardization in order to advance the national economy, support sustainable development, benefit the health, safety and welfare of workers and the public, assist and protect consumers, facilitate domestic and international trade and further international cooperation in relation to standardization. For regulated areas, additional considerations and guidance are needed to meet the expectations of policy and regulatory decision makers.

A.2 Increasing regulatory confidence in standards is critical to the overall social utility of the standards world. Standards only have value if they are used. When a standard is incorporated into a regulation, it is being utilized at the highest possible level and becomes part of the overall technical and social infrastructure of the jurisdiction(s) concerned.

A.3 Some advantages for a regulatory authority referencing standards developed within the National Standards System include:

(a) the standards have been developed by balanced committees of all relevant interests, employing the principles of consensus;
(b) the standards have undergone a public review process as well as a “second level review” by the standards body prior to publication;

(c) the standards are maintained and reviewed at appropriate intervals to ensure current technological developments are incorporated;

(d) the commercial needs of producers, users, and other interests are addressed at the development stage, thus ensuing regulations referencing these standards are more amenable to commercial acceptance; and,

(e) the standards address the national public interest by considering to the extent possible as appropriate to the subject of the standard, how it advances the national economy, supports sustainable development, benefits the health, safety and welfare of workers and the public, assists and protects consumers and facilitates trade.

B. Considerations on the Development of Regulatory-Oriented Standards

B.1 The effective development of a standard suitable for incorporation by reference in a legislative instrument requires that a cooperative effort between the regulatory authority and the standards development committee be established from the outset.

B.2 The standards development committee should be aware of the views of the regulatory authority with respect to the scope of the standard and its expected date of completion.

B.3 Representatives of interested regulatory authorities should be active participants on the standards development committee. If for reasons of balance, time, or distance this is not possible, they should be associate or corresponding members who can make comments and provide input.

B.4 Depending on the nature and complexity of the work of the standards development committee and the number of regulatory authorities involved, it may be advisable to establish an appropriate mechanism for coordination with all interested parties. For example, coordination with a range of regulatory authorities could be achieved by correspondence and through report sharing which is made simple and effective with current technology.

B.5 Should a standards development committee become aware of a requirement which is beyond the scope but related to, or considered essential to, a broader aspect of the subject under consideration, the standards development committee should refer the issue to the appropriate body, such as other standards or code committees or a regulatory authority so that the matter can be resolved.

C. The Content of the Standard

C.1 The body of a standard for reference in legislative instruments should contain only those requirements considered essential for regulatory reference.

C.2 A standard intended for regulatory reference as well as for marketplace needs should be drafted to facilitate this separation whenever possible.

C.3 Requirements should be divided into distinct, consistent and easily identifiable sections to facilitate their incorporation by reference in codes and regulations. This permits selected sections to be separately identified in a code or regulation when only part of the standard is referenced.
C.4 References to certification or administrative requirements relating to conformity assessment, marks of conformity and other non-technical issues, including promotional material, should not be included in the normative content of a standard. These requirements typically use terms such as "approved," "approval," "accepted," "acceptable," "certified," "listed" and "registered" and imply acceptance, endorsement, certification or listing by a regulatory authority or its appointee. Such requirements may be included in the preface, notes to the preface, foreword, or informative annexes.

C.5 A standard should not specify any date for enforcement of a standard to be referenced in a legislative instrument. The enforcement date is an administrative requirement determined by the regulatory authority.

C.6 The language for a standard to be used in regulation should be clear, direct and precise. A standard written in language which "recommends" is not likely to be suitable in a regulation if failure to comply could result in prosecution.

C.7 Each specific requirement of the standard should be stated unambiguously using wording that is logical, valid and specific. In particular,

(a) terms such as “adequate”, “adversely affected”, “sufficiently strong”, and “extreme conditions”, should be avoided;

(b) qualitative adjectives and nouns that could be taken as absolute should not be used unless defined. Examples include “waterproof”, “unbreakable”, “flat”, and “safe”;

(c) qualitative adjectives and nouns that describe a measurable property should not be used unless defined. Examples include “high”, “strong”, “transparent”, and “accurate”; and,

(d) the term "unless otherwise specified" should not be used, except when the "other specification" is clearly identified in the standard.

C.8 If a standard is to repeat requirements stated in another standard, the repetition should be by specific reference and clearly indicate the referenced version. The use of the term "latest issue" should be avoided unless it has been carefully thought out and decided by the standards development committee that there are valid reasons to do so.

D. Advantages of Referencing Standards in Regulations

When a standard is available and it allows the achievement of a regulatory objective by reference, it can provide some of the following advantages:

(a) **Fulfils the Need**: the process of developing a standard in a consensual manner, which takes into account various interests, supports a solution that is likely to meet the expectations of the majority of the stakeholders addressed by the regulation.

(b) **Verification**: a standard which lends itself to 3rd party certification enhances confidence in a product or a system and provides the necessary positive support for a regulatory requirement.

(c) **Effectiveness of Requirements and Access to Expertise**: a standard may represent the sum of the knowledge of a broader expert pool than the one which the regulatory authority has access to.
Uniformity of Requirements: a standard produced in collaboration with representatives of several jurisdictions of regulatory authorities results in more uniform requirements, eliminating unnecessary trans-border barriers and favouring the exchange of goods and services.

Marketplace Compliance: by referencing standards which bring together marketplace and regulatory input, the likelihood of market compliance increases, thereby reducing the oversight burden.

Efficiency: If manufacturers are using the same tool to meet market needs and regulatory needs it will be more effective and efficient where both are concerned.

Resource Savings: referencing a standard which contributes to the objective of the regulation is likely to save significant resources. This saving can be examined in light of costs associated with participation by the regulatory authorities in the standard development process.

E. Methods of Referencing Standards

E.1 The method of referencing standards in regulations usually employs one of the following preferred variations:

(a) Dated Identification (Referencing a Specific Issue of a Standard): This is the most restrictive reference, used when a specific issue of a standard is intended, and future amendments and editions are excluded. Such references should include a date of issue or edition number of the standard.

(b) Dated Identification (Referencing a Specific Issue of a Standard Including Future Amendments): This type of reference incorporates a specific issue of a standard and includes all future amendments to that specific issue, but excludes new editions. Such references should include the date of the specific issue of the standard with the addition of the preferred phrase "as amended from time to time".

(c) Undated Identification (Referencing to Incorporate New Editions of the Referenced Standard without Requiring a Change to the Regulation): This type of reference incorporates a standard with no mention of a date of issue or a specific edition. In such instances, regulatory authorities should add the phrase, "latest edition of". This is the most liberal reference and permits regulatory authorities to respond easily and quickly to technical changes.

E.2 Each regulatory authority is responsible for determining which type of reference it is empowered to employ and must consult the provisions of the appropriate legislative instrument. For example, some Acts may not allow the use of undated references as this could be interpreted as a delegation of legislative authority to the standards development committee.

F. Referencing Options

F.1 The following are potential options for referencing standards or parts of standards:

(a) Complete Reference: In this application, all of the contents of the standard are included by reference in the regulation.
(b) Qualified Reference: In this application, selected portions of the referenced standard are deleted as being inappropriate for the intended purpose, however, the retained balance of the standard is included in the regulation.

(c) Partial Reference: In this application, only selected portions of the referenced standard are included in the regulation.

(d) Reference as Good Practice: In this application, a standard is referenced as a guide to permit conformance to 'good engineering practice'. The method of compliance to ensure good engineering practice is generally determined by regulatory authorities. This is a flexible approach that does not require compliance with the referenced standard, but informs the user of its existence and acceptability.

(e) Reference as an Alternate: In this application, standards are referenced as examples whereby compliance will ensure that certain performance requirements will be satisfied or where compliance will allow the user to obviate certain provisions.

(f) Inclusive Reference to Standards: In this application, the standard selected as a reference contains one or more references to other standards. For example, standard X (the primary reference) may include a reference to standard Y, (the secondary reference) and Y in turn may reference standard Z (the tertiary reference). Regulatory authorities should ensure that such secondary or tertiary references are germane to the regulation being formulated. If not, this should be so indicated by specifying they are to be excluded, or by the application of the "Qualified" or "Partial" reference options described above.

G. Recommendations for Maintenance and Maintenance Procedures for Standards for Use in Legislative Instruments

G.1 National Standards bodies have procedures which require them to regularly review standards to ensure that they remain current and abreast of technology. When undertaking this review, standards development committees should determine the requirements of the interested regulatory authorities. When a standard is being considered for maintenance action, the standards development organization should provide sufficient notice to the interested regulatory authorities such that they may have ample opportunity to make their views known or to take such action as they consider appropriate.

G.2 Regulatory authorities should develop procedures to assist them in monitoring the status of standards referenced in their regulations. This monitoring should include updates, amendments and withdrawals so that the regulatory authority can take appropriate action to affected regulations. As part of its maintenance procedure, the regulatory authorities should maintain active participation in the appropriate standards committees.

References

Safe Food Australia: A Guide to the Food Safety Standards (ANZFA, 2001)

Private Food Safety Standards: Their Role in Food Safety Regulation and their Impact (FAO, 2010)

Analysis of Economic Impacts: Standards for the Growing, Harvesting, Packing and Holding of Produce for Human Consumption (FDA, 2011a)

Methods of Referencing Standards in Legislation with an Emphasis on European Legislation (Leibrock, 2002)


6.3.13 Sustainability Practices in Fisheries Resource Management

A. In the standardization field, policy objectives are placed at the highest hierarchy and should inform the targets set be achieved by standards and conformity assessment. Owing to the dynamisms and imperatives of trade, it is recognized that in many situations policies are formulated as a response to the exigent state of play. Indubitably, the exigent state of play that informed the eco-labelling standards and certification regimes operating in Africa derived their mandate exogenously and are predominantly oriented towards satisfying the requirements formulated by marketing and retail chains in Europe and North America. In their original formulation, these standards and schemes were intended to satisfy European and North American consumers that the products, predominantly food were:

(a) Safe and healthy

(b) Produced in an environmentally sustainable manner which secured future supplies

B. In response to food safety scares of the 1990s, many governments in North America and Europe established mandatory requirements for firms to introduce Hazard Analysis and Critical Control Point (HACCP) food safety management systems (Washington et al., 2011). Private standards schemes in fisheries and aquaculture have emerged in areas where there is a perception that public regulatory frameworks are failing to achieve desired outcomes, such as sustainability and responsible fisheries management, or to ensure food safety, quality and environmental sustainability in the growing aquaculture industry. The two main types of private standards which affect fish trade relate to:

(a) “Ecolabels” which focus on sustainability of fish stocks and are designed to incentivize responsible fisheries practices and to influence the procurement policies of large retailers and brand owners, as well as the purchasing decisions of consumers.

(b) Food safety and quality fish and seafood private standards which seek to offer guarantees related to quality, safety, environmental impacts, social responsibility, traceability, and transparency of production processes.

C. UNEP-TDIE (2009) recognizes that much of the interest in certification as a market-based initiative stems from the fact that certified products can be traded globally, and the value of international seafood trade has been growing rapidly in recent years. Resulting improvements in fisheries management from certification could result not just in the environmental benefits which are the main motivation for those establishing environmental certification schemes, but also potentially in significant contributions to both poverty alleviation and food security in developing countries through guaranteeing the long-term availability of fish stocks, increased long-term value-added and improved trade. Certification and ecolabelling thus have the potential to generate environmental, social, and economic benefits (UNEP-TDIE, 2009).
D. The concept of an African Ecolabelling Mechanism (AEM) was supported by UNEP under the African 10 Year Framework Programme (10YFP) on Sustainable Consumption and Production. The relevance of the AEM to African countries were highlighted in the background assessment report (Janisch, 2007) as follows:

1. **Environmental requirements:** Increasingly being used to define commercial relationships between producers and buyers by way of eco-labels.

2. **Market competitiveness:** Make African products competitive in destination markets and improve environmental and social aspects of production.

3. **Rationalize and unify eco-labels:** Reduce the need for individual green claims and avoid ‘label fatigue’ and ‘label clutter’.

4. **Locally relevant certification process with internationally-recognised standards:** Facilitate exports market for high-value sectors.

5. **Raise awareness on mitigating environmental impact in Africa.**

6. **Communicate the message of African sustainability:** Communicate the accurate message of sustainability that accounts for the African circumstances.

7. **Emphasise that an African Eco-label assures genuine benefits:** In particular that the label is part of providing institutional, environmental, social and economic wellbeing (poverty reduction) in Africa on a sustainable basis as opposed to existing eco-labels which offer partial solutions.

8. **Expanding Africa’s market access:** Evidence is strong that eco-labels have a role to play in expanding Africa’s market access and assuring customers that current issues of concern such as environmental degradation and greenhouse gas emissions are mitigated by compliance with the African eco-label.

E. These objectives helped to shape the African Ecolabelling Standards (ARS/AES). The African Eco-Labelling Mechanism (AEM) was formally established in 2010 to coordinate the development of sustainability standards and conformity assessment of the same with a view to issuing Eco-Labelling Certification for goods and services complying with these standards. A quick-win strategy was to develop a benchmarking scheme with a view to creating a mutual recognition arrangement for the various eco-labelling and sustainability schemes operating in Africa. While in the course of developing these standards there were strong voices arguing for the direct adoption of existing eco-labelling standards which already had international visibility and presence, or completely abandoning the African initiative in favour of giving recognition to existing schemes.

References

Ecolabelling and Certification in Capture Fisheries and Aquaculture (NAAS, 2012)

Ecolabelling and Fisheries Management (Gardiner et al., 2004)

Eco-Label and Sustainable Fisheries (Deere, 1999)

Eco-Label Conveys Reliable Information on Fish Stock Health to Seafood Consumers (Gutiérrez et al., 2012)

Fisheries and Aquaculture Certification: Implications for Southeast Asia (Wilkings, 2012)
Guidelines for the Ecolabelling of Fish and Fishery Products from Inland Capture Fisheries (FAO, 2011b)

Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries (FAO, 2009)

Product Certification and Ecolabelling for Fisheries Sustainability (Wessells et al., 2001)

Private Standards and Certification in Fisheries and Aquaculture: Current Practice and Emerging Issues (Washington et al., 2011)

Is Certification a Viable Option for Small Producer Fish Farmers in the Global South? Insights from Vietnam (Marschke et al., 2014)

Handbook of Marine Fisheries Conservation and Management (Grafton, 2010)

Policy and Guidelines for Fish Habitat Conservation and Management (NSW-DPI, 2013)

6.3.14 Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa

The overall purpose of the Policy Framework and Reform Strategy for Fisheries and Aquaculture is to facilitate transformation of Africa’s fisheries and aquaculture for food, livelihoods and wealth. Accordingly, the Policy Framework and Reform Strategy is intended to:

(1) elaborate and make explicit essential guiding principles for good governance of Africa’s fisheries for increased coherence and coordination of the sector

(2) assist AU Member States, RECs and RFBs to develop realistic fisheries and aquaculture policies by suggesting standards and best practices to the sector’s benefits to AU member states, in terms of food security, employment and income

(3) help facilitate regional collaboration and integration in shared fisheries and aquaculture resources management

(4) provide appropriate guidance on how to implement reforms for fisheries and aquaculture development

(5) facilitate ratification and/or adoption of appropriate provisions in international fisheries management instruments

(6) facilitate advocacy for increased investment in the fisheries and aquaculture sector

The key references to sustainability are those which address (i) Legal institutional framework; (ii) Social wellbeing; (iii) Economic and livelihood sustainability; and (iv) Environmental sustainability

Institutional Reforms

The PFRS recognizes that the regulatory and governance framework is characterized as ineffective and of need for reform in many countries. The PFRS seeks to establish national and sub-national governance and institutional arrangements that ensure that the societal contribution generated by Africa’s sectors have the greatest impacts at the most appropriate level.
**Social Aspect**
The PFRS envisions Member States moving from open access fisheries to user rights-based fisheries is a key element in increasing societal benefits from the sector while ensuring ecological sustainability of the resource. Member States are invited to define and design various suites of user rights-based fisheries management that take into account the geographical scope, socio-cultural context and nature of the fisheries, and minimize negative impacts to vulnerable groups and ecosystems.

**Economic and Livelihood Sustainability**
The PFRS recognizes the abundance in Africa of rich and diverse fisheries resources, both marine and inland which together generate significant economic benefits to the continent in terms of revenues, food and livelihoods. Part of the policy objectives of the PFRS include the following economic and livelihood sustainability aspects:

(i) Development of sustainable small-scale fisheries by improving and strengthening the contribution of small-scale fisheries to poverty alleviation, food and nutrition security and socio-economic benefits of fishing communities and beyond.

(ii) Realizing the full potential of the aquaculture sector to generate wealth, social benefits and contribute to the development of the African economy by jumpstarting market-led sustainable development strategies.

(iii) Promoting responsible and equitable fish trade and marketing by significantly harnessing the benefits of Africa’s fisheries and aquaculture endowments through accelerated trade and marketing.

**Environmental Sustainability**
The PFRS expresses concern on the current unsustainable exploitation of fisheries resources, noting that many resources are in a critical state for a number of reasons, including overcapacity and effort, uncontrolled use of illegal practices, over-exploitation and environmental degradation including mechanized trawling in inshore and protected areas and pollution. The PFRS also notes that fisheries policies are expansionary with emphasis on tonnage landed rather than extracting higher values by processing and value addition. Coastal resources are under growing fishing pressure by both mechanized trawling and small-scale fisheries operators. Thus the PFRS advocates the adoption of policies and measures which promote conservation and sustainable resource use.

**Reference**
Electronic or printed copies of the following documents to be distributed:

*Regional Assessment of Fisheries Issues, Challenges and Opportunities for Eastern Africa Region: Toward the Formulation of the Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa* (Mwima, 2012)


6.3.15 Introduction to ARS/AES 02:2014, *Fisheries — Sustainability and Eco-Labelling — Requirements*

This African standard originated from the realization that existing eco-labelling schemes and standards operating in Africa and across the world had specific biases with respect to the sustainability pillars. The current standard, ARS/AES 2:2014 takes into account Africa’s circumstances with the aim of ensuring that fisheries and aquaculture operations translate to genuine benefits for African operators and host communities rather than only satisfying the perceptions of foreign customers. It is important to recognize that ARS/AES 2 was developed in parallel with the PFRS and therefore some aspects of the PFRS may not be aligned. Below are the highlights of ARS/AES 2:2014.

ARS/AES 2 employs eight key principles which together with criteria and indicators address the sustainability perspectives:

(a) Principle 1: Legal compliance
(b) Principle 2: Respect human rights
(c) Principle 3: Respect labour rights
(d) Principle 4: Maintain fisheries resources and rebuild depleted fish stocks
(e) Principle 5: Maintain ecosystems integrity
(f) Principle 6: Contribute to the mitigation and adaptation to the detrimental effects of climate change.
(g) Principle 7: Responsible waste management
(h) Principle 8: Efficient use of resources

These eight (8) principles are detailed within the following outline:

(a) Governance and policy
   (i) Legal compliance
   (ii) Management systems
   (iii) Incentives for sustainable fishing
   (iv) Fishing methods and gear
   (v) Information for research
   (vi) Customary rights

(b) Social aspect
   (i) Universal Declaration of Human Rights
   (ii) Labour rights

(c) Fisheries resources
   (i) Fish stocks status
   (ii) Reference point
   (iii) Stock rebuilding
   (iv) Harvest strategy
   (v) Harvest control rules and tools

(d) Ecosystem approach
   (i) Fishing operations
   (ii) Retained species
   (iii) Bycatch species
   (iv) Endangered, threatened and protected (ETP) species
   (v) Habitats
(vi) Ecosystem

(e) Climate change aspect

(i) Climate change mitigation and adaptation
(ii) Reduction of ozone layer depleting compounds

(f) Environmental management

(g) Waste management

(h) Resource use efficiency

(i) Energy management

The standard is structured to support large scale as well as small-scale fisheries. The standard was optimized for inland and marine capture fisheries operations.

Reference
A printed or electronic copy of ARS/AES 02:2014, Fisheries — Sustainability and eco-labelling — Requirements to be provided.

6.3.16 Packaging and Labelling as the Weak Link in Fisheries Marketing

A. The Rationale for Packaging Fish Products

A.1 Packaging can be defined in several ways, including the following (Paine et al., 1992):

Table 28: Definitions of packaging

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>(1)</td>
<td>A coordinated system of preparing goods for transport, distribution, storage, retailing and end-use</td>
</tr>
<tr>
<td>(2)</td>
<td>A means of ensuring safe delivery to the ultimate consumer in sound condition at minimum overall cost</td>
</tr>
<tr>
<td>(3)</td>
<td>A techno-economic function aimed at minimizing costs of delivery while maximizing sales (and hence profits)</td>
</tr>
</tbody>
</table>

Table 24 lists three of the more fundamental; (1) and (2) indicate that packaging contains and protects during transport and has an economic aspect. To ensure delivery, the package must at least provide information as to the address of the recipient, describe the product and perhaps explain how to handle the package and use the product. A little more thought and we recognize that packaging is part of the marketing process (Figure 42).

Marketing may be defined as the identification, anticipation and satisfaction of customer need profitably.

The basic function of food packaging is to identify the product and ensure that it travels safely through the distribution system to the consumer. Packaging designed and constructed solely for this purpose adds little or nothing to the value of the product; it merely preserves farm or processor freshness or prevents physical damage. Cost effectiveness is the sole criterion for success. If, however, the packaging facilitates the use of the product, is reusable or has an after use, some extra value can be added to justify extra cost and promote sales.
Packaging has also been described as a 'complex, dynamic, scientific, artistic and controversial segment of business'. Packaging is certainly dynamic and is constantly changing. New materials need new methods, new methods demand new machinery, new machinery results in better quality, and better quality opens up new markets which require changes in packaging. The cycle then starts again.

Thus, at its most fundamental, packaging contains, protects and preserves, and informs. At its most sophisticated, it provides two more functions—those of selling and convenience. In a world where the quality of products is high, in many instances almost the only difference between competitive brands lies in the packaging, and only packaging influences the selling operations. The last definition in Table 24 states: ‘packaging is a techno-economic function aimed at minimizing costs of delivery while maximizing sales (and hence profits)’. At this level, the value of—or even the need for—the added functions is controversial, and as a result opinions vary as to whether packaging is a waste of material and energy, or is properly utilized for the conservation of goods and reduction of labour. Containment, protection and information will always be essential in any packaging and these functions are basically conservational. How
much we should spend on the ‘selling’ and ‘convenience’ functions and how far they are regarded as necessary, is a matter for discussion.

A.2 The Need for Packaging

A.2.1 Efficient packaging is a necessity for every kind of food, whether it is fresh or processed. It is an essential link between the food producer and the consumer, and unless performed correctly the standing of the product suffers and customer goodwill is lost. All the skill, quality and reliability built into the product during development and production is wasted unless care is taken to see that the consumer gets it in prime condition. Proper design is the main way of providing ‘a package which protects what it sells and sells what it protects’.

A.2.2 Thus, the packaging functions require specialized knowledge and skills, in addition to specific machinery and facilities, to produce a package which will provide most, if not all, of a number of basic requirements of which the following are the most important: containment; protection and preservation; communication; suitability for the packaging line, i.e. machinability; convenience in shape, size, and weight for handling and storage; adapted for the use of the product it contains; environmentally friendly in respect of manufacture, use and disposal. Moreover, these basics must be provided at one or all of the three levels of packaging usually employed, namely the primary pack, the secondary package or shipping container and the unit load.

A.2.3 These basic needs must now be examined in more detail together with some less important options.

(1) Containment. Obviously, the package must keep its contents secure between the end of the packaging line and the time when all the food has been eaten.

(2) Protection and preservation. The packaging must protect the food from both mechanical damage during handling and deterioration by the climate(s) through which the package will pass during distribution and storage in the home.

(3) Communication. All food packaging must communicate. Not only must the contents be identified and the legal requirements of labelling be met, but often the packaging is an important factor in promoting sales. Also, the unit load and the shipping container must inform the carrier about its destination, provide instructions about the handling and storage of the food and inform the retailer about the method of opening the package and possibly even of the best way to display the product.

(4) Machinability. The majority of modern retail packages and many transport packages are today erected, filled, closed and collated on machinery operating at speeds of 1000 units or more per minute. They must therefore perform without too many stoppages or the process will be wasteful of material and uneconomic. Even when the numbers concerned are small and the items specialized, the need for a good performance in filling and closing operations is still important.

(5) Convenience and use. The most common impressions of convenience in retail packaging for foods are those of providing easy opening, dispensing and/or after use. Easy opening must be tempered by seal integrity. We must avoid the trap of producing an opening device which falls in transit, or of failing to provide sufficient control on the packaging line to ensure the device works 99% of the time. However, the provision of convenience is much wider than just these impressions. The shipping container as well as the primary packaging must provide convenience at all stages from the packaging line, through warehousing to distribution, as well as satisfying the needs of the user of the product.
A.2.4 We must also fit the packaging to the needs of the food and this involves answering questions such as:

- What age groups are we concerned with? Are they well informed, impulsive or irrational?
- What kind of packaging is used by the competition? Should we follow the general line or be different?
- What do distributors and retailers want from the packaging? Have they criticisms of our or the competition's packaging?
- Is the relationship between packaging cost and the selling price of the food correct or does it give a wrong impression of the position in the market?
- Is the possibility of pilfering, tampering or stealing such as to make an impact on the design of package?
- Is the possibility of an after use for the packaging worth considering as a sales incentive and will the packaging be generally considered as environmentally responsible?
- Do we want a strong brand identity?
- Is there a range of related products that might form a family resemblance in the packaging?
- How will the packages be set out on retail shelves, etc.?

Such considerations will obviously differ according to the food concerned and the customers who are expected to buy. They can only be answered by a well conducted survey of the market.

A.2.5 To be effective, therefore, packaging must make the maximum contribution to the success of the marketing and distribution operations of which it forms a vital part, while at the same time be regarded as environmentally responsible. In general, technical developments in the packaging of any food product arise from changes in four main areas:

(a) Availability of newer materials and improved constructions, e.g. improved flexible barriers through metallizing and co-extrusion and changes in thermoforming techniques, etc.
(b) Developments in food processing and/or packaging machinery such as aseptic processing and modified atmosphere packaging as well as faster and more accurate computer control of machines.
(c) Changes in methods of storage and distribution.
(d) Improvements in methods of management and control, such as the use of bar codes and just-in-time (JIT) deliveries.

A.2.6 Developments in marketing also influence packaging. If we define marketing as 'the identification, anticipation and satisfaction of customer need profitably' we realize the influence that customer lifestyles could have on the packaging of food. In many instances improved
packaging can promote a marketing response to customer demands or even change lifestyles, and in the food area consumers have reacted strongly to such influences as:

(a) Malicious tampering, whether for blackmailing retailers or other reasons.

(b) Green issues such as organic farming, more acceptable methods of animal husbandry and the reuse and/or recycling of packaging before final disposal.

(c) Health lobbies (low fat and sugar diets; elimination of artificial colourings and reduction in preservatives, etc.).

(d) A desire to reduce meal preparation time to a minimum.

A.3 Designing successful packaging

A.3.1 In order to design successful packaging four sets of facts must be considered:

• Product assessment
• The hazards of distribution
• Marketing requirements
• Packaging materials selection and machinery considerations.

A.3.2 All we need here are the answers to the question: How can the product be damaged or deteriorate? Some of these are obvious from a visual examination, some can be ascertained by simple measurements, whilst other information must be supplied by the designer and producer. The more important facts required are:

(a) The nature of the product—the materials from which it is made and the manner in which these can deteriorate.

(b) Its size and shape.

(c) Its weight and density.

(d) Its weaknesses—which parts will break, bend, move about, become loose, scratched or abraded easily.

(e) Its strengths—which parts will withstand loads or pressures and which might be suitable for locating the product in the pack.

(f) The effect of moisture and temperature changes on the product, and whether it will absorb moisture or corrode.

(g) Compatibility—whether the product is likely to be affected by any of the possible packaging materials, which items can be packed together, with protection if necessary, and which items must not be packed together under any circumstances.

(h) Possibilities for dismantling complex products, how far stripping down may be carried out to reduce the package size to a minimum, and whether the required assembly, installation and use instructions will be such that the customer can handle them.
B. Food Safety and Packaging Materials

B.1 Barone et al. (2015) reports that the connection between food safety and food packaging materials (FPM) is one of the most debated arguments in the modern world of food production. FPM is generally seen as a sort of accessory structure by inexperienced subjects with reference to the real edible content. On these bases, it could be inferred that FPs are not responsible for the use of FPM and related consequences: in fact, containers are clearly non-edible!

Food safety regulations recognize that packaging materials are active components of the so-called integrated food product (IFP) when used by food producers (FP). In other words, the FP is surely responsible for its own product, including the use and the management of food containers and similar components. These packaging materials are certainly able to determine and influence the safety and integrity of the packaged product with distinctive advantages, but the possibility of damages for the consumer has to be considered at the same time.

B.2 Chemical Food Safety

B.2.1 Chemical food safety deals with all aspects of chemical risks in food, which the World Health Organization introduces as follows: The contamination of food by chemical hazards is a worldwide public health concern and is a leading cause of trade problems internationally. Contamination may occur through environmental pollution of the air, water and soil, such as the case with toxic metals, PCBs and dioxins, or through the intentional use of various chemicals, such as pesticides, animal drugs and other agrochemicals. Food additives and contaminants resulting from food manufacturing and processing can also adversely affect health (Brimer, 2011).

B.2.2 Generally, the chemical risk is coincident with the concept of chemical contamination. In other words, the possible occurrence of apparent or clearly defined chemical hazards occurs if the designed IFP is not correlable with the planned chemical composition. One or more of the below-mentioned situations can occur:

1. Diffusion of foreign but edible contaminants in the inner and/or external layers, including the superficial area
2. Diffusion of foreign and non-edible contaminants in the inner and/or external layers, including the superficial area
3. Transformation of one or more original components of the final IFP because of predictable or unknown factors, with active influence of FPM
4. Transformation of one or more original components of the final IFP because of predictable or unknown factors under incorrect storage conditions, without active influence of FPM
5. Transformation of one or more original components of the final IFP because of predictable or unknown factors under incorrect storage conditions, with active influence of FPM
6. Apparent transformation of sensorial features because of predictable or unknown factors under normal or incorrect storage conditions, with or without FPM ruptures or other damages.

B.2.3 The concept of chemical interaction between packed food and FPM is widely accepted in the scientific world and the recent regulatory has evidenced the attention of the national
legislator in a number of countries. Anyway, three conditions have to be respected in relation to
the possible migration of chemical substances from FPM to packed foods (the inverse migration
is always possible). The following can be affirmed:

(a) The human safety cannot be compromised

(b) The chemical composition of packed foods cannot be modified in an
unacceptable way in reference to the original product (these conditions state IFP
and packed foods are two different concepts)

(c) Sensorial features of the IFP cannot be altered (for example, texture and colour
are either correlable with packed foods and FPM at the same time).

B.2.4 As a result, the migration of potentially toxic or harmful substances from FPM to food
products has to be carefully evaluated, with or without the modification of chemical
compositions and sensorial features. Actually, every chemical or physical modification of IFP is
important because of the intrinsic meaning of ‘warning light’: sometimes, food hygiene alerts
may be highlighted by apparently strange or grotesque phenomena on the organoleptic
viewpoint.

B.2.5 Metal Contamination and Toxicology

B.2.5.1 Metals are the most abundant group of chemical elements on the earth’s crust, and
they are found in all foods. Some of these elements, such as iron, calcium, potassium and zinc,
are present in nature and are considered essential when speaking of human diet at least,
within certain specific tolerances. On the other hand, metals, such as lead, cadmium, arsenic
and mercury, may be detected in foods and other commodities as contaminants and pose
serious risks to the human health because of different factors, including the known
bioaccumulation. By a general viewpoint, the detection of metals in preserved foods can have
three main causes:

(i) Presence in raw materials used in the preparation of preserved foods. Metallic
elements may be naturally present in raw materials. On the other hand, the
detection of metals may depend on environmental contamination

(ii) Presence in food preparations before of the final packaging. The cause(s) can be
originated on one or more of processing steps. Examples: contact with metal
parts of processing plant (tubes, thanks, valves and electrodes)

(iii) Contamination of preserved foods during packing and especially during storage
steps.

B.2.5.2 Depending on the level of contamination, several corrective actions have to be put in
place including (a) analyses of raw materials, (b) evaluation of production steps and (c) the
examination of packaging and/or distribution processes (Barone et al., 2015).

(1) Alumínium: At present, there is no indication of any adverse health effects caused by
released aluminium from packaging material, when speaking of packaged food
products. The Joint FAO/WHO Expert Committee on Food Additives (JEFCA) of the
Food and Agriculture Organization (FAO) and the World Health Organization (WHO) has
established a ‘Provisional Tolerable Weekly Intake’ (PTWI) of 1 mg/kg body weight (b.w.)
for aluminium in 2006. This limit applies to all aluminium compounds in food,
including additives.
Tin: At present, there is no indication of a chronic toxicity of Sn in humans because this element does not accumulate in the organism (traces in the bones > soft tissues). The acute toxicity of Sn is rather low: according to a recently published study, tin levels up to 267 mg/kg in foodstuff do not cause any harm to the health of adults. It should be noted that there is a great variation in the sensitivity of individuals to Sn. Different levels for chronic and acute toxicity of Sn could be established.

Lead: The human exposure to Pb causes a variety of health effects with particular relation to children. People are exposed to Pb through the air they breathe, through water and through food/ingestion. Toxic effects are usually due to long-term exposure. The maximum limit for Pb in canned tomato paste is 1.0 mg/kg according to the Codex Standard 193-1995.

Cadmium: Oral exposure to Cd may determine adverse effects on a number of human tissues, including also the immune system, and the cardiovascular system. The intake of Cd from the diet is usually about 0.0004 mg/kg/day, roughly ten times lower than the typical amount needed to cause kidney damage by this route. With reference to this metal, the Codex Alimentarius Commission has defined a limit of 0.05 mg/kg.

Arsenicum: Inorganic As is well known as a notable human carcinogen; in addition, children can suffer other health problems in later life. Available data have shown that inorganic As causes cancer of the lung and urinary bladder, in addition to skin damages. There are no limits for As in most foods with relation to the USA, but the recognised standard value for drinking water is 10 ppb. With concern to the European viewpoint, the EFSA has recommended that the dietary exposure to inorganic As should be lowered in comparison with the JECFA PTWI of 15 μg/kg b.w.

Table 29: Fish products in lacquered metallic cans: metal contamination

<table>
<thead>
<tr>
<th>Fish product</th>
<th>Average values (mg/kg)</th>
<th>Max. allowed limits (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lead</td>
<td>Cadmium</td>
</tr>
<tr>
<td>Tuna in olive oil</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Mackerel filet in olive oil</td>
<td>&lt;0.03</td>
<td>&lt;0.03</td>
</tr>
</tbody>
</table>

C. Chemical and Microbiological Aspects of the Interaction between Food and Food Packages

C.1 Packages are an integral part of packaged foods; these necessary ‘accessories’ are designed to function as a protective barrier for foods in terms of quantity and preservation. However, it has been estimated that packages can represent also

(1) A source of food contamination

(2) A permanent location for microbial spreading because of the existence of a sort of ‘gap’ or empty space for micro-organisms.

Moreover, packages may be the layer that promotes the interaction between food contact surfaces and packed foods.

C.2 At present, the packaging market appears to be dominated by plastic-made containers and objects. Modern environmental requirements force food packaging manufacturers to modify basic materials with the aim of supplying easily biodegradable packages. On the other
hand, this type of packaging can also create good or acceptable conditions for the development of food degrading microflora.

C.3 In relation to the evaluation of the impact of packages on foods, an important element is the observation of the microbial behaviour when micro-organisms are in contact with packaging surfaces. The interaction between packages and microflora can influence food products in terms of safety and quality.

C.4 Microbes in contact with packaging materials may, after a more or less prolonged contact, inhibit their development. On the other side, there is a possibility of penetration into packaged foods. Microflora can also (a) adhere to both surfaces of the same package and (b) form biofilms. In detail, a remarkable modification in the development stage of micro-organisms in concomitant contact with packages and foods may occur. Subsequently, the microbial spreading can occur in packaged products with the typical metabolism of degrading micro-organisms. Sometimes, the contact of micro-organisms with packages is responsible for similar reactions; the delamination of laminates used for food packaging can occur.

D. Major Microbial Hazards Associated with Packaged Seafood

Kerry (2012) details that for most pathogens associated with seafood, cooking by the end user to an adequate temperature for a specific time will be suitable control to prevent illness. If, however, there is temperature abuse, heat-stable toxins may be formed or pathogens may have time to reproduce. Further, if seafood is harvested from waters contaminated by sewage (of either human or animal origin) or inadequate sanitation is followed at any of the unit operations from harvest to table, there will be greater opportunity for the development of seafood-borne illness. Obviously, it is undesirable to bring any seafood heavily contaminated by bacteria, viruses or amoeba into a processing facility due to the potential for contamination of ‘clean’ species and/or the potential for cross contamination. Furthermore, a seafood processor’s HACCP plan is written for events that are reasonably likely to occur – not any eventuality. There are never any guarantees that a raw seafood will be free of pathogens; however, it is critical to have some assurance from the harvester, receiving dock or wholesaler that species have been harvested from waters of purity acceptable within that locale. In the United States, waters are certified by state officials, while waters further than three miles from shore are overseen by the National Marine Fisheries Service (NMFS), an agency within the National Oceanic and Atmospheric Administration. Waters for growing aquacultured species should have similar assurances of purity, although they are geographically variable and have become a topic of regular reporting in the popular press.

E. Fish Product Labelling Requirements

E.1 Protection of consumers from misleading or inaccurate description and labelling of foods exists in most national jurisdictions and regional legislations have been harmonized to protect citizens and to facilitate trade. These legislations require that any labelling, advertisement or presentation of the food should not be misleading to the purchaser to a material degree, particularly:

- as to the characteristics of the food, and, in particular, as to its nature, identity, properties, composition, quantity, durability, origin or provenance, method of manufacture or production process
- by attributing to the food effects or properties that it does not possess
- by suggesting that the food possesses special characteristics when, in fact, all similar foods possess such characteristics.
E.2 Mandatory information required for pre-packed food which includes:

- the name of the food
- a list of ingredients
- the quantity of certain ingredients or category of ingredients
- the net weight of the food
- an indication of the durability of the food
- any special storage conditions or conditions of use
- the name and address of the manufacturer or packer, or EU seller
- lot identification
- place of origin, if omission would mislead to a material degree with regard to its true origin of provenance
- instructions for use if appropriate use of the food could not be made of the product without those instructions
- Non pre-packed foods: Foods sold loose or just overwrapped, even in a tray, do not have to give all the mandatory information required for pre-packed foods. Only the name of the food needs to be given and the category of the class of additive, if used in the food. If the food is described by a legal name, then it still has to conform to the requirements associated with that name.
- Nutritional information: Unless a nutritional claim is stated – for example, low fat – then, nutritional information is given on a voluntary basis.
- Allergen labelling: ingredients known to cause allergies or intolerances need to be labelled.

E.3 Controls on Labelling of Fish and Shellfish

- the commercial designation of the fish/shellfish (i.e., an agreed commercial name for that species)
- the production method (i.e., whether it is farmed or wild, and, if wild, whether caught at sea or inland waters)
- the catch area (i.e., an area of the ocean in the case of sea-caught fish, or country of production in the case of farmed fish or fish caught in inland waters).

References

A Handbook of Food Packaging (Paine et al., 1992)

Chemical Food Safety (Brimer, 2011)

Handbook of Seafood Quality, Safety and Health Applications (Alasalvar et al., 2011)
6.3.17 Biotechnology in Fisheries and Aquaculture: Opportunities and Challenges

In 2007, more than 113 million tonnes of food fish were supplied by capture fisheries and aquaculture globally, providing an estimated 17 kg per capita. Aquaculture contributed nearly half (44 percent) of this total, and is the fastest growing food-producing sector in the world. It is expected that in the near future aquaculture will produce more fish for direct human consumption than capture fisheries.

Started primarily as an Asian freshwater food production system, aquaculture (the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants) has now spread to all continents, encompassing all aquatic environments and utilizing a range of aquatic species. From an activity that was principally small-scale, non-commercial and family-based, it now includes large-scale commercial or industrial production of high value species that are traded at the national, regional and international levels. Although production remains predominantly Asian and still largely based on small-scale operations, there is wide consensus that aquaculture has the potential to meet the growing global demand for nutritious food fish and to contribute to the growth of national economies, while supporting sustainable livelihoods in many communities.

The rapid growth of aquaculture has significantly benefited both from conventional technologies and from biotechnologies, and it is expected that advanced biotechnologies will further help the sector in meeting the global demand for aquatic food in the coming decades. Aquaculture, compared with livestock or crop production, is a novel production system in many developing and developed countries. While biotechnologies are being applied in fisheries management, their use is very limited compared to aquaculture.

One of the main reasons for the success of aquaculture is the diversity of species currently in culture (over 230) and the genetic diversity that can be exploited through captive breeding and domestication. However, the rearing of many newly cultured species is to a large extent based on juveniles and/or broodstock obtained from the wild. In order to establish practical breeding programmes to produce seed in hatcheries, it is necessary to have a detailed understanding of the complete production cycle. Such knowledge is also required in order to disseminate breeding improvements to the production sector. Improvements that allow the wider application of appropriate genetic and reproduction biotechnologies will undoubtedly increase aquaculture production, thus contributing to global food production. These biotechnologies
include polyploidy, gynogenesis and androgenesis, the development of monosex populations and cryopreservation.

Disease outbreaks are a serious constraint to aquaculture development. Disease control and health management in aquaculture are different from the terrestrial livestock sector, particularly due to the fluid environment. Disease occurs in all systems, from extensive to intensive, and losses are possible in all types of production systems. There is a need for better management of intensive systems, and biotechnologies are being used for this purpose. Immunoassay and DNA-based diagnostic methods are currently being used to screen and/or confirm the diagnosis of many significant pathogens in aquaculture in developing countries. Also, one of the most important factors leading to reduced antibiotic use by the aquaculture sector is the availability of good prophylactic measures for diseases causing severe mortalities in cultured fish and shellfish. The use of vaccines provides good immunoprophylaxis for some of most important infectious diseases of finfish. As molecular-based vaccine production procedures rely heavily on biotechnological tools, vaccines are being produced mainly in developed countries.

Reducing the environmental impacts of aquaculture is a significant task. Aquaculture is often accused of being unsustainable and not environmentally friendly. Reducing the impacts of effluent discharge, improving water quality and responsible use of water are key areas to be considered in aquaculture development. Some biotechnologies are being used to address these areas, including bioremediation for the degradation of hazardous wastes and use of DNA-based methodologies for the early detection of toxin-producing algae.

In capture fisheries, the sustainable management and conservation of fisheries is a priority. Better understanding of the population structure of the fishery is therefore of paramount importance. Some biotechnologies have already been applied, but there is ample scope for the greater use of biotechnologies in fisheries management worldwide. The use of molecular markers and the principles of population genetics have proved very effective for assessing the actual levels of genetic variability within single populations and for measuring the extent of differentiation between populations.

References
Biotechnology and Genetics in Fisheries and Aquaculture (Beaumont et al., 2010)

Aquaculture and Fisheries Biotechnology: Genetic Approaches (Dunham, 2004)

Use of Genetically Improved and Alien Species for Aquaculture and Conservation of Aquatic Biodiversity in Africa (Gupta, 2004)

Biotechnology in Aquaculture: Prospects and Challenges (Edun et al., 2011)

6.3.18 The Rules-Based Nature of Fish Trade: Implications of the WTO TBT and SPS Agreements — The National Obligations Under the OIE and WTO Fish Trade Facilitation Regimes

A. Introduction

Trade within national jurisdictions and across borders is increasingly affected by the proliferation of standards and technical regulations with increased regulatory intensity being particularly noticeable in the food and agricultural sectors covering cereals; fish, crustaceans and other aquatic vertebrates; edible preparations of meat, fish and crustaceans; edible vegetables, roots and tubers; prepared vegetables, fruit, nuts and other plant parts; and
prepared cereals and flours (Sheldon, 2013). The proliferation of standards and technical regulations in both the food and agricultural sectors is typically regarded as the response of policymakers to consumer demands for improved product safety, increased environmental protection, and greater product information. Standards and technical regulations “have as their prima facie objective the correction of market inefficiencies stemming from regional, national, transnational, or global externalities associated with the production, distribution, and consumption of these products.

Standards in the food and agricultural sector can be classified under two broad categories: (i) provision of public goods such as control of pesticide use in agricultural production; and (ii) reduction of transactions costs associated with information asymmetries between producers and consumers concerning food product characteristics, e.g., the extent of pesticide residues in a product which consumers are unable to ascertain either before or after its consumption. While the theory of optimal intervention prescribes that market distortions should be targeted at source, there is also acknowledgement that they may also provide protection for domestic producers and are, therefore, subject to “regulatory capture” (Sheldon, 2013). Given the potential for standards and technical regulations to distort international trade, a key outcome of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994 was the securing of multilateral disciplines on their use through the World Trade Organization’s (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS), and the Agreement on Technical Barriers to Trade (TBT). The objective of these agreements is to ensure that standards and technical regulations, while potentially meeting legitimate economic objectives, are not disguised restrictions on international trade.

Sheldon (2013) reports that there has been considerable discussion of the problems of regulatory compliance faced by developing countries in accessing developed country markets, given the latter typically have higher levels of regulatory intensity than the former. Testing the hypothesis of “standards as barriers” has been a dominant feature of the limited amount of empirical research on the impact of food safety regulations on trade flows of specific food and agricultural commodities. A common finding of these empirical studies is that more stringent standards imposed by developed countries act as barriers to trade.

B. Basic Definitions under WTO SPS and TBT Agreements

Certification system: the set of rules for executing of works on certification, its participants and rules for operation of the certification system as a whole.

Standard: a document establishing, for the purposes of voluntary multiple use, the product performances, the rules for realization and the characteristics of processes of production, operation, storage, transportation, marketing and utilization, executing of works or rendering of services. The standard may also contain the requirements for terminology, symbology, packing, marking or labelling, and the rules for their affixing.

Standardization: the activity of establishing of rules and performances for the purpose of their voluntary multiple use, aimed at achievement of orderliness in the spheres of production and circulation of products, and at heightening of competitiveness of products, works or services.

Technical regulating: the legal regulating of relations in the field of establishing, application and executing of obligatory requirements for products, processes of production, operation, storage, transportation, marketing and utilization, and also in the field of establishing and application, on a voluntary basis, of the requirements for products, processes of production, operation, storage, transportation, marketing and utilization, executing of works or rendering of services, and legal regulating of relations in the field of conformity assessment.

Technical regulation: a directive, compliance with which is mandatory, whereby the
competent authority, through an administrative action, establishes the characteristics of a product or the production processes or methods relating to the product, including applicable administrative provisions. It may also include, or exclusively address, requirements in the areas of terminology, symbols, packaging, branding or labelling applicable to products, including buildings, structures and constructions, for processes of production, operation, storage, transportation, marketing and utilization. Preparation, adoption and application shall be the responsibility of the respective Ministries or agencies duly authorized for this purpose.

C. Pivotal Provisions of the WTO SPS Agreement

SPS measures include all relevant laws, decrees, regulations, requirements and procedures including, *inter alia*, end product criteria; processes and product methods; testing, inspection, certification and approval procedures; quarantine treatments including relevant requirements associated with the transportation of animals and plants, or with the materials necessary for their survival during transport; provisions on relevant statistical methods, sampling procedures and methods of risk assessment; and packaging and labelling requirements directly related to food safety.

D. Key Expectations

(i) Except under very special circumstances, countries generally benefit from removal or reduction trade barriers arising from SPS measures and technical regulations.

(ii) In principle, SPS standards are introduced by government in the interest of the society, to protect public, animal and plant health, and the environment.

(iii) In theory, establishment of SPS standards (or other technical standards) could facilitate trade through reducing transaction cost, by assuring consumers that the food they consume is of an acceptable standard and reducing the cost of uncertainty that they face in assessing product quality.

(iv) Standards can serve to signal quality in foreign markets and thus contribute to increasing elasticity of substitution between similar goods produced in different countries, thereby permitting relatively more efficient producers to thrive through export expansion.

(v) Efficiency of production would be increased through standardization as it reduces information asymmetries between buyers and sellers, and promotes product commutability, thereby allowing for increased economies of scale and scope.

E. Key Impacts

Importing countries may deliberately craft SPS measures that impose a cost or other disadvantage on foreign competitors to provide protection for domestic producers.

Even when comparable SPS measures are applied in developed countries to both domestic and imported products, they can act to impede imports from developing countries because of asymmetry in compliance cost.

Food safety has the potential of mutating to a ‘luxury’ good whose demand rises as income levels rise, and greater prosperity tends to be accompanied by increased demand for more stringent SPS standards in developed countries. Many in developed countries see the much laxer SPS standards that often prevail in developing countries as a threat precipitating ‘a race to bottom’.
As traditional trade barriers such as tariff and quantitative restrictions continue to decline, protectionist interests are likely to make increasing use of food safety regulations and other technical barriers to block trade.

Among African countries, TBTs and SPS measures have been deployed on the instigation of foreign interests to hinder intra-African trade.

Institutional capacity constraints to conduct conformity assessment on fish products coupled with rapid changes in the food safety perceptions of export destination countries. Significant investments are usually required to procure equipment, materials and competent human resources which represent a major barrier to developing countries.

Discriminative technical and financial assistance and transitional periods for the application of environmental and biodiversity safeguards such as turtle excluder devices (TEDs) in shrimp trawlers to reduce sea turtle mortality (Asche et al., 2009).

The globalization of the fish trade has led to substantial product that is exported to one country, processed, and then re-exported, sometimes back to the original country. If product is processed in a country besides the one harvesting or producing it, traceability may be more difficult. Traceability requirements could then become technical barriers to trade not just for raw product but also for processed product that ostensibly originates in the importing country.

Export-oriented fisheries are subjected to legislative and regulatory pressures in the export destinations which may demand significant costs in legislative and regulatory reforms and upgrades of processing facilities, and in some cases loss of markets and closing down of facilities unable to upgrade (Henson et al., 2004).

The WTO SPS Agreement anticipates SPS measures differ in the first instance due to significant differences in tastes, diets, income levels and perceptions that influence the tolerance of populations toward these risks. Differences in climate and in the available technology (from refrigeration through to irradiation) affect the incidence of different food safety and agricultural health hazards. Standards reflect the feasibility of implementation, which itself is influenced by legal and industry structures as well as available technical, scientific, administrative and financial resources. Some food safety risks, for example, tend to be greater in developing countries due to weaknesses in physical infrastructure (for example standards of sanitation and access to potable water) and the higher incidence of certain infectious diseases. Further, tropical or sub-tropical climatic conditions may be more conducive to the spread of certain pests and diseases that pose risks to human, animal and/or plant health (Jaffee et al., 2004).

F. Key Obligations of Member States under WTO SPS and TBT Regimes

Member States are under the following obligations whenever they anticipate developing and adopting SPS measures and technical regulations:

F.1 SPS Measures

(1) Relevant technical regulatory authorities shall prepare, adopt and enforce technical regulations establishing essential minimum SPS measures in relation to products originating from the separate countries and/or places, including the restriction of import, use, storage, transportation, marketing and utilization, providing biological safety (irrespective of the ways of safety assurance used by the manufacturer).

(2) The SPS measures may provide for the requirements for products, for methods of product processing and production, for procedures of product testing,
inspection, conformity assurance, the quarantine rules, including the requirements connected with transportation of animals and plants, for materials necessary to ensure life or health of animals and plants during their transportation, and also for methods and procedure of sampling, for methods of test and evaluating of risk and other requirements contained in technical regulations.

(3) Regulatory authorities shall ensure that any SPS measure that it prepares, adopted, maintained or enforced is:

(a) based on scientific principles, taking into account relevant factors including, where appropriate, different geographic conditions;

(b) not maintained where there is no longer a scientific basis for it; and

(c) based on a risk assessment, as appropriate to the circumstances.

(4) Each regulatory authority shall ensure that an SPS measure that it adopts, maintains or applies does not arbitrarily or unjustifiably discriminate between domestic goods and like goods of another country, or between goods of another country and like goods of any other country, where identical or similar conditions prevail.

(5) SPS Measures shall be proportionate to the appropriate level of protection, taking into account technical and economic feasibility.

(6) Regulatory authorities shall not adopt, maintain or apply any SPS measure with a view to, or with the effect of, creating a disguised restriction on trade.

(7) Technical regulatory authorities shall use, as a basis for preparing sanitary and phytosanitary measures, relevant international standards, guidelines or recommendations which will not be trade disruptive.

(8) Governments shall continuously register and analyse all cases causing harm, as a result of violation of requirements of SPS measures, to life or health of people, property of natural or legal persons, state or municipal property, environment, life or health of animals and plants, taking into account the weight of this harm, and also shall organize the informing of purchasers, manufacturers and sellers on the situation in the field of observance of technical regulation requirements.

F.2 Technical Regulations

(1) The following objectives shall constitute the legitimate purposes for the preparation, adoption and application of technical regulations in consistency with the provisions of the WTO TBT Agreement:

(a) protection of life or health of people, property of natural or legal persons, state or municipal property;

(b) protection the environment, life or health of animals and plants;

(c) prevention of actions misleading the purchasers / deceptive practices.

(2) In pursuing the legitimate objectives, regulatory authorities may establish the levels of protection that it considers appropriate.
(3) Regulatory authorities shall not prepare, adopt, maintain or apply any technical regulations with a view to or with the effect of creating an unnecessary obstacle to trade. An unnecessary obstacle to trade shall not be deemed to be created where:

(a) the demonstrable purpose of the measure is to achieve a legitimate objective; and

(b) the measure does not operate to exclude products of other Member States that meet that legitimate objective.

(4) Regulatory authorities shall ensure that a technical regulation shall:

(a) serve clearly identified policy goals, and be effective in achieving those goals;

(b) have a sound legal and empirical basis;

(c) produce benefits that justify costs, considering the distribution of effects across society and taking economic, environmental and social effects into account;

(d) minimize costs and market distortions;

(e) promote innovation through market incentives and goal-based approaches;

(f) be clear, simple, and practical for users;

(g) be consistent with other regulations and policies; and

(h) be compatible as far as possible with competition, trade and investment-facilitating principles at domestic and international levels.

G. WTO Dispute Resolution Mechanism

For any state or customs territory, WTO membership implies accepting limitations on regulatory autonomy in five areas: (1) trade in goods; (2) trade in services; (3) the protection of intellectual property rights; (4) the settlement of disputes; and (5) periodic review of national trade policies (Hoekman et al., 2007).

SPS and TBT Agreements address trade in goods and services and under the WTO legal obligations, all disputes arising from the implementation of these agreements shall exclusively be addressed through the Dispute Settlement Body (DSB).

Settling disputes is the responsibility of the Dispute Settlement Body (the General Council), which consists of all WTO members. The Dispute Settlement Body has the sole authority to establish “panels” of experts to consider the case, and to accept or reject the panels’ findings or the results of an appeal. It monitors the implementation of the rulings and recommendations, and has the power to authorize retaliation when a country does not comply with a ruling.

• First stage: consultation (up to 60 days). Before taking any other actions the countries in dispute have to talk to each other to see if they can settle their differences
by themselves. If that fails, they can also ask the WTO director-general to mediate or try to help in any other way.

- **Second stage: the panel** (up to 45 days for a panel to be appointed, plus 6 months for the panel to conclude). If consultations fail, the complaining country can ask for a panel to be appointed. The country “in the dock” can block the creation of a panel once, but when the Dispute Settlement Body meets for a second time, the appointment can no longer be blocked (unless there is a consensus against appointing the panel).
Officially, the panel is helping the Dispute Settlement Body make rulings or recommendations. But because the panel’s report can only be rejected by consensus in the Dispute Settlement Body, its conclusions are difficult to overturn. The panel’s findings have to be based on the agreements cited.

The panel’s final report should normally be given to the parties to the dispute within six months. In cases of urgency, including those concerning perishable goods, the deadline is shortened to three months.

The agreement describes in some detail how the panels are to work. The main stages are:

1. Before the first hearing: each side in the dispute presents its case in writing to the panel.
2. First hearing: the case for the complaining country and defence: the complaining country (or countries), the responding country, and those that have announced they have an interest in the dispute, make their case at the panel’s first hearing.
3. Rebuttals: the countries involved submit written rebuttals and present oral arguments at the panel’s second meeting.
4. Experts: if one side raises scientific or other technical matters, the panel may consult experts or appoint an expert review group to prepare an advisory report.
5. First draft: the panel submits the descriptive (factual and argument) sections of its report to the two sides, giving them two weeks to comment. This report does not include findings and conclusions.
6. Interim report: The panel then submits an interim report, including its findings and conclusions, to the two sides, giving them one week to ask for a review.
7. Review: The period of review must not exceed two weeks. During that time, the panel may hold additional meetings with the two sides.
8. Final report: A final report is submitted to the two sides and three weeks later, it is circulated to all WTO members. If the panel decides that the disputed trade measure does break a WTO agreement or an obligation, it recommends that the measure be made to conform with WTO rules. The panel may suggest how this could be done.
9. The report becomes a ruling: The report becomes the Dispute Settlement Body’s ruling or recommendation within 60 days unless a consensus rejects it. Both sides can appeal the report (and in some cases both sides do).

**Appeals**

Either side can appeal a panel’s ruling. Sometimes both sides do so. Appeals have to be based on points of law such as legal interpretation — they cannot re-examine existing evidence or examine new issues.

Each appeal is heard by three members of a permanent seven-member Appellate Body set up by the Dispute Settlement Body and broadly representing the range of WTO membership. Members of the Appellate Body have four-year terms. They have to be individuals with recognized standing in the field of law and international trade, not affiliated with any government.
The appeal can uphold, modify or reverse the panel’s legal findings and conclusions. Normally appeals should not last more than 60 days, with an absolute maximum of 90 days.

The Dispute Settlement Body has to accept or reject the appeals report within 30 days — and rejection is only possible by consensus.

**H. Scientific Evidence as Basis for WTO Engagements**

The proliferation and enhanced stringency of food safety and agricultural health standards is a source of concern among many developing countries and those promoting the increased integration of these countries into the world trading system. Reflecting wider changes in the trade regime for various agricultural and food products, there is a presumption that food safety and agricultural health measures can (and will) be used as a protectionist tool, providing 'scientific' justifications for prohibiting imports of certain products altogether, or discriminating against imports by applying higher standards and/or more rigorous regulatory oversight than on domestic suppliers.

The SPS Agreement permitted measures that were ‘necessary to protect human, animal or plant life and health’, yet required regulators to: (1) base measures on a scientific risk assessment; (2) recognize that different measures can achieve equivalent safety outcomes; and (3) allow imports from distinct regions in an exporting country when presented with evidence of the absence or low incidence of pests or diseases.

Scientific justification is called for wherever standards are deemed to not be based on established international standards. Yet, complications are inevitable given the wide range of areas for which no agreed international standards exist and given broad (and emerging) areas for which the state of scientific knowledge is incomplete. Hence, many of the controversies which have occurred surround the legitimacy and appropriateness of measures in the context of scientific uncertainty.

**I. Capacity of African Member States to Engage in WTO**

Most African countries have not developed the capacity to demonstrate compliance of their fish products to international or regional standards. The imposition of scientifically unproven limits or disproportionate requirements on products originating from African countries has not been scientifically challenged due to low capacity of Member States in carrying out comparative research.

To establish and enforce appropriate standards requires building expertise and devoting additional resources to applied science and public management. To a great extent this effort can be left to private firms wishing to expand domestic and international sales, but there remains a role for government in light of the public-good nature of effective standards. In defining and implementing more effective standards, however, many poor countries will need technical assistance from international organizations and specialists with expertise (Hoekman et al., 2002).

The SPS and TBT agreements have set a bar that must be met by exporting firms in developing countries. These agreements strongly encourage importing nations to adopt product standards that are at least as rigorous as those developed by international standards-setting bodies. Over time, all WTO members can be expected to adopt such regulations, with the richer members choosing even stronger rules. Thus, developing economies have no choice but to meet recognized international standards, at least for exports. It is likely, however, that such standards would have to be applied to all production within each country simply to inspire confidence in importing markets that goods are produced safely by all potential supply sources.
In this context, problems relating to the implementation of obligations under the TBT and SPS agreements rank high among developing country concerns. Lack of modern technical infrastructure and capacity to engage in international standards development activities and to provide internationally recognized testing and certification procedures for products is a common constraint. Without the resources necessary for building and maintaining modern standards and conformity assessment systems, it is difficult either to ensure rights or to exercise responsibilities under existing WTO rules. If developing countries lack resources to access information on international standards or to participate in their development, a key link between the rule of law as specified in the WTO system and developing countries’ ability to fulfill their obligations and defend their rights is called into question.

Many countries are also concerned to clarify provisions regarding special and differential treatment in the TBT and SPS agreements. India, for example, has recommended extending the timeframe for compliance by developing country members with the existing provisions of WTO agreements referencing standards. In a related vein, a number of developing countries have cited problems with their ability to react to notifications of new TBT and SPS measures. A notification of intent to promulgate a new regulation, with a 60-day open comment rule, is of questionable value to developing countries that have no capacity to respond.

Concern over the use of environmental standards to restrict imports is also prevalent among developing countries. The use of trade measures to enforce environmental standards is viewed with serious alarm by many countries with regard to both manufactures and agricultural products. Among other issues, the lack of clear rules on the appropriate use of labels to indicate environmental impact and the rise in the use of standards for process and production measures in industrial countries have been noted in developing country submissions to the WTO.

Questions of how and under what circumstances mutual recognition agreements (MRAs) are best implemented to facilitate trade have also been raised. Such agreements are used to reduce the trade-impeding effect of technical barriers through mutual recognition of national product testing and certification procedures. To date, they have only been negotiated between industrial countries, although both the TBT and SPS agreements encourage all WTO members to enter into MRAs.

Developing countries may use the WTO dispute resolution mechanism to raise concerns about whether particular standards in import partners meet SPS and WTO rules. This situation likely means that WTO panels must give greater voice to scientific evidence and representations by members of civil society. Developing countries need to monitor the development of dispute settlement in this regard and assert their own interests. It must be recognized, however, that the WTO itself is not a standards-setting body; it has neither the expertise nor the resources for this purpose. Ultimately, the real concern of developing countries must be to influence the development of global standards in ways that at least pay attention to their concerns.

J. WTO and the North-South Politics

There are arguments that since SPS standards have the latitude of protecting the health and safety of human, plant and animal life, their adoption and enforcement tend to be less transparent, allowing ample room for tweaking them to make them stronger than necessary for achieving optimal levels of social protection and to twist the related testing and certification (conformity assessment) procedures to make competing imports less competitive (Athukorala et al., 2003).

An example is given of the 1998 EC regulation that reduced the maximum permissible level of aflatoxin in foodstuffs and animal feed to a lower level than international standards specified
by the Codex Alimentarius (EEC, 1998). The results suggest that the EU standards, which would reduce health risk by approximately 1.4 death per billion a year would reduce exports by more than 60% or US$ 670 billion from 9 countries (Cameroon, the Dominican Republic, Ghana, Nicaragua, Nigeria, Sudan, Senegal, Tanzania and Zambia) (Athukorala et al., 2003), as compared with regulation based on the international (Codex) standard.

There is evidence of some instances where standards prohibit trade altogether (Athukorala et al., 2003:432). For example, a EU regulation requires that dairy products be manufactured from milk produced by cows kept on farms and milked mechanically. This regulation virtually precludes imports from many DCs where milk production is by and large a smallholder activity. The EU recently invoked this regulation to ban import of camel cheese from Mauritania, bringing hardship to a small enterprise, which developed the product at a considerable cost (Athukorala et al., 2003). The EU also raised the issue that Mauritania is not free of foot-and-mouth disease, although there is little scientific evidence to suggest that camels (or, in particular, camel milk) can transmit the associated virus. An Australian quarantine regulation requires that chicken meat imported from Thailand must be heated at 70 Celsius for 143 minutes to avoid the possibility of carrying a certain disease. This has effectively closed the Australian market for Thai chicken exporter [It is said that the required heat treatment transforms chicken into paper!). In June 2002, Thai authorities provided the Australian government with a risk assessment report showing that the risk of introducing IBDV to backyard flocks through cooked chicken meat was negligible.

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Kenyan Exports of Nile Perch: Impact of Food Safety Standards on an Export-Oriented Supply Chain (Henson et al., 2004)

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6.3.19 The Politics of Food Safety and Food Security Indicators: The Politics of International Food Standards

A. Introduction
The general public as consumers want food to be safe—or safe enough—and they expect the food industry and government to make sure that it is. The public is also part of the political equation. Food safety is a matter of politics as well as science and stakeholders need to recognize the political forces at work in safety matters. One of the noticeable weaknesses of food safety systems governance in most countries is the fragmented, overlapping, and confusing distribution of authority among the national agencies concerned with food safety. While these disparate authorities are responsible for making sure that unsafe food does not get into the human food supply, most often the system fails to ensure that food companies follow rules designed to protect public health. The mandate overlap complicates government oversight of microbial contaminants in food, genetically engineered foods, and protection of the food supply against potential threats of bioterrorism.

There is a tendency by the food industries to promote economic self-interest at the expense of public health and safety. Whenever things go wrong, culpable companies shift blame to others or variables outside their control, and oppose, resist, and undermine food safety guidelines, following them only when forced to do so by government action or public opinion.

The food industry invokes science as a rationale for self-interested actions. In the case of the ongoing debate about the safety of genetically engineered foods, companies use scientific arguments that the products are not yet known to cause food safety concerns push for registration and approval of their products. Unscrupulous food companies use science as a political tool to oppose requirements to keep harmful microbes out of food, label genetically modified foods, or institute protective measures against bioterrorist threats. Greater attention to food safety has been raised partly by the extensive media coverage in recent years given to food scandals, food-borne human diseases, fears with regard to genetically modified foods, and, recently, consideration of the vulnerability of food and water supplies to terrorist activity.

Food safety is used as a means through which consumer advocacy groups raise issues about the self-interested exercise of corporate power, the imbalance in power between corporate and public interests, and the collusion of government policies with business interests. Advocacy groups can use questions of safety to address much broader social and political concerns.

B. Perceptions of Food Safety Risk
Safety is relative; it is not an inherent biological characteristic of a food. A food may be safe for some people but not others, safe at one level of intake but not another, or safe at one point in time but not later. Instead, we can define a safe food as “one that does not exceed an acceptable level of risk” (Nestle, 2010). Decisions about acceptability involve two overlapping approaches in which people assess risk to decide whether a food is safe: from the perspective of “science” and from the perspective of “values.” A “science-based” approach to food safety, which balances risk against benefits and costs and contributes to the estimation of risk, is distinguished from a “value-based” approach focused on the acceptability of risk, which tends to balance risk against dreaded outcomes or feelings of outrage. Scientific questions do not arise in value-free contexts and value-based approaches often consider scientific arguments. When such decisions have implications for commercial or other self-interested motives, food safety enters the realm of politics.

Nestle (2010) argues that the estimation of risk is a scientific question—and, therefore, a legitimate activity of scientists in government agencies, in universities and in the research institutions while the acceptability of a given level of risk, however, is a political question to be
Table 30: Comparison of “science-based” and “value-based” approaches to evaluating the acceptability of food safety risks

<table>
<thead>
<tr>
<th>“Science-Based”</th>
<th>“Value-Based”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts and calculates:</td>
<td>Assesses whether risk is:</td>
</tr>
<tr>
<td>▪ Cases</td>
<td>▪ Voluntary or imposed</td>
</tr>
<tr>
<td>▪ Severity of illnesses</td>
<td>▪ Visible or hidden</td>
</tr>
<tr>
<td>▪ Hospitalizations</td>
<td>▪ Understood or uncertain</td>
</tr>
<tr>
<td>▪ Deaths</td>
<td>▪ Familiar or foreign</td>
</tr>
<tr>
<td>▪ Costs of the risk</td>
<td>▪ Natural or technological</td>
</tr>
<tr>
<td>▪ Benefits of the risk</td>
<td>▪ Controllable or uncontrollable</td>
</tr>
<tr>
<td>▪ Costs of reducing the risk</td>
<td>▪ Mild or severe</td>
</tr>
<tr>
<td>▪ Balance of risk to benefits</td>
<td>▪ Fairly or unfairly distributed</td>
</tr>
<tr>
<td>Balances risk against benefit and cost</td>
<td>Balances risk against dread and outrage</td>
</tr>
</tbody>
</table>

Source: (Nestle, 2010)

Thus each dispute has two main components, factual issues and value issues. Factual questions include: What risks are involved? How big are they? Who is at risk? These are scientific questions. The central value question is: Given those facts, what should society do? A more detailed examination of the two approaches to evaluating risks—called, for lack of better terms, science-based and value-based—helps to explain why food safety issues are so political.

### B.1 Science-Based Approaches: Counting Cases and Costs

Science begins with an observation, but rather than accepting an observation as a universal truth, scientists question its accuracy, interpretation, and relevance; develop theories to explain its significance; and design and conduct experiments to test those theories (Nestle, 2010). The quality of scientific research depends not only on the question under investigation (some research questions are more interesting and important than others) and the care ("rigour") with which studies are conducted, but also on the ability of the studies to eliminate ("control for") all possible causes of the observation other than the one being tested. Scientific methods also extend beyond observations to suggest probable causes, to exclude irrelevant causes ("confounding variables"), and to estimate the probability that a particular cause is the true reason for the observation of interest. However, probability is not the same as proof. Biological experiments in humans are complicated by genetic variation and behavioural differences, and study results nearly always depend on probabilities and statistics. This means that they are subject to interpretation and, therefore, to perception, opinion, and judgment. Scientists tend to minimize the subjective nature of interpretation and to view knowledge gained through the testing of theories as objective, accurate, evidence-based, hypothesis-driven, and rigorous.

In practice, a science-based approach to food safety is one that appears to focus exclusively on the characteristics of the risk itself: annual cases of illness, doctor's visits, hospitalizations, deaths, costs to individuals and to society, the benefits of doing nothing about the risk, and the benefits and costs of risk reduction. From this perspective, risks are measurable and, therefore, “scientific” and “objective.” Researchers and government officials evaluate potential hazards through a formal process of risk assessment that involves identifying the hazard,
characterizing it, determining its degree of exposure in the population, and calculating the balance of risk to benefit and cost. Using this science-based approach, government agencies identify the primary preventable food safety hazards as microbial infections, antibiotic resistant Salmonella, food allergens, and certain pesticides. Because so much self-interest is at stake in such decisions, these areas have political as well as scientific dimensions—whether recognized or not.

B.2 Value-Based Approaches: Estimating Dread and Outrage

Scientific methods estimate the probability that something in a food might lead to illness, but they do not consider the intangible value or significance of that food to the people eating it. Many people, however, evaluate risks not only for their potential to cause health problems but also from the standpoint of personal beliefs and values that depend on a host of psychological, cultural, and social factors. These personal perspectives about food have also been studied extensively. Anthropologists, for example, tell us that the act of consuming food—taking it into our bodies—is so primal that societies create myths to explain the transformation of food into us. Because, in that sense, we truly are what we eat, food raises questions of intimacy and identity and provokes feelings of anxiety. People do not necessarily want food to be perfectly safe (or we would never eat wild mushrooms or raw oysters). We are just more comfortable knowing what we are eating. At some deep psychological level, “If we are what we eat, and we don’t know what we are eating, then do we still know who we are?”

On the ranking of potential hazards according to the degree of perceived harm, studies indicated that people worry most about risks perceived as highly dangerous, particularly to pregnant women and small children (a science-based concept), but they are also concerned about risks perceived as involuntary, unpreventable, unfamiliar, and inequitably distributed—factors based on values (Nestle, 2010). People are less willing to accept risks induced by technology, those poorly understood by science, and those subject to contradictory statements from experts. The more such value-based factors characterize a particular risk, the more the risk generates feelings of anxiety, alarm, dread, and outrage. In fact, risk communication researchers rank such factors on a predictable scale of dread and outrage.

With respect to food, acceptance of risk depends far more on perception of the number and intensity of dread-and-outrage factors than it does on the number of cases of illness. On a population basis, microbial contaminants unquestionably pose the most prevalent foodborne threat to health. The public, however, also ranks chemical pesticides and additives, irradiation, and genetic engineering high on the list of perceived risks, largely because exposures to them are invisible, involuntary, imposed, and uncontrollable. The health risks of genetically modified foods (however remote they may be) are hidden and undemocratically applied and as a result are far less acceptable. Because questions of who imposes risks and who takes risks are crucial in assessing whether a risk is acceptable, decisions about food safety take on political dimensions.

A comparison of the two approaches to assessing risk explains why whenever someone invokes science in discussions of food safety, we can be reasonably certain that questions of self-interest are at stake but are excluded from debate. Scientists talk about risk as a matter of illness and death. The public wants dread-and-outrage factors to be considered as well. The failure of food companies, scientists, and government agencies to recognize the need to address values as well as science in matters of food safety leads to widespread distrust of the food industry and its regulators. When officials and experts dismiss dread-and-outrage concerns as emotional, irrational, unscientific, and indefensible, they raise questions about their own credibility and competence. They fail to recognize their own biases as well as the predictability of public responses to food safety risks. When a risk manager continues to ignore these factors—and continues to be surprised by the public’s response of outrage—it is worth asking just whose behaviour is irrational (Nestle, 2010).
B.3 The Precautionary Principle: Look Before You Leap

The differences in the two approaches to food safety risk have an additional political dimension. They imply different expectations for the ways in which authorities make decisions about the release of new foods and ingredients. The science-based approach works on the proposition “nothing ventured, nothing gained.” Regulators determine as well as they can whether a food or ingredient is likely to cause harm and permit those that seem reasonably safe to enter the food supply. Food safety authorities use this approach for food additives characterized as “generally recognized as safe” (GRAS). If problems occur, the authorities deal with them after the foods are marketed. This approach requires neither premarket testing nor labelling; it is based on a standard that requires food manufacturers to demonstrate “reasonable certainty of no harm.” This standard, which translates as “safe enough to be acceptable,” leaves plenty of room for subjective opinion and judgment.

An alternative approach is one that has come to be known as the principle of precautionary action, or the “precautionary principle.” Whether or not to invoke the Precautionary Principle is a decision exercised where scientific information is insufficient, inconclusive, or uncertain and where there are indications that the possible effects on the environment or human, animal or plant health may be potentially dangerous and inconsistent with the chosen level of protection. The appropriate response in a given situation is thus the result of a political decision, a function of the risk level that is “acceptable” to the society on which the risk is imposed. In practice, invocation of the precautionary principle can be used to require companies to demonstrate that foods are safe before they are marketed. Further stressing the principle, the Wingspread statement on the precautionary principle states: “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context, the proponent of the activity, rather than the public, should bear the burden of protection” (Nestle, 2010). Further to this, European and United States experts on food biotechnology issued a joint statement in 2000 saying, “When substantive uncertainties prevent accurate risk assessment, governments should act protectively on the side of safety.” Even so mild a statement suggests that companies will have to do more to demonstrate safety in advance. But because testing can never prove that a food is perfectly safe, public willingness to accept a new food depends on how well it meets the value concerns summarized in Table 3. If a food ranks high in dread and outrage, it will never appear safe enough, no matter how much effort goes into attempts to prove it harmless.

C. The Political Economy of Foodborne Illness

The strengthening of food laws is a necessary political process intended to control food safety for which the society expects governments and their regulatory agencies to take responsibility. Accurate burden-of-illness estimates for foodborne diseases are useful for policy makers and others that seek to characterize and prioritize resources dedicated to addressing the problem of these diseases (Scharff, 2012).

Government agencies that employ economic cost data in regulatory analyses typically use either a basic cost-of-illness model that includes values for medical care, productivity losses, and mortality or a cost-of-illness model enhanced to include pain and suffering values. By including a value for pain and suffering, the enhanced model has the advantage of more fully accounting for economic costs associated with foodborne illness. This value is derived by monetizing quality-adjusted life years (QALYs) that have been designed to assess utility loss. Monetized QALY losses are the product of loss of well-being from a condition, the number of days with the condition, and the economic value of 1 day (derived from the value of statistical life). Ideally, this measure would represent the ill consumer's willingness to pay to avoid these pain and suffering losses. In contrast, the basic model avoids the controversy over how QALYs
should be used but does not provide a value for the legitimate economic costs associated with pain and suffering.

Table 31: Burden of Foodborne Illness Expressed as Annual Number of Cases in the USA
Adapted from (Scharff, 2012)

<table>
<thead>
<tr>
<th>Disease or agent</th>
<th>No. of illness</th>
<th>No. of hospitalizations</th>
<th>No. of deaths</th>
<th>Total cost (millions of US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Basic</td>
</tr>
<tr>
<td>Bacteria</td>
<td></td>
<td></td>
<td></td>
<td>Enhanced</td>
</tr>
<tr>
<td>Bacillus cereus</td>
<td>63,400</td>
<td>20</td>
<td>0</td>
<td>2.28</td>
</tr>
<tr>
<td>Brucella spp.</td>
<td>839</td>
<td>55</td>
<td>1</td>
<td>8.24</td>
</tr>
<tr>
<td>Campylobacter spp.</td>
<td>845,024</td>
<td>8,463</td>
<td>76</td>
<td>437 – 4,031</td>
</tr>
<tr>
<td>Clostridium botulinum</td>
<td>55</td>
<td>42</td>
<td>9</td>
<td>4 – 416</td>
</tr>
<tr>
<td>C. perfringens</td>
<td>965,958</td>
<td>438</td>
<td>26</td>
<td>45-1443</td>
</tr>
<tr>
<td>Shiga toxin-producing Escherichia coli O157:H7</td>
<td>63,153</td>
<td>2,138</td>
<td>20</td>
<td>121-1827</td>
</tr>
<tr>
<td>Shiga toxin-producing E. coli non-O157</td>
<td>112,752</td>
<td>271</td>
<td>0</td>
<td>11-273</td>
</tr>
<tr>
<td>Enterotoxigenic E. coli</td>
<td>7,894</td>
<td>12</td>
<td>0</td>
<td>0-41</td>
</tr>
<tr>
<td>Other diarrheagenic E. coli</td>
<td>11,982</td>
<td>8</td>
<td>0</td>
<td>0-28</td>
</tr>
<tr>
<td>Listeria monocytogenes</td>
<td>1,591</td>
<td>1,455</td>
<td>255</td>
<td>95-6613</td>
</tr>
<tr>
<td>Salmonella, nontyphoidal</td>
<td>1,027,561</td>
<td>19,336</td>
<td>378</td>
<td>1479-10881</td>
</tr>
<tr>
<td>S. enterica Typhi</td>
<td>1,821</td>
<td>197</td>
<td>0</td>
<td>0-24</td>
</tr>
<tr>
<td>Shigella</td>
<td>131,254</td>
<td>1,456</td>
<td>10</td>
<td>38-768</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>241,148</td>
<td>1,064</td>
<td>6</td>
<td>29-434</td>
</tr>
<tr>
<td>Streptococcus group A</td>
<td>11,217</td>
<td>1</td>
<td>0</td>
<td>0-112</td>
</tr>
<tr>
<td>Vibrio cholera, toxigenic</td>
<td>84</td>
<td>2</td>
<td>0</td>
<td>0.3</td>
</tr>
<tr>
<td>V. vulnificus</td>
<td>96</td>
<td>93</td>
<td>36</td>
<td>54-538</td>
</tr>
<tr>
<td>V. parahaemolyticicus</td>
<td>34,664</td>
<td>100</td>
<td>4</td>
<td>29-169</td>
</tr>
<tr>
<td>Other Vibrio</td>
<td>17,564</td>
<td>83</td>
<td>8</td>
<td>28-179</td>
</tr>
<tr>
<td>Yersinia enterocolitica</td>
<td>97,656</td>
<td>533</td>
<td>29</td>
<td>69-1662</td>
</tr>
<tr>
<td>Parasite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cryptosporidium spp.</td>
<td>57,616</td>
<td>210</td>
<td>4</td>
<td>21-394</td>
</tr>
<tr>
<td>Cyclospora cayetanensis</td>
<td>11,407</td>
<td>11</td>
<td>0</td>
<td>0-39</td>
</tr>
<tr>
<td>Giardia intestinalis</td>
<td>76,840</td>
<td>225</td>
<td>2</td>
<td>128-267</td>
</tr>
<tr>
<td>Toxoplasma gondii</td>
<td>86,686</td>
<td>4,428</td>
<td>327</td>
<td>1,112-5,726</td>
</tr>
<tr>
<td>Trichinella spp.</td>
<td>156</td>
<td>6</td>
<td>0</td>
<td>0-4</td>
</tr>
<tr>
<td>Virus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrovirus</td>
<td>15,433</td>
<td>87</td>
<td>0</td>
<td>5 – 22</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>1,566</td>
<td>99</td>
<td>7</td>
<td>13 – 125</td>
</tr>
<tr>
<td>Norovirus</td>
<td>5,461,731</td>
<td>14,663</td>
<td>149</td>
<td>1,545-4,728</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>15,433</td>
<td>348</td>
<td>0</td>
<td>4 – 21</td>
</tr>
<tr>
<td>Sapovirus</td>
<td>15,433</td>
<td>87</td>
<td>0</td>
<td>4 – 18</td>
</tr>
<tr>
<td>Total known</td>
<td>9,388,074</td>
<td>55,962</td>
<td>1,350</td>
<td>8,436-29,230</td>
</tr>
<tr>
<td>Total unknown</td>
<td>38,392,704</td>
<td>127,839</td>
<td>1,686</td>
<td>21,047-51,404</td>
</tr>
<tr>
<td>Grand total</td>
<td>47,780,778</td>
<td>183,801</td>
<td>3,036</td>
<td>31,214-76,142</td>
</tr>
</tbody>
</table>

The estimated cost of foodborne illness was substantial: $51.0 billion in annual health-related costs in the basic model and $77.7 billion in the enhanced model. Whether a potential food...
safety program improves social welfare is dependent on three factors: the cost per case of foodborne illness, the number of cases expected to be averted by the program, and the cost of the program to government, consumers, and industry. When examining a particular program, social welfare will only be improved when the product of the cost per case and the number of cases averted exceeds the expected cost of implementing the program for society as a whole.

Underlying the discussions of Food Politics are several recurrent themes:

1. The increasing concentration of food producers and distributors into larger and larger units
2. The overproduction and overabundance of food in the United States
3. The competitiveness among food companies to encourage people to eat more food or to substitute their products for those of competing companies
4. The relentless pressures exerted by food companies on government agencies to make favourable regulatory decisions
5. The invocation of science by food companies as a means to achieve commercial goals
6. The clash in values among stakeholders in the food system: industry, government, and consumers
7. The ways in which such themes demonstrate that food is political

D. Food Sources and Virulence

Regardless of the accuracy of cost and case estimates, one trend is clear: an increasingly broad range of foods is contaminated with harmful bacteria. Cases refers to the number of individuals who become ill—whether or not they report the disease. In contrast, outbreaks always are reported; authorities discover them when more than one person gets sick from the same food source and doctors report the illnesses to health officials. It is easier to identify cases—and, therefore, report them—when an illness occurs right after the food is eaten. With these distinctions in mind, the tracking information indicates a change in the food sources of outbreaks: seafood ranks first, followed by eggs, fruits and vegetables (sprouts, lettuce, berries, cantaloupe), beef, poultry, and foods such as salads and sandwiches made with multiple ingredients. In part because so many more meals are consumed outside the home, foods other than those prepared by home cooks now account for 80% of the outbreaks (although not necessarily 80% of the cases of food-borne illness).

E. Government Oversight in Food Safety

Government oversight in food safety is often spread among many institutions. Food safety politics involves diverse stakeholders with highly divergent goals. Food producers must compete for shares of the consumer’s food money. One way to do this is by taking advantage of a divided, inconsistent, and illogical government regulatory system. Food companies owe their primary allegiance to stockholders, and their principal goal must be profit, not public health. Whenever safety measures raise costs or intrude on autonomy, the affected industries mobilize their considerable political power to block actions perceived as unfavourable—even when such measures are strongly supported by science (example: antibiotics). Government regulatory agencies also engage in competition, in this case among themselves for scarce resources and territorial mandates. They often appear to be more concerned about protecting their own turf—or that of the industries they regulate—than about protecting the health of consumers. The public, unaware of such disputes, simply wants food to be safe and assumes that both
industry and government share that goal and are doing everything possible to achieve it.

In this environment, the various participants in the food system blame one another (but never themselves) when outbreaks occur. The costs of foodborne illness to individuals, to society, and to food companies should encourage everyone to collaborate in efforts to ensure safe food. That the groups do not collaborate is a curious consequence of food safety politics.

Spriggs et al. (2001) argue that for international competitiveness, a food safety system must be designed consisting of a set of (governmental and non-governmental) institutional arrangements or a ‘governance structure’ providing formal and informal rules to ensure food safety. Institutional arrangements on food safety are important and it is crucial they evolve, as needed, in order to remain consistent with new technological innovations and changing consumer preferences.

Nestle (2010) posits that as citizens, we need to understand that producing safe food is not impossibly difficult. She argues that Sweden, Denmark, and the Netherlands have reduced foodborne illnesses by instituting control systems at every stage of production, starting on the farm. They set testing standards to reduce pathogens, limit antibiotics in animal feed, prevent infections in transported animals, test for microbes at slaughterhouses and supermarkets, and provide incentives to the industry to comply with safety rules.

F. Relevance of Food Safety Systems in Developing Countries to International Food Trade

The importance of developing countries as providers of an increasing percentage of the food being consumed globally is receiving growing recognition. This is because these countries remain an undeniably important source of key food items for developed-country consumers, including increasingly sophisticated food product offerings. Consequently, the status of the food safety and quality systems in these countries is no longer a matter of local interest only; a food safety challenge in Asia or Africa can have repercussions as well in developed countries (Gordon, 2015). As examined in the foregoing sections, governments and their regulatory agencies use standards and technical regulations as a means of assuring consumer demands for improved product safety, increased environmental protection, and greater product information (Sheldon, 2013).

Sheldon (2013) reports that there has been considerable discussion of the problems of regulatory compliance faced by developing countries in accessing developed country markets, given the latter typically have higher levels of regulatory intensity than the former. The growing movement of people, live animals, and food products across borders, rapid urbanization in developing countries, changes in food handling, and the emergence of new pathogens or antibiotic resistance in pathogens all contribute to increasing food safety risks. These issues are recognized in international trade negotiations under the WTO and in the FAO’s Committee on World Food Security. Managing food safety risks is a prerequisite for participation in international trade, and taking advantage of trade opportunities is an important strategy to reduce poverty. There is an increasing realization that exports are a critical component in rural economic growth. Thus, food safety has a dual role in poverty alleviation, as it is important to public health and to market development. At the same time, several global trends lead to increased complexity in food systems, including increased trade in fresh and processed foods, growing urbanization and increased demand for foods of animal origin, and associated changes in the way that food is produced, processed, and distributed.

Current understanding of food safety management and the desire of most industrial countries to be responsive to consumers and efficient in the use of public resources has brought about changes in food safety regulatory systems. The development of modern food safety systems:
their structure, practices and functioning, depends on a number of principles and trends including (Unnevehr et al., 2000; Mwamakamba et al., 2012):

(a) Emphasis on development of integrated and holistic food safety systems with a farm-to-table approach using a well-resourced consolidated authority. There is shift from sectoral approaches to managing food safety risks to more holistic and multi-faceted strategies. The farm-to-table approach to food safety is based on the premise that foodborne disease is commonly caused by multiple factors arising at dispersed points along the farm-to-table continuum. It addresses the notion that quality needs to be managed along the entire food supply chain, from the initial stages of raw material production to the final stages of food preparation to consumption.

(b) The globalization of the food supply chain and obligations under trade agreements as well as advances in the control of foodborne hazards. Greater scientific understanding of food safety risks and means to assess their impact on public health as well as the development of international food standards by the Codex Alimentarius Commission are some of the factors that have influenced proactive approaches to food safety control over the years.

(c) Increased recognition of the roles of stakeholders and cooperation with industry and consumers to provide information and education. There is a general shift in thinking about the roles of stakeholders from the farm-to-table, with responsibilities for food control shifting from the government to producers, processors, food manufacturers, transport operators, retailers and consumers that operate along the food chain. Food producers at all levels have a responsibility for the production of safe food. At the farm level, farmers and workers must control pesticide and other chemical inputs and recognize potential sources of microbial contaminants from water, soil, animals and humans. Fishermen must understand that the safety and quality of their catch is linked to the levels of contaminants in the harvest waters. The food processing and transportation industries must assess where food safety may be jeopardized at critical points in food production and transport and take appropriate measures to control these potential hazards. Retail establishments, restaurants and other food vendors must also understand how to ensure proper sanitary practices and temperature controls. The role of the consumer may be the most important since at that level food safety is assured at the point closest to food consumption. It is the last safety check on the road from the farm to table.

(d) Reorientation of quality assurance protocols. There is a shift from the traditional focus on end-product testing toward quality management of the production process. There has been a renewed emphasis on preventive measures to food safety. A widely recognized preventive system, Hazard Analysis Critical Control Point (HACCP) is geared on sound science and focuses on identifying and preventing hazards from contaminating food.

(d) An open decision making process that allows stakeholder participation.

(e) Evaluation of public health outcomes from regulation.

G. Components of a National Food Control System

(a) Food policy, law and regulations: Containing the necessary statutory powers to ensure jurisdiction over food safety from farm to table and allow competent food authorities to take immediate preventive and enforcement measures using
updates food laws, regulations and updated food standards. They must tailor available information, concepts and requirements to the national context, so as to develop a regulatory framework that will both satisfy national needs and meet international obligations and trading partners’ demands.

(b) **Food control management**: Effective food control systems require operational coordination at the national level including an institutional structure which responds to the needs of food safety management. Where food control responsibilities lie among different government agencies, the roles and responsibilities of these agencies should be clearly defined and efforts made to establish a more integrated system, in order to provide increased consistency in assuring the safety of food.

(c) **Inspection services**: An effective food safety management system requires clear inspection policy and procedures that are applied by inspectors who are well trained not only to apply these procedures but also to act as quality assurance advisors and extension officers to the food industry.

(d) **Laboratory services**: **Food monitoring, foodborne disease surveillance and epidemiological data**: Laboratories underpin decisions of food control services. It has been noted that limited resources to maintaining and equipping laboratories are often cited as major constraints to enhancing national laboratories. It has been pointed out, though, that while laboratory capabilities are expensive resources, it is essential, at least at the national level, that good laboratory facilities and competent personnel be adequately supported.

(e) **Information, education, communication and training**: Assuring food safety along the entire food chain requires partnerships and education at all levels. Stakeholder participation and empowerment grounded on sound knowledge of food safety is paramount. All should recognize their individual role to enhancing and minimizing food-related risks. Emphasis of food safety information, education and communication programmes should be in providing the different stakeholders with the information and motivation necessary to make informed decisions on food safety.

H. **Export Challenges Facing Food and Agriculture from Developing Countries**

Food export markets present a somewhat different set of challenges from domestic food safety regulation. Fresh food products are more likely to encounter sanitary and phytosanitary barriers to trade. Delivering safe food to distant markets requires process controls throughout the production process and mechanisms to certify to buyers that such controls are effective. Developing-country exporters need to know how to meet standards in different markets and how to meet the increasing demand for product trace-back and certification of production methods.

The SPS agreement of 1994 provides a framework for resolving disputes about SPS measures under the WTO. There is evidence that this agreement has stimulated activity to reduce SPS barriers to trade, but there remains significant disagreement at the international level over the role of science and consumer choice in regulating risk. Controversies at the global level influence the ability of countries to compete in export markets. They create uncertainties about the potential acceptability of production methods and products in different potential markets.

For Africa, the major challenges faced by countries include (Mwamakamba *et al.*, 2012):
Limited awareness about food safety. Information, education, health promotion and training programmes for the food industry and consumers are limited in a number of countries. There has been a drastic increase in countries of small-scale food industries, ever-growing number of food vendors and household level production. This change, however, in the increase of small-scale food industries has not been accompanied by the improvement of food safety patterns in most countries. Personnel engaged in food production and processing have insufficient knowledge to comply with food safety assurance schemes including the Hazard Analysis Critical Control Point (HACCP) system.

Inadequate coordination. The administration of food safety is complicated by the fact that food safety has many facets. National food safety control systems within the Region often have a sectoral or fragmented structure. Typically, under such arrangements the food control responsibilities are shared between several government ministries such as health, agriculture, commerce, environment, trade and tourism. The roles and responsibilities of each of these agencies are specified but remain quite different. While multiple food control agencies may be the norm, they suffer several drawbacks, including lack of coordination, and confusion over jurisdiction. To overcome the problems associated with fragmentation of food control, food control functions could be transferred to a single government department or a national food control body with inter-ministerial and inter-departmental representation.

Inadequate enabling policy, outdated legislation and regulations. In many cases existing legislation is outdated, incomplete and fails to adequately address current and emerging food safety problems. Even with a food act and regulations, enforcement may be undermined by the lack of effective food control infrastructure and institutional capacities to ensure compliance. Failure to clearly clarify in legislative documents the respective responsibilities of the main stakeholders involved in food safety, and the mechanisms through which they should work together results in duplication of regulatory activities and inadequate coordination in policy implementation and surveillance. The existence of several different laws each addressing various aspects of food, animals, plants, public health and trade further compound the problem.

Insufficient and inadequate capacities for food safety. Human resource capacity is inadequate in terms of: development and implementation of policies that affect food safety and trade, including capacity to implement relevant international agreements; capacities for food analysis and microbiological risk assessment procedures.

Inadequate resources for food safety. One key factor affecting food control systems is the lack of financial support. This is exacerbated by the low priority accorded to food safety in national and regional planning, and the limited funding food safety receives in relation to other areas. Funds are needed to improve infrastructure, purchase equipment, train personnel and monitor food contamination.

I. North-South Trade and Food Standards

Sheldon (2013) reports that it is typically claimed that developing countries are hampered in their ability to meet stringent food standards due to a lack of necessary human capital and poor governance. There is empirical evidence to support the hypothesis that the capacity to satisfy standards is correlated with real GDP per capita, developing countries specializing away from industries with heavier regulatory burdens. Standards in many export destinations for
African agricultural and food products are viewed as as instruments of ‘protection in disguise’ (Jaffee et al., 2004; CUTS, 2009; Otieno et al., 2009; Kareem, 2014). For example, the growing concern among policy-makers and private entities in EAC developing countries is about the proliferation and strengthening of food safety and agricultural standards in the EU market and how this is impacting upon their competitiveness. This concern is multi-faceted, involving:

(i) the suspicion that important standards can and will be used as a trade protection measure and be applied in a discriminatory manner;

(ii) the concern that EAC governments, traders and producers lack the administrative, technical and other capacities to comply with the emerging standards requirements in the EU, or that even in the few cases where they are able to comply, the costs incurred to attain compliance certainly undermines their comparative advantage; and,

(iii) the proposition that such institutional weaknesses and rising compliance costs only serve to marginalise weaker economic players, including small countries, small enterprises, and small-scale farmers.

Jaffee et al. (2004) argue that standards reflect the feasibility of implementation, which itself is influenced by legal and industry structures as well as available technical, scientific, administrative and financial resources. Some food safety risks, for example, tend to be greater in developing countries due to weaknesses in physical infrastructure (for example standards of sanitation and access to potable water) and the higher incidence of certain infectious diseases. Further, tropical or sub-tropical climatic conditions may be more conducive to the spread of certain pests and diseases that pose risks to human, animal and/or plant health.

Over time there has been greatly increased public awareness and concern about food safety within high-income developed countries in the wake of a series of highly publicized food scandals, foodborne illnesses and food-poisoning fatalities. In some countries, these events have shaken the underlying confidence of consumers in national or regional systems of food safety regulation. In response, there have been significant institutional changes in food safety oversight and reform of pertinent laws and regulations. For long-held concerns (for example the potential environmental and health impacts of pesticides), there has been a tightening of many standards in industrialized and other countries. In addition, new standards are being applied to address previously unknown or unregulated hazards.

In parallel with these changes in official standards and public oversight, have been accelerated moves by the private sector to address food safety risks and otherwise address the concerns and preferences of consumers and civil society organizations. Much of the motivation behind this trend has been the mitigation of reputational and/or commercial risks, while in some product lines and industries these moves have also been part of commercial strategies of differentiation. The ensuing result has been a growing plethora of private ‘codes of practice’, standards and other forms of supply chain governance. While these efforts have been especially prominent amongst major food retailers, food manufacturers and restaurant chains in industrialized countries, systems of private food safety governance are also being applied more widely in middle-income and some low-income countries, in part through the investments undertaken by multinational supermarket or restaurant chains and competitive responses by local firms. In addition, new food safety standards in industrialized countries are serving to shape the expectations of developing country consumers, especially those with higher incomes and in urban areas.

The proliferation and enhanced stringency of food safety and agricultural health standards is a source of concern among many developing countries and those promoting the increased integration of these countries into the world trading system. Reflecting wider changes in the
trade regime for various agricultural and food products, there is a presumption that food safety and agricultural health measures can (and will) be used as a protectionist tool, providing 'scientific' justifications for prohibiting imports of certain products altogether, or discriminating against imports by applying higher standards and/or more rigorous regulatory oversight than on domestic suppliers. Even if standards are not intentionally used to discriminate against imports, there is concern that their growing complexity and lack of harmonization between countries could still impede the trading efforts of developing countries.

While the process of notification under the SPS Agreement has contributed to increased transparency of official food safety and agricultural health measures, this has been accompanied by the proliferation of private standards that fall outside of the purview of the WTO. Thus, the overall picture for food safety and agricultural health requirements in trade is becoming increasingly complex and fast moving as standards are promulgated in multiple spheres at both the national and international levels. Further, the complexity of this issue stems not only from the variability of standards on paper, it is magnified by differences in the ways, means and intensities by which the standards are monitored and enforced, which themselves are changing over time.

An illustration of this complexity is depicted in Figure 2. For a developing country exporter, the operative ‘rules of the game’ are derived by a combination of factors including the prevailing standards themselves, enforcement capacities and predilections of official agencies, nature of private standards and oversight arrangements such as certification, and the prominence of particular concerns among consumers and civil society organizations at any point in time. Clearly, there are potentially significant gains from the harmonization of standards, internationally, among countries and within the private sector. Yet, complexities will inevitably persist, especially as supply chains are increasingly driven by the exacting and more dynamic demands of consumers. The challenge for developing countries is clearly immense, although (as is discussed below) the pay-off for those that succeed is potentially significant. However one thing is certain, non-compliance is not an option for those that wish to continue to export!
J. Food Security Indicators

According to the World Food Summit of 1996 “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2001). This widely accepted definition points to the following dimensions of food security:

(i) **Food availability**: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).

(ii) **Food access**: Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).

(iii) **Utilization**: Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

(iv) **Stability**: To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

Food security can be assessed using the following indicators (Death, 2011; FAO, 2015):

**Availability:**
- Average dietary energy supply adequacy
- Average value of food production
- Share of dietary energy supply derived from cereals, roots and tubers
- Average protein supply
- Average supply of protein of animal origin

**Access**
- Percent of paved roads over total roads
- Road density
- Rail lines density
- Gross domestic product per capita (in purchasing power equivalent)
- Domestic food price index
- Prevalence of undernourishment
- Share of food expenditure of the poor
- Depth of the food deficit
- Prevalence of food inadequacy

**Stability**
- Cereal import dependency ratio
- Percent of arable land equipped for irrigation
- Value of food imports over total merchandise exports
- Political stability and absence of violence/terrorism
- Domestic food price volatility
6.3.20 The Politics of International Food Standards

A. Food Politics

Food politics are the political aspects of the production, control, regulation, inspection, distribution and consumption of food. The politics can be affected by the ethical, cultural, medical and environmental disputes concerning proper farming, agricultural and retailing methods and regulations. Government policies around food production, distribution, and consumption influence the cost, availability, and safety of the food supply domestically and
Internationally. On a national scale, food policy work affects farmers, food processors, wholesalers, retailers, and consumers. Commodity crops, such as corn, rice, wheat, and soy, are most often at the heart of agricultural policy-making. While most food policy is initiated domestically, there are international ramifications. Globally, protectionist trade policies, international trade agreements, famine, political instability, and development aid are among the primary influences on food policy. Increasingly, climate change concerns and predictions are gaining the attention of those most concerned with ensuring an adequate worldwide food supply.

Herring (2015) explains that simultaneously, the numbers and causes of people asserting political interests in food and agriculture beyond their own grain pile have likewise shifted out and up. Europeans have used a variety of policy and social-movement tactics to influence what Africans can grow and eat. American diplomats apply pressure to alter European political choices about what not to grow and eat. An international organization of People for the Ethical Treatment of Animals challenges traditional practices confining and slaughtering animals—and thus livestock as livelihood and meat as market. Trade conflicts over whether or not phyto-safety regulations constitute another form of agricultural protectionism or an expression of democratic sovereignty cross powerful currents of science and culture: if Americans and Chinese can eat transgenic virus-resistant papayas, how can Japanese legally regulate them out of their markets? In theory, the Codex Alimentarius represents species-wide knowledge of standards for food safety, which should allow deliberation within the World Trade Organization to set lines between agricultural protectionism and justifiable precaution in regulating novel foods. In practice, there are trade conflicts, ineffectual rulings, and intermittent rejection of WTO rulings. Bans on whale slaughter pit Japan against international political coalitions. Bans on eating companion animals such as horses and dogs, or intelligent animals such as dolphins, raise persistent politics in some places but not others, with consequences for international trade. Shark fin is a valued and traditional food in some cultures, but restaurants are routinely raided for surreptitiously serving it in many jurisdictions. Demands for a ban on cow slaughter have raised intermittently powerful politics in India but not in Pakistan or Texas. Signs on bridges in Europe declare “GMOs Kill.” If true, such a claim would justify, perhaps morally compel, political mobilization to ban GMOs, create GMO-free zones, attack biotech research facilities, and restrict international trade in genetically engineered foods.

Food politics thus depends fundamentally—and increasingly—on ideas, not simply the material interests that have dominated political economy as an approach. Conventional food politics was answerable in a context of classical political economy: the dynamic of interests within social systems. Major interests were fairly clear: control of surplus from the land. The landless fought for land that produced food, the landed resisted. Tenants mobilized around securing their interests; landlords mobilized around defending theirs. The hungry demanded food as traditional obligation or political right. Farmers demanded better deals from traders and moneylenders and state intervention to protect their livelihoods. These demands on the state for protection from the market continue today, and have become globalized with international allies with less direct material interests in outcomes. The new world of food politics thus adds distinctly different dimensions. Contention exists not only around the expertise of agricultural and nutritional sciences, but also around what have been called, since the mid-20th century, alternative paths to “development.” Not only are distal populations recognizing a political imperative to alleviate hunger in societies our moms probably knew little about, but justifications differ, as do contending development theories advocating proper roles for states and markets.

B. Standards and Regulatory Capitalism

Food safety standards are among the most long-standing public health regulations and were also among the first to “go global,” as a way of harmonizing national standards and reducing frictions in trade (Post, 2005). Moreover, the World Trade Organization (WTO) relies on
international food standards in resolving trade disputes among countries over potentially protectionist policies. Although there has not been the same innovation in regulatory instruments experienced in other fields, such as the environment, the case of food safety provides a strong argument for both the existence of regulatory capitalism and its diffusion via horizontal agents. At the same time, it highlights the resilience of national differences in the face of common global structural forces.

Food safety presents a complex challenge. On one hand, in the United States alone, an estimated 76 million people become ill from foodborne illnesses each year, and 5,000 die. Clearly, monitoring and regulation are needed to prevent such occurrences. On the other hand, trade in food and agriculture is a huge global business, estimated at over $1,486 billion and US$1,765 billion per year respectively (WTO, 2015). At a minimum, differing national food safety standards hinder food trade, increasing costs to the consumer. More of a concern is that national standards are frequently accused of serving as non-tariff barriers to trade, that is, having protectionist purposes with no actual public health effect. Indeed, conflicts over food safety standards have emerged as one of the most controversial international trade issues in recent years, as indicated by U.S. and European Union (EU) tussles in the WTO over beef hormones and genetically modified foods.

To help address these twin concerns of safety and protectionism, an international governmental organization called the Codex Alimentarius Commission (CAC) sets food standards that in turn are used by the WTO in dispute resolution.

Two contradictory expectations arise with respect to how international standards affect domestic policies:

(i) From international relations and international law, whether soft law such as international norms influence the actions of countries or whether only “hard” or binding law and force matter

(ii) Whether, on one hand, international standards will be the result of a least common denominator and subsequently push domestic standards lower or, on the other hand, international standards will help raise domestic standards because large companies can use the higher standards to squeeze out competition. Do international norms matter at all, and if so, in which direction do they push national standards?

There is also need to consider how international standards influence domestic regulations, in particular: (i) how dominant states—primarily the United States, the EU and other Organisation for Economic Co-Operation and Development (OECD) countries—are shaping the global order of food safety, in particular how they are using the international arena to project their own domestic ideas of what regulation should be; and (ii) regional integration initiatives as both horizontal and top-down forces of diffusion best explain the degree of convergence that has happened thus far.

C. The Codex Alimentarius Commission and Food Safety

The CAC is an international governmental organization created more than forty years ago by the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO). Its purpose is to develop international food standards that ensure consumer safety and fair practices in food trade. As a highly technical organization, its work went mainly unnoticed by the broader international community up until 1994, when the establishment of the WTO cast Codex standards in a more prominent light. Under the terms of the WTO Sanitary and Phytosanitary (SPS) Agreement, which governs disputes related to food safety standards among others, Codex food standards serve as a benchmark in resolving
disputes between nations related to trade in food commodities. This development has prompted a massive increase in attention to and participation in Codex activities. One of the key criticisms of the CAC is that despite its dual mandate to protect public health and promote fair trade practices, in fact public health protection takes a back seat to trade interests (Post, 2005).

The relation between the CAC and the WTO is emblematic of the transformation of governance that is embodied in regulatory capitalism. Although the WTO aims to remove barriers to trade among all member countries, it does not advocate complete deregulation. Rather, it seeks to walk a fine line between liberalizing trade and maintaining national regulations. In signing the SPS Agreement, WTO member states acknowledged that safety standards for human, animal, and plant health remain in the domain of states to decide. Yet these domestic measures must either rely on international standards or be based on a risk assessment. Thus, as states agree to free their markets to trade, at the same time they reassert their rights to determine their own safety standards.

The importance accorded to international standards in the WTO SPS agreement, coupled with the failure so far of any national SPS regulations to pass through the WTO dispute resolution process unscathed, has contributed to a tremendous increase in the perceived importance of developing Codex standards. The number of countries participating in Codex Commission meetings jumped from 77 in 1991 to 188 in 2016, a 244 percent increase. Yet although Codex membership is currently composed of more than 188 member states, as well as numerous nonvoting international governmental and nongovernmental organizations, in practice the development of standards is done by a fraction of the membership, mostly developed countries.

What this means is that although Codex standards are international, in fact they reflect bargaining and negotiation mostly among a set of well-known countries. Although initial drafts of standards are often issued from the Codex secretariat, in fact the drafts are usually written by individual countries. Most of the actual drafting work is done by working groups. Once a carefully tailored draft reaches the full committee for discussion, it is in theory open for discussion, but in fact the working group members are often extremely reluctant to reopen debate on the draft. They argue that the draft reflects a well-thought-out consensus on the part of working group members. In part, this reflects the difficulty of trying to negotiate international standards by committee. But regardless of whether the intention is to exclude opinions, the result is that a handful of countries, usually those that can afford to devote staff time to drafting Codex standards in between committee meetings, dominate the framing of the standard.

D. Perspectives on Diffusion of Standards

There are three overarching types of explanations for the diffusion of regulatory capitalism: top-down, bottom-up, and horizontal as summarized in Table 5. The main source of top-down diffusion involves producers in the major exporting countries. These producers are interested in having similar legal standards across the markets that they export to. Two kinds of effects can result. A race to the bottom of lax regulatory standards occurs when producers press for the lowest common denominator of standard across the range of countries. A race to the top, on the other hand, occurs when dominant producers press for a ratcheting up of standards because they already have to meet a high standard in one country. Thus, under the international explanation, producers in powerful exporting countries (in this case, the United States and countries in the European Union) would work to develop Codex standards that

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3 188 Codex Members - 187 Member Countries and 1 Member Organization (EU) 234 Codex Observers - 54 IGOs, 164 NGOs, 16 UN.
reflect their interests and then work to have countries adopt those standards. Depending upon their interests, standards would vary in stringency.

Table 32: Perspectives on Diffusion of Standards

<table>
<thead>
<tr>
<th>Forces of Diffusion</th>
<th>Direction of Diffusion</th>
<th>Promote Convergence and/or Stringency?</th>
</tr>
</thead>
<tbody>
<tr>
<td>International producers</td>
<td>Top-down</td>
<td>Yes on convergence, probably on stringency. Will lobby for convergence of standards because it is easier to meet one standard across markets. May lobby for more stringent standards, since they are more capable of meeting higher standards than small producers and will therefore derive a competitive advantage from higher standards.</td>
</tr>
<tr>
<td>Domestic trade groups</td>
<td>Bottom-up</td>
<td>Depends. Will lobby for convergence with international standards depending on whether they will benefit from adoption of the standard. Similarly, will lobby for stringency if they can derive competitive advantage from it.</td>
</tr>
<tr>
<td>Government officials</td>
<td>Bottom-up</td>
<td>Depends. Will lobby for convergence if they are persuaded by international organizations that this is important. No expectations regarding stringency.</td>
</tr>
<tr>
<td>Regional associations</td>
<td>Horizontal or top-down</td>
<td>Possibly on convergence, probably not on stringency. Member states are supposed to converge on the standards set by the association, so convergence toward international standards depends on whether the association has adopted the international standards already. Increased stringency is unlikely in most regional associations because the primary goal is trade facilitation, and the negotiators generally have that as their main goal.</td>
</tr>
</tbody>
</table>

The second and third perspectives on diffusion incorporate bottom-up actors. The first is industry, such as particular domestic trade associations within the country of interest. Within a country, who wins and who loses from the adoption of a Codex standard? At the national level, if the domestic interests explanation dominates, one would expect that domestic producers or trade associations would be involved in promoting or opposing specific standards depending on whether they win or lose from those standards. The second category of bottom-up domestic interests are actors in government. From this point of view, international standards are not promoted by particular actors; rather, they help domestic actors in government to identify problems and solutions in food safety. Here, the main causal force lies with government actors in the countries that learn from the international system. Rather than seeing governments as adopting standards purely by assessing costs and benefits of doing so, the international standards shape the perceived interests of government actors and help set government agendas. If this explanation dominates, one would expect that what government actors consider as important is to some degree contingent upon what the CAC is considering. This explanation may be particularly important for areas involving scientific and technical knowledge, where epistemic communities may form to push for particular policy changes.

A fourth perspective on diffusion can be found in regional integration initiatives. These can be either a horizontal or a top-down force for diffusion, depending on whether they can be viewed as an interdependent decision of multiple countries or an unchanging exogenous force. Government actors in regional economic communities (for example, EAC, SADC, ECOWAS or COMESA) discuss their standard-setting activities in the context of what the regional integration initiatives require them to do. Because regional trade bodies have explicitly acknowledged Codex standards as at least one basis for harmonization, this pathway of influence is a very important one. Thus, variation in national adoption of Codex standards in this view would depend on the degree to which countries are integrated with regional integration initiatives. This approach views regional initiatives as conduits for policy transfer.
E. The Political Perspectives of Standards

It is evident that under certain conditions—in particular, when a country participates in and perceives as important a regional integration initiative that upholds Codex standards, and when there is little prior regulatory history—international standards do influence countries’ policies. In the case of food additives, the result has been to drive standards to more stringent levels than they otherwise might have been, due to the successful efforts of European states to impose their preferences on the Codex standard.

Regional integration initiatives are key to understanding the pattern of convergence since the participation of policy makers in them, can be viewed as part of a policy transfer process. Alternatively, the process can be considered one of institutional isomorphism, where institutions come to resemble those in their immediate environment. This is complementary to the world society approach. Depending on the degree to which regional integration initiatives take decisions apart from their member states, these can be either horizontal or top-down forces for diffusion.

Regulatory capitalism in the form of Codex standards is not a disinterested, objective form of regulation. Rather, it is shaped by powerful countries and actors. In this case, the European Union shaped the standard for food additives. In other areas, other countries have similarly influenced the Codex outcome. The role of politics and power in forming highly technical standards often goes unnoticed. Yet how and by whom the standards are shaped—and for what purposes—has ethical and distributive consequences. “Once clothed in technical language, such [technical] decisions lose their transparency and acquire a look of impartial credibility that resists criticism by actors lacking the necessary expertise”. Wealthy countries are shaping the international food safety regime and then encouraging poorer countries to adopt elements of it, and there are potential problems with this, similar to conclusions others have drawn regarding the global financial system. Thus, as regulatory capitalism continues to spread, conclusions about whether this is a normatively good or bad phenomenon will be highly case-specific, and power in addition to expertise should continue to be a subject of investigation.

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6.3.21 Public and Private Standardization Systems for Fisheries and Effective Articulation of National Position and Interests

A. Introduction to Public and Private Standards

Public standards are understood as those established by government authority and embedded in laws and regulations (Bain et al., 2013). Private standards are often referred to as voluntary because compliance is enacted through the market and not via public authority. In addition, where market signals or drivers do not exist, or are weak, companies may choose to use private standards to protect their reputation or show to the public that they are a socially and/or environmentally responsible business. There may also be overlap between the two where public
regulations incorporate private standards and where private standards incorporate public standards (e.g. public food safety standards are often incorporated into private food safety certification systems, such as ISO 22000).

Formal standards are tied increasingly to a hierarchical monitoring and compliance infrastructure that includes standard setting, certification (often through third-party certifiers), and accreditation, the so-called tripartite standards regime (TSR) (Bain et al., 2013). With the expansion in standards and standard-makers, third-party certifiers (TPC) emerged to assess, evaluate and certify safety and quality claims against a particular set of standards and compliance procedures. Similarly, as the number of certifiers and certifications expanded, accreditation organizations were developed to standardize TPC and regulate their practices. This rise in the ‘control of control’ is intended to promote self-regulation in the management of risk as well as to help stabilize networks through the creation of trust and legitimacy.

B. The Rise of Private Standards

Within the agri-food sector, standards are part of the institutional infrastructure that coordinates the production and distribution of agricultural products. Until the 1990s, bulk commodities, such as grain, cotton and cocoa, dominated world trade. To facilitate the creation of such commodity markets, reduce transaction costs and increase market efficiency public standards were developed. Here the focus of attention was on product standards (e.g. pesticide residues, colour, moisture content), which could easily be measured and would ensure uniformity and consistency (Ransom, 2007).

In the recent past, a confluence of forces have challenged this paradigm, creating new opportunities for non-state actors, including food retailers, business associations, non-governmental organizations, and multi-stakeholder groups, to develop standards and use them, together with labels and certification systems, to accomplish a range of objectives. Some of the key drivers of these developments include

(i) greater attention consumers put on food safety and quality,
(ii) the expansion of global value chains in the wake of the establishment of the World Trade Organization (WTO)
(iii) the rise of neo-liberal economic and social policies
(iv) activist concerns about corporate social responsibility within the context of globalization
(v) a shift from public to more private market governance; partly due to lack of technical expertise and lack in financial resources to deal with ever more complex standards issues on public level.

Proponents of private standards argue that within this changing economic and political climate the nation state alone was no longer capable – or willing – to regulate the behaviour of businesses.

As the importance and promulgation of standards has increased so has scholarly interest in who develops and controls standards and for what purpose. Influenced by frameworks such as global value chain analysis (GVCA), scholars argue that power within the market has shifted from producers and manufacturers to retailers. Mammoth food retailers have benefited from the changes described above and are using their oligarchic position in the marketplace, together with their ability to source products from around the globe, to establish themselves as the primary gatekeeper to consumer markets.
Researchers utilizing a GVCA framework have been particularly concerned with understanding the distributional effects of retailer-led standards and their implications for power and inequality, especially for small-scale producers in developing countries and to a lesser degree farm workers and women. Here, a focus on governance is viewed as valuable for revealing the social relations inherent in the production of commodities. The concept of governance focuses our attention on understanding the tools, techniques and activities, such as standards and audits, that food retailers utilize to influence and coordinate production and consumption within the value chain. For example, retailers use standards to shape the division of labour within the agri-food system, which has important implications for how financial, material, and human resources, as well as costs, risks and rewards, are distributed.

NGOs have also emerged as important actors in setting standards and shaping the governance of global value chains. Media and activist exposés have drawn public attention to examples of negligent behaviour, such as the use of child labour, by suppliers to the major retailers. Recognizing that the brand name and corporate reputation of retailers is vulnerable to such negative campaigns, NGOs have pressured – or worked with – retailers to establish standards and certification systems designed to minimize the threat of liability and scandal for retailers while enhancing the social and environmental performance of actors throughout the value chain. In addition, NGOs, have sought to challenge what they perceive as the destructive environmental and social production and consumption practices inherent within the conventional agri-food market by developing alternative systems of standards and certification. Perhaps best known is the example of fair trade, which through its social and environmental standards seeks to transform inequitable North–South relations, empower producers, and encourage ethical consumption.

Agri-food scholars have also been influenced by conventions theory and the economy of qualities approach. One of the central ideas here is that competition within the food sector has shifted from a focus on price and quantity to one that emphasizes notions of quality. Retailers or NGOs are concerned with creating standards that can communicate information to the consumer about particular attributes, such as safety or production process, embedded in a product. For example, standards can be used to communicate if a banana is organic, something that a consumer cannot determine objectively for themselves. A conventions approach is focused on understanding the role of norms and values in determining how particular assessments of quality are made as well as the rules, procedures and organizational forms that coordinate exchange relations. Through an analysis of conventions, researchers can appreciate ‘the constellations of ideas, practices, and institutions’ that comprise and guide ‘relations of production, exchange, and consumption’.

In sum, private standards are no longer simply about reducing transaction costs and increasing market efficiency. Instead, private standards have emerged as tools used strategically by both businesses and NGOs to achieve a range of objectives. These objectives include access to new markets, coordination of operations, quality and safety assurances to consumers, and the establishment of new brands, niche products and markets.

One recent area of enquiry has been to analyse the discursive and organizational mechanisms through which private standards and standard-makers achieve and maintain legitimacy. Public standards derive their authority and legitimacy from the state and the democratic decision-making process. The issue for these scholars is to understand how standard-makers convince potential standard-users to view their standards as credible and trustworthy. The legitimacy of governance mechanisms is especially relevant within the context of global trade where rules and regulations are largely voluntary and authorities policing non-compliance are largely absent. It is argued that the use of public, private or public–private hybrid TPC organizations has become de rigueur for enhancing the trust and legitimacy of claim-making related to standards, largely due to its perception as a compliance tool that is transparent, independent and objective.
Proponents assert that standards are grounded in techno-scientific practices, such as value neutrality, consistency, and transparency, as well as the objectivity of independent third-party certifiers. Influenced by science studies, especially actor-network theory, agri-food scholars of standards have sought to challenge this view. Drawing on understandings of how techno-scientific development works in practice, these scholars argue that standards are not simply an objective means to address technical compatibility issues. Rather, standards and TPC are socially mediated and are 'examples of disciplinary power'. Standards are not absolute, universalist tools imposed on local actors and sites, instead the ongoing work of standardizing – making people and things commensurable and calculable – is a process of negotiation, revision and strategic design. From this perspective, standards inevitably embody the interests, values, and asymmetrical power relations of different actors involved in the process.

One of the useful insights that have emerged is that science, politics and ethics are not mutually exclusive. Standards are normative because the very process of creating classifications and categories involves choices over what or who to include and exclude. Standards are normative because they not only define 'what (who) is good and what is bad', but also discipline ‘those people and things that do not conform to the accepted definitions of good and bad’. Similarly, standards are norms through which people, objects or actions (including government regulation itself) can be judged and compared’. Standards have political and moral significance because they order relationships among people by defining their rights and their exposure to the rights of others. Thus, we can understand techno-scientific practices, such as standards, as 'politics by other means', which play a role in (re)producing social structures and informing issues related to ethics, social justice and democracy.

C. Typology of Standards

Four distinctions of standards can be made as follows (ITC, 2011):

(i) Public nonmarket-based standards collaboration of intergovernmental organizations or cooperation among domestic regulators (e.g., ILO core labour standards)

(ii) Public market-based standards result from market-like competition between public regulatory agencies of individual states or regional and multilateral standard setting bodies (e.g., Codex standards, ARSO).

(iii) Non-market-based private regulation by private bodies dominating one or several sectors (e.g., ISO and IEC standards).

(iv) Market based private regulation by firms or any other body, such as NGOs, research institutes, multi-stakeholder coalitions/roundtables and industry associations (e.g., Fairtrade, FSC, MSC).

D. The Basics in Public Standards Setting

While tariffs and quotas have been reduced significantly since the creation of the WTO the rise in public and private standards is one element contributing to the growing amount of non-tariff measures. So as to counter a trade impeding impact of non-tariff measures, a number of agreements were developed. Key agreements include (ITC, 2011):

- **The Sanitary and Phytosanitary (SPS) Agreement**: this agreement lays out the basic rules for food safety and animal and plant health standards. Countries are allowed to develop their own standards given that these standards are based on science, and are only applied to the extent necessary to protect human, animal or plant life or health. Also, they should not arbitrarily or unjustifiably
discriminate between countries where identical or similar conditions prevail. Importantly, member countries are encouraged to use international standards, guidelines and recommendations where they exist. This gives international standards setting bodies such as the Codex Alimentarius de facto mandatory status.

- **The Technical Barriers to Trade (TBT) Agreement**: this agreement aims to ensure that regulations, standards, labelling, customs forms, testing, certification procedures and other technical aspects do not create unnecessary obstacles to trade. Members still have the right to implement measures to achieve legitimate policy objectives, such as the protection of human health and safety, or the environment.

- **The Trade Related Intellectual Property Rights (TRIPS) Agreement**: this agreement introduced global minimum standards for protecting and enforcing intellectual property rights in international trade. It requires similar intellectual property regimes from all signatory nations. WTO members are obliged to adapt their laws to the minimum standards of protection and to comply with detailed obligations for the enforcement of intellectual property rights.

A key area regulated by public standards is food safety and quality and environmental protection. Food safety constitutes a public good aiming to reduce risks to human health related to food consumption. It is generally seen as a responsibility of the state as markets alone will not always provide the socially desirable level of food safety, although companies have several legal and market incentives to provide effective food safety control. Public authorities need to correct this market failure resulting in information asymmetries and consumption externalities.

This is particularly relevant for a good’s experience attributes, where consumers can evaluate characteristics such as quality and utility only upon consumption and credence attributes, which are impossible for a consumer to ascertain even after consumption or utilization of a good. In these cases, standards and certifications facilitate the functioning of the market. They define the specifications of the product and provide consumers with a guarantee concerning the product’s characteristics, such as the process of production, ingredients used or its utility impact. Certifications and labels reduce the information asymmetry between the seller and the buyer. For search attributes, market incentives mostly are strong enough to provide the desirable amount of food quality, because a consumer can evaluate the product before buying and consuming it.

A number of governments started requesting preventive systems of food safety control, notably the HACCP standard system. HACCP is a preventive system that allows identifying potential food safety hazards during the food production and preparation process. In combination with product traceability systems, this allows for the enforcement through inspection of production records rather than finished product inspection. This shift from regulating the production processes makes regular product inspection and firm plant visits redundant, which in turn reduces costs. Public authorities’ controls changed from product inspection to control whether appropriate systems are in place and function correctly. Authorities can rely on reports and work more efficiently, which results in more controls being carried out. This delegation of quality control to the sellers constitutes a major shift in the role of public authorities.

Public authorities not only set minimum requirements for food safety but also define minimum quality standards. While the majority of standards developed by governments are mandatory and also include grades, weights and measures mainly for agricultural commodities, governments are also involved in the development of voluntary standards. For example, a
number of governments participate in the development of the International Organization for Standardization (ISO) standards.

In the case of the organic standards, governments took a key role in developing national or regional standards. This also provided for a harmonized definition of the term ‘organic’ and provided a legal framework for accrediting certification bodies. A national authority implements this legal framework on national level. Goods to be imported into the EU as organic must meet organic production and procedural standards as defined in EC regulation. Production, processing, documentation, inspection and certification need to be of equivalent standards to EU Regulation, meaning that regulation in the exporting country does not need to be identical, but procedure and actions need to be in place demonstrating ‘that the legislator targets of the Regulation have been met’. This allows exporting countries to develop their own organic production and certification systems. Most policy recommendations to governments are provided by voluntary accreditation schemes, with the International Federation of Organic Agriculture Movements (IFOAM) being the most influential.

In developing an EU recognized national certification system Chile improved market access for its organic producers to the EU and reduced transaction costs. Exporters no longer need to request a special import permit to import their organic products into the EU. National standards seem to lead to ‘superior export performance’. From an economic point of view, incentive based voluntary standards can be more efficient than mandatory regulation, generating lower compliance and transaction costs. This emphasizes the importance of the development of national voluntary standards and the potential impact on trade that harmonized standards could have. However, research generated mixed results as to the efficiency of voluntary standards in achieving socially and environmentally desirable outcomes (ITC, 2011).

E. Developing Private Standards

Private standards are as standards developed by private entities such as companies, non-governmental organizations or multi-stakeholder coalitions (ITC, 2011). These standards may vary in scope, ownership and objectives. Objectives range from environmental conservation, ensuring food safety, protection of social and human rights, to promoting good agricultural and manufacturing practices. Private standards can be numerical standards defining required characteristics of products such as contaminant limits or maximum residue limits, or process standards prescribing the production processes (including performance objectives) or pertaining to management system and documentation requirements.

Private standards certification schemes comprise the private standard itself and also covers the standard setting procedures, adoption and implementation practices, and conformity assessment and enforcement. Drivers for the development of private standards are numerous. They include:

(i) Increased consumer awareness of the impact of food on health,

(ii) Food quality and due diligence requirements assigned to food chain operators,

(iii) Growing societal and consumer demand for more responsibly produced goods and information about the production and processing conditions of products. The latter resulted in an increasing number of consumers and companies basing purchasing decisions on ethical criteria and a notion of corporate responsibility.

Particularly in the food sector, firms use private standards to differentiate from competitors, to build brand recognition and consumer loyalty, and to define and occupy market niches. This leads to companies establishing standards beyond public requirements for food safety. Given
the high transaction costs for individual firms of establishing their own standard in supply chains, firms started to pressure industry organizations and established coalitions and consortia (national and international) for the development of collective standards. Examples include the Global Food Safety Initiative (GFSI), Global GAP, or the British Retail Consortium (BRC).

In some cases companies exceed public standards aiming (i) to build influence on private standard setting in case public authorities decide to further develop public standards and (ii) to be able to select a private standard of their choice that minimizes their costs in complying with public standards. In a survey of the Committee on Sanitary and Phytosanitary Measures of the WTO, over two thirds of respondents replied that ‘at least some of the requirements of private standards exceed those of the relevant international standards and official import requirements’. These include more detailed operational procedures, lower MRLs, among others. But pre-emptive strategies also have other reasons such as being a measure to pre-empt additional public regulation.

In addition, standards are a tool to more efficiently manage geographically wide spread supply chains by standardizing product requirements and reducing transaction costs. Companies also use standards to ensure a quantitatively and qualitatively consistent supply and build their own brand specific product attributes. Especially credence attributes of products relating to production and handling of products are guaranteed through the use of standards and certification. In addition to these standards an ‘intense dynamic has emerged around initiatives dealing with social, environmental, and sustainability concerns - pushed by international agreements and civil society pressures - giving rise to a complex and evolving landscape of voluntary standard initiatives in agricultural and agrifood markets. While standards relating to ethical concerns, sustainability issues or product quality, in most cases can be considered business-to-consumers (B2C) standards (with some using a label), food safety, traceability and GAP standards, usually are business-to-business (B2B) standards.

By implementing private standards some companies claim that their product safety is above that required by public authorities. This entails the danger of eroding public confidence in public food safety authorities. Additionally, public confidence in national food safety authorities is in the interest of all stakeholders in the food industry. According to the FAO/WHO Codex Alimentarius Commission reducing minimum residue levels below the official amount, as done by some corporations through additional private standards, does not provide additional protection of public health (ITC, 2011). The same applies to restricting the number of residues where it has not been scientifically proven that multiple residues might have a synergistic toxicological effect. Therefore, the level of detail of private food standards needs to be scientifically proven, for example when it comes to exceeding minimum residue levels. Private standards thus risk undermining the authority of the texts adopted by the FAO/WHO Codex Alimentarius Commission (CAC). Standards going beyond CAC mainly address traceability, documentation and testing requirements.

This development also has challenging implications for producers and exporters. Private standards exceeding public requirements are more difficult to comply with. Private food standards tend to impose the same requirements to suppliers all over the world where these face very different preconditions in meeting them. Aiming to alleviate this problem, CAC standards, for example, focus on the relevant factors to be taken into account and the results to be achieved. So, they prescribe the ‘what’ and ‘why’, but do not detail the ‘how’. The reason for this is the recognition of the very different circumstances and realities in member countries. The ‘why’, the actions, procedures and provisions to be put in place are translated by national governments, producers or food business associations and individual food businesses.

Preventive food safety management resulted in the development of process standards and codes of conduct instead of end-product checks. It is argued that private food quality systems are often more flexible and agile in responding to consumer needs than national or
international public standards. Nevertheless, there remains a trade-off between an efficient food quality control system operated by a business and the most efficient food quality outcome for society given the risks and transaction costs associated with expensive supply chains (e.g. traceability, or separation for composite products).

Finally, the question whether the SPS Agreement is applicable to private standards has not been settled conclusively. In a nutshell, some countries argue that Article 13 of the SPS Agreement obliges governments to ensure that product certification and labelling standards developed by private entities are consistent with WTO rules. Article 13 requires governments to ‘take such reasonable measures as may be available to them to ensure that nongovernmental entities within their territories […] comply with the relevant provisions of this Agreement’. Conversely, others argue that Article 13 is not legally binding for private certification schemes as they do not qualify as non-governmental entities. The question whether private standards could be considered as ‘non-governmental entities’ as defined in the WTO SPS Agreement remains contested. The SPS Agreement has not been effective in addressing private standards, mainly regarding two issues: (i) legal issues that relate to the multilateral agreement structure of the General Agreement on Tariffs and Trade (GATT), SPS, and TBT Agreements and (ii) practical issues over the implications of private standards.

As competition in international food markets is shifting from price based to quality based, private food standards are expected to become more important and widespread. Although firm incentives to carry out control of credence attributes are theoretically small, the contrary development is evident and retailers and food firms are found to compete on the basis of food safety and quality, increasing the number of private standards. This inevitably leads to the discussion about the legitimacy of private standards and the question what makes a legitimate standard. Legitimacy becomes particularly relevant when discussing overlaps in private and public standard setting and in cases where private standards substitute public standards and assume regulatory functions.

F. The Legitimacy of Private Standards

Private standards are governance mechanisms beyond the state that claim legitimacy, although these may not be elected mandate holders and do not have democratic internal structures. But without a certain extent of legitimacy, standards are not accepted as regulatory instruments. An independent set of indicators to measure the relative legitimacy of specific standards: the influence of value chain stakeholders on the standards-setting process, the extent to which the standard-setting process is transparent, the inclusion of developing country interests, and the scientific foundation on which they are based. On this basis, the authors cite the lack of representation of smaller firms and marginalized groups as a challenge to the legitimacy of some standards. A key concern surrounding the legitimacy of the standards is whether they are ‘science-based’, questioning if private food safety standards do in fact provide appreciably higher levels of protection against food safety hazards than those under the purview of the SPS Agreement. Finally, the credibility of the standard setters is a precondition for private standards to obtain legitimacy. But credibility alone does not guarantee legitimacy.

The different notions of legitimacy revolve around the three concepts of transparency, inclusiveness and accountability and the different stages of (i) standards setting, (ii) standard implementation and the certification process, (iii) standard monitoring, and (iv) the impacts of standards. The key elements according to which these stages are scrutinized include: the assurance of a transparent process, the inclusion of diverse interests (inclusiveness), the scientific foundation of requirements, and the accountability of standard organizations. The concepts of legitimacy tend to focus on one or two stages that are analyzed according to one or several elements of legitimacy. It is important to note that concepts such as accountability, transparency and inclusiveness are overlapping as for one of them to function it requires that the other two be equally respected. For example, to achieve full accountability organizations
need to be transparent; and inclusiveness is not very useful if you are not at the same time accountable to the stakeholders you are including. Figure 18 provides an overview of the key elements of legitimacy.

In summary, it is evident that a number of approaches co-exist aiming to define what makes a legitimate standard. It is important that the discussion of the legitimacy of private standards and the different elements constituting standards’ legitimacy be kept in mind, while looking at the complementarities, overlaps and conflicts of private and public standards. Legitimacy of private standards is particularly critical when private standards substitute public standards and assume regulatory functions. The same applies to cases where private standards are referenced in public norms.

The ways in which public authorities engage with private standards can decisively influence the legitimacy of private standards, e.g. through their simple use of a standard. Governments’ behavior can go from facilitating national stakeholder dialogue on private standards, through public authorities incentivizing organizations to adhere to private standards, to public authorities incorporating private standards in statutes, regulations, permits or international agreements. These governmental actions can potentially work towards public and private standards’ harmonization, complementarity or substitution.

![Figure 52: Elements of legitimacy (ITC, 2011)](image)

G. Effective Articulation of National Position and Interests in Standardization

Effective articulation of national position and interests in standardization should be informed not only on the scientific facts which should be indisputable, but also the reality of the existing trade-political environment and as well as emerging issues. The implementation of private food standards is likely to become even more widespread in terms of the types of markets to which they apply, the number of countries where use of 3rd party certification systems is important and the product groups affected. This underlines the need for private standard setters and governmental authorities to better understand the impact of private standards and to take measures to optimise the benefits of private standard certification and reduce difficulties that they pose, particularly to developing countries. Transparency, on the part of industry and industry coalitions, in the setting and implementation of private food standards becomes increasingly important. Other considerations that could guide discussions on approaches for moving forward to a better understanding of the issues and a shared vision of the role of private food standards in the overall architecture of food safety regulation include the following (FAO, 2010):
Concerned national institutions should ensure that they are well informed of the situation in their countries concerning the use and impact of private standards and can report on these to relevant international organizations.

Engagement between private standard setting bodies and concerned international organizations could contribute to resolving some of the concerns of developing countries. However, it must be understood that constructive dialogue depends on all parties having access to relevant information.

The ability of countries to implement Codex standards and guidelines would greatly enhance their ability to comply with private food standard requirements. Countries should consider making better use of Regional Codex Coordinating Committees for regular reporting on actions taken to implement Codex standards in their national context.

Stakeholder input into the development and review of private standards contributes to promoting their feasibility in each national context. Member countries and private standard setters should consider whether national technical working groups might be an effective means of providing developing country input into the processes of reviewing and revising private standard schemes.

Member organizations of the Standards and Trade Development Facility (STDF) and the STDF secretariat might consider increased emphasis on identifying and promoting best practices in designing and delivering technical assistance aimed at enabling food chain operators in developing countries to implement effective programmes of food safety management.

The ability of developing countries to demonstrate equivalence of alternative food safety management measures could contribute to overcoming the challenges posed by overly prescriptive private standards. Donor agencies and development partners should consider increasing their support for building the scientific and technical capacities in developing countries that would facilitate such approaches.

The use of microbiological criteria may become increasingly important in both official and private food safety standards. Member countries should be aware of the potential relevance of new work proposed by the Codex Committee on Food Hygiene concerning the revision of the Codex “Principles for the development and application of microbiological criteria” to their expressed concerns about the stringency of private food standards.

References

Private standards and certification in fisheries and aquaculture: current practice and emerging issues (Washington et al., 2011)

Interaction of Public and Private Standards in the Food Chain (Smith, 2009)

Private Agri-food Standards: Contestation, Hybridity and the Politics of Standards (C. Bain et al., 2013)


Private Food Safety Standards: Their Role in Food Safety Regulation and their Impact (FAO, 2010)
6.3.21 The Political Economy of Undernutrition: Bringing Fisheries and Aquaculture to Bear

A. Concepts in Malnutrition (WFP, 2012)

Malnutrition occurs when the nutrient and energy intake does not meet or exceeds an individual's requirements to maintain growth, immunity and organ function. Malnutrition is a general term and covers both undernutrition and over-nutrition (overweight/obesity).

Undernutrition is the consequence of an insufficient intake of energy, protein and/or micronutrients, poor absorption or rapid loss of nutrients due to illness or increased energy expenditure. Undernutrition encompasses low birth weight, stunting, wasting, underweight and micronutrient deficiencies.

Undernourishment indicates food intake that is insufficient to meet dietary energy requirements continuously. Undernourishment is not assessed at the individual level.

Nutrient gap is the difference between nutrient requirements and nutrient intake. While diets may be adequate in terms of energy (kcals), they may still be inadequate in terms of nutrients, leaving individuals at risk of undernutrition.

Micronutrient deficiency is a lack or shortage of a micronutrient (also called vitamins or minerals). Micronutrients are essential components of enzymes and hormones and are therefore key in bodily processes, immunity, proper growth and metabolism of an individual. Micronutrient deficiencies often occur simultaneously and can arise due to lack of intake, absorption, or utilization of one or more vitamins or minerals. It is referred to as hidden hunger because a large percentage of the population may be deficient without showing any clinical symptoms or signs of deficiency.

Growth failure is the condition where an individual is shorter and/or thinner than their well-nourished counterparts and where the individual does not meet her/his growth potential. Growth may fail due to deficiencies of various micronutrients, energy, protein and/or macro-minerals.

Acute malnutrition, also known as wasting, develops as a result of recent rapid weight loss or a failure to gain weight. In children, it is assessed through the nutritional index of weight-for-height (WFH) or mid-upper arm circumference (MUAC). Acute malnutrition is also assessed using the clinical signs of visible wasting and nutritional oedema. In adults, wasting is assessed through MUAC or Body Mass Index (BMI). In pregnant and lactating women (PLW), wasting can be assessed through MUAC. The degree of acute malnutrition of an individual is classified as either moderate (MAM) or severe (SAM) according to specific cut-offs and reference standards. At the population level, acute malnutrition is categorized in three ways:

(i) Global acute malnutrition (GAM) represents the proportion of children 6-59 months in the population classified with MAM + SAM according to their weight-for-height (WFH) (Z-score), and/or nutritional oedema. GAM is an indicator of acute malnutrition in a population, and is used to assess the severity of the situation.

(ii) Moderate acute malnutrition (MAM) represents the proportion of children 6-59 months in the population who are classified with WFH ≥ -3 and < -2 (Z-score).

(iii) Severe acute malnutrition (SAM) represents the proportion of children 6-59 months in the population who are classified WFH <-3 (Z-score) and/or presence of nutritional oedema.
**Nutritional oedema** indicates a serious type of acute malnutrition in which nutritional deficiencies lead to swelling of limbs (feet, hands) due to retention of fluids. Children with nutritional oedema are automatically classified with severe acute malnutrition (SAM), and often require therapeutic feeding and medical treatment to recover. Also known as bilateral oedema.

**Chronic malnutrition:** Chronic malnutrition is also referred to as stunting and develops as a result of inadequate nutrition or repeated infections or both; typically, during the critical window of opportunity of the first 1,000 days from conception to two years of age. It is measured by the nutritional index of height-for-age (HAZ) and is manifested by a child being too short for his or her age. Unlike wasting, the development of stunting is a slow cumulative process that may not be evident immediately. Chronic malnutrition cannot generally be reversed, only prevented.

**B. The Problem of Undernutrition/Malnutrition**

According to IFPRI (2015) good nutrition signals the realization of people’s rights to food and health. Without good nutrition, human beings cannot achieve their full potential. When people’s nutrition status improves, it helps break the intergenerational cycle of poverty, generates broad-based economic growth, and leads to a host of benefits for individuals, families, communities, and countries. Good nutrition provides both a foundation for human development and the scaffolding needed to ensure it reaches its full potential. Good nutrition, in short, is an essential driver of sustainable development.

Malnutrition, though, is a problem of staggering size—large enough to threaten the world’s sustainable development ambitions. Malnutrition takes many forms: children and adults who are skin and bone, children who do not grow properly, people who suffer because their diets are imbalanced, and people who are obese or suffer from nutrition-related non-communicable diseases. Malnutrition affects all countries and one in three people on the planet. Nearly half of all countries face multiple serious burdens of malnutrition such as poor child growth, micronutrient deficiency, and adult overweight.

**C. Burden and Causes of Malnutrition in Africa**

![Figure 53: The Causes of Undernutrition (AUC et al., 2014)](image)

The main factors associated with undernutrition as a public health problem can be grouped into the following: environmental (natural or entropic causes), sociocultural-economic (linked to poverty and inequality) and political-institutional. Together, these factors increase or decrease biomedical access and productivity abilities, through which they determine the quantity and quality of dietary intake and the absorption capacity, which constitute the elements of
undernutrition. Each of these factors increases or decreases the likelihood of a person to suffer from undernutrition (see Figure 3). Further, the importance of each of these factors depends on the level of the country’s demographic and epidemiological transition as well as on the person’s current stage in the life cycle. Together these factors determine the intensity of the resulting level of undernutrition.

Poor environmental conditions may increase insect and protozoan infections and also contribute to environmental deficiencies in micronutrients. These include the risks stemming from the natural environment itself and its cycles (floods, droughts, frosts, earthquakes and other phenomena), as well as those produced by humans themselves (such as water and air pollution, contamination of food, expansion of agriculture, etc.). Overpopulation, more commonly seen in developing countries, can reduce food adequacy, leading to inadequate food intake or intake of foods of poor nutritional quality and quantity. The sociocultural-economic determinants include elements associated with poverty and inequality, education and cultural norms, employment and wages, access to social security and coverage of aid programmes. The political-institutional factors encompass government policies and programmes aimed specifically at solving the population’s food and nutritional problems.

Production factors include those directly associated with the production and access to food by the population at risk. The availability and autonomy of each country’s dietary energy supply depend directly on the characteristics of production processes, the degree to which they utilize natural resources, and the extent to which these processes mitigate or aggravate environmental risks.

Finally, biomedical factors take into account the individual’s susceptibility to undernutrition, insofar as deficiencies in certain elements limit the capacity to make biological use of the food consumed (regardless of quantity and quality).

D. Consequences of Undernutrition in Africa

Figure 54: The COHA Framework of Social and Economic Consequences of Child Undernutrition in Africa (AUC et al., 2014)
Bain et al. (2013) reports that malnutrition is estimated to contribute to more than one third of all child deaths, although it is rarely listed as the direct cause. Contributing to more than half of deaths in children worldwide; child malnutrition was associated with 54% of deaths in children in developing countries in 2001. Protein-energy malnutrition (PEM), first described in the 1920s, is observed most frequently in developing countries but has been described with increasing frequency in hospitalized and chronically ill children in the United States. Child undernutrition has long-term negative effects on a person’s life, most notably in the aspects of health, education, and productivity (see Figure 4). These elements are quantifiable as costs and expenditures to both the public sector and to individuals. Consequently, these effects exacerbate problems in social integration and increase or intensify poverty. A vicious cycle is perpetuated as vulnerability to undernutrition grows.

Kwashiorkor and marasmus are two forms of Protein Energy Malnutrition (PEM) that have been described. The distinction between the two forms of PEM is based on the presence of edema (kwashiorkor) or absence of edema (marasmus). Marasmus involves inadequate intake of protein and calories, whereas a child with kwashiorkor has fair-to-normal calorie intake with inadequate protein intake. Although significant clinical differences between kwashiorkor and marasmus are noted, some studies suggest that marasmus represents an adaptation to starvation whereas kwashiorkor represents a dys-adaptation to starvation.

In addition to PEM, children may be affected by micronutrient deficiencies, which also have a detrimental effect on growth and development. The most common and clinically significant micronutrient deficiencies in children and childbearing women throughout the world include deficiencies of iron, iodine, zinc, and vitamin A and are estimated to affect as many as two billion people. Although fortification programs have helped diminish deficiencies of iodine and vitamin A in individuals in the United States, these deficiencies remain a significant cause of morbidity in developing countries, whereas deficiencies of vitamin C, B, and D have improved in recent years. Micronutrient deficiencies and protein and calorie deficiencies must be addressed for optimal growth and development to be attained in these individuals.

Undernutrition may have immediate or evolving impacts throughout a person’s lifetime; individuals who suffered from undernutrition during early years of their life cycle (including intrauterine) are more likely to be undernourished later in life. Health studies have shown that undernutrition leads to increased appearance or intensified severity of specific pathologies and increases the chance of death during specific stages of the life cycle. The nature and intensity of the impact of undernutrition on pathologies depends, in part, on the epidemiological profile of a given country.

In education, undernutrition affects student performance through disease-related weaknesses and results in limited learning capacity associated with deficient cognitive development. This translates into a greater probability of starting school at a later age, repeating grades, dropping out of school and ultimately obtaining a lower level of education. Later in life, individuals may experience lower physical capacity as a result of stunting. Stunting, which is caused by food deprivation and nutrient deficiencies, is established by low height-for-age measurements during childhood. In adulthood, it leads to an overall reduced body mass when compared to the full adult potential.

E. The Political Economy of Malnutrition: The Cost of Hunger in Africa

Africa has experienced a recent period of economic growth that has positioned the region as a key area for global investment and trade. The pace of real GDP growth on the continent has doubled in the last decade and six of the world’s fastest growing economies are in Africa. All this has occurred despite some of the highest rates of child undernutrition in the world. Globally, there has been progress in reducing both stunting (low height-for-age) rates and the number of stunted children in the last 20 years. In Africa, the proportion of stunted children reported has decreased from 41.6 percent (1990) to 35.6 percent (2011) (see Table 5). Nevertheless, for that same period, the number of stunted children has increased from 45.7
million to 56.3 million, evidencing that stronger efforts must be put in place to have a decisive impact. The biggest proportion of these children are located in East Africa, where 22.8 million represent more than 40 percent of all stunted children on the continent. Together with West Africa, they account for three out of every four stunted children on the continent.

Child undernutrition is one of the most critical negative effects of hunger. When a child is undernourished before the age of five, his or her body and brain cannot develop at its potential, and they are at risk for cognitive delays. Figure 5 illustrates the rates of stunting in Africa. According to this data, 17 countries on the continent have stunting rates above 40% and 36 countries have rates above 30%. Furthermore, a large proportion of Africa’s population often does not access diets containing the essential vitamins and minerals required for optimum health and productivity.

![Figure 55: Stunting Rates by Country (AUC et al., 2014)](image)

<table>
<thead>
<tr>
<th>Table 33: Estimated Prevalence and Number of Stunted Children Under Five Years of Age (Moderate or Severe), by UN Region: 1990, 2010, 2011 (AUC et al., 2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prevalence estimate (%)</strong></td>
</tr>
<tr>
<td>Africa</td>
</tr>
<tr>
<td>Eastern</td>
</tr>
<tr>
<td>Middle</td>
</tr>
<tr>
<td>Northern</td>
</tr>
<tr>
<td>Southern</td>
</tr>
<tr>
<td>Western</td>
</tr>
</tbody>
</table>
Table 34: Number of Undernourished People, by Region (FAO et al., 2012)

<table>
<thead>
<tr>
<th>Region</th>
<th>1990-1992</th>
<th>Proportion</th>
<th>2010-2012</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>175</td>
<td>18%</td>
<td>239</td>
<td>28%</td>
</tr>
<tr>
<td>Asia</td>
<td>739</td>
<td>74%</td>
<td>563</td>
<td>65%</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>65</td>
<td>7%</td>
<td>49</td>
<td>6%</td>
</tr>
<tr>
<td>Oceania</td>
<td>1</td>
<td>0%</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>World</td>
<td>1000</td>
<td></td>
<td>868</td>
<td></td>
</tr>
</tbody>
</table>

Table 35: Effects of Child Undernourishment through Life (AUC et al., 2014)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 years</td>
<td>Undernourished children are at higher risk of anaemia, diarrhoea, fever and respiratory infections. These additional cases of illness are costly to the health system and to families. Undernourished children are at a higher risk of dying.</td>
</tr>
<tr>
<td>6-18 years</td>
<td>Stunted children are at a higher risk of repeating grades in school and dropping out of school. Grade repetitions are costly to the education system and to families.</td>
</tr>
<tr>
<td>15-64 years</td>
<td>If a child has dropped out of school early and has entered the workforce, he or she may be less productive, particularly in the non-manual labour market. If engaged in manual labour, he or she is likely to have reduced physical capacity and will tend to be less productive. People who are absent from the workforce as a result of undernutrition-related child mortality represent lost economic productivity.</td>
</tr>
</tbody>
</table>

Table 36: Summary of Costs of Child Undernutrition (AUC et al., 2014)

<table>
<thead>
<tr>
<th>Country</th>
<th>Losses National Currency</th>
<th>Losses US$</th>
<th>Equivalent % of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>EGP20.3 billion</td>
<td>3.7 billion</td>
<td>1.9</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>ETB55.5 billion</td>
<td>4.7 billion</td>
<td>16.5</td>
</tr>
<tr>
<td>Malawi</td>
<td>MKW147 billion</td>
<td>597 million</td>
<td>10.3</td>
</tr>
<tr>
<td>Rwanda</td>
<td>RWF503.6 billion</td>
<td>820 million</td>
<td>11.5</td>
</tr>
<tr>
<td>Swaziland</td>
<td>SZL783 million</td>
<td>92 million</td>
<td>3.1</td>
</tr>
<tr>
<td>Uganda</td>
<td>UGX1.8 trillion</td>
<td>899 million</td>
<td>5.6</td>
</tr>
</tbody>
</table>

F. The Contribution of Fish Intake, Aquaculture and Fisheries to Improving Nutrition

F.1 The health benefits of fish and seafood have been well documented and widely promoted in recent years. Fish is low in saturated fat and is a healthy alternative to red meat. It provides the body with essential vitamins and minerals, including iron; zinc (from shellfish); vitamins A, B and D; and, of course, protein. Omega-3 fatty acids found in fish are also beneficial, particularly in terms of cardiovascular health. Preliminary evidence suggests that early exposure to omega-3 fats may enhance brain development as well (ARHP/PSR, 2004).
F.2 Tacon et al. (2013) reports that despite the fact that the African region has the lowest per capita supply of aquatic animal food products of any region (9.50 kg/year, with the bulk of this supply coming from capture fisheries), aquatic food products represent over 18.5% of total animal protein supply within the region, and only second to the Asian region at 22.6% in 2009. Moreover, 18 sub-Saharan countries derive the bulk of their very limited animal protein supply from aquatic animal food products, including: Sierra Leone (64.8% total animal protein supply), Gambia (56.6%), Comoros (55.6%), Ghana (54.5%), Cameroon (49.3%), Congo Republic (48.0%), Sao Tome and Principe (46.4%), Equatorial Guinea (42.6%), Nigeria (41.1%), Congo DFR (39.6%), Senegal (38.6%), Mozambique (37.6%), Benin (35.7%), Guinea (33.3%), Guinea (33.3%), Uganda (33.3%), Cote d'Ivoire (31.8%), and Malawi (27.1%).

F.3 In terms of nutrient composition, aquatic animal food products represent one of the world's most healthy and nutritious food sources. Thus, compared with terrestrial farmed meat products, aquatic animal foods (whether captured or cultured) generally have the following nutritional and health attributes:

(a) Aquatic animal foods have a higher protein content on an edible fresh weight basis (mean 17.3%) than most terrestrial meats (mean 13.8%), despite having a higher moisture content than most terrestrial meats.

(b) Aquatic animal food proteins are highly digestible and have a high biological value, as evident by their excellent essential amino acid (EAA) profile, the latter closely approximating to the recommended human dietary EAA requirement pattern. In particular, aquatic animal proteins are rich dietary sources of methionine and lysine. Since these EAA are usually limiting within most edible plant proteins consumed by humans, aquatic food products constitute a perfect addition to the typical plant-based diets consumed by the rural poor.

(c) Aquatic animal foods are generally leaner on an edible fresh weight basis (average of fat = 2.7%) compared with terrestrial meats (average of fat = 16.6%), have a lower saturated fat content (average of 0.16% in crustaceans, 0.32% in molluscs, 1.19% in fish, and 4.97% in terrestrial meats), have a lower calorific density (average of 101.3 kcal/100g) than terrestrial meats (average of 209 kcal/100g).

(d) Aquatic animal food products contain the highest concentration of long-chain omega-3 [(n-3)] polyunsaturated fatty acids of any foodstuffs, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) of terrestrial meat. Highest levels of EPA/DHA were reported within small pelagic fish species, and farmed and wild salmonid fish respectively. Although not analyzed or presented here, it is important to mention that filter feeding freshwater fish species (such as silver carp Hypophthalmichthys molitrix and bighead carp Hypophthalmichthys nobilis) are also rich sources of EPA/DHA, which they derive from freshwater plankton. As a general rule, the tissue levels of EPA/DHA within farmed fish and crustacean species are usually derived from the level of fish oil used within their formulated feeds, with higher levels usually reported with feeds containing higher dietary fish oil levels. In health terms, fish-derived omega-3 [(n-3)] fatty acids EPA and DHA have been shown to have a positive role in infant development (including neuronal, retinal, and immune function), cardiovascular diseases (including reduced incidence of heart disease in adults), cancer, and various mental illnesses (including depression, attention-deficit hyperactivity disorder, and dementia.

(e) Aquatic animal food products are a richer source of most essential minerals and trace elements than most terrestrial meats, including: Calcium; Phosphorus; Magnesium; Iron; Potassium; Sodium; Zinc; Copper; Manganese; Selenium.
(f) As with the long-chain omega-3 fatty acids EPA and DHA, higher levels of mineral elements were observed in small pelagic fish species (includes European anchovy, Atlantic and Pacific herring, Atlantic mackerel and Spanish mackerel), compared to other fish species, including calcium, iron, magnesium, potassium, zinc, copper, manganese, and selenium. Aquatic animal food products are also rich dietary sources of other important essential trace elements that are generally lacking in terrestrial meat products, including iodine, fluorine, and trivalent chromium.

(g) Aquatic animal food products are a richer source of several key water soluble and fat soluble vitamins than most terrestrial meats, including: Vitamin A; Vitamin C; Vitamin B12; Folic acid; Vitamin E; Vitamin D; Choline.

(h) As with the omega-3 fatty acids and minerals, higher vitamin levels were observed in small pelagic fish species (includes European anchovy, Atlantic and Pacific herring and Atlantic mackerel), compared to other fish species, including riboflavin, niacin, vitamin B12, and vitamin D.

F.4 Last, but not least, edible aquatic plants or seaweeds also play an important role as a valuable source of essential nutrients in global food supply, including:

(a) Depending upon the species, season, and or culture conditions, edible seaweeds may contain considerable amounts of protein, with the red seaweeds such as Porphyra spp. (Nori) usually having the highest levels of protein (up to 47% on a dry weight basis), followed by green seaweeds such as Enteromorpha lactuca (former Ulva; sea lettuce) with protein levels ranging between 10 to 25%, and lastly by brown seaweeds such as Laminaria japonica with the lowest protein levels of between 5 and 12%, on a dry weight basis. Aspartic acid and glutamic acids constitute a large part of the amino acid make-up of edible seaweed proteins, with these amino acids being highest within brown seaweed proteins. Moreover, edible seaweeds such Palmaria palmata (Dillisk/Dulse) and Enteromorpha spp. (sea lettuce) are good sources of essential amino acids such as histidine, leucine, isoleucine, methionine and valine, with the levels of isoleucine and threonine in Palmaria palmata being similar to the levels found in legumes, and histidine levels is in Enteromorpha pertusa being similar to the levels found in egg proteins.

(b) Although the lipid fraction of marine edible seaweeds is usually low (typically ranging between 1.5 and 3.5%, on a dry weight basis), the lipids present are rich in omega-3 polyunsaturated fatty acids, and in particular EPA and to a lesser extent DHA, which are important to human health.

(c) Edible seaweeds are a good source of dietary fibre, including insoluble fibre and soluble fibre. The main component of the fiber component in marine seaweeds are xylans, alginates, carageenans and/or agar.

(d) Edible seaweeds are a rich dietary source of biologically available minerals and trace elements (compared with most other terrestrial plant food sources), including: iodine; iron; zinc; copper; magnesium; potassium; and calcium.

(e) Edible seaweeds are a rich source of many water-soluble and fat soluble vitamins, including vitamin C, vitamin E, vitamin B12, thiamin, riboflavin, niacin, pyridoxine, inositol, folic acid.

F.5 Lastly, edible seaweeds may contain a variety of different species specific bioactive chemicals with potential pharmaceutical and health enhancing properties, including
bromophenols, phytosterols, photosynthetic pigments, and immune enhancing polysaccharides.

**F.6** Kawarazuka (2010) explains that aquaculture interventions can contribute to improving nutritional status of households through people consuming fish produced from their own ponds, selling fish for household income to enhance their purchasing power, and by expanding wider accessibility to fish by lowering market prices. Fish sold for cash income contribute to purchasing sufficient staple foods, and can also be used for consumption or purchase of non-staple foods which directly improve dietary intake beyond energy intake.

![Figure 56: The Pathways through Which Aquaculture Can Contribute to Improving Nutritional Status (Kawarazuka, 2010)](image)

**Figure 56: The Pathways through Which Aquaculture Can Contribute to Improving Nutritional Status (Kawarazuka, 2010)**

**F.7** Kawarazuka (2010) reports on studies which indicate that fish is a major animal protein source and own catches are kept for household consumption although the proportion of catches consumed at household varies from around 10% to 70% of total catches. In the areas where fish are abundant year-round or seasonally, people consume fish caught by household members, and hardly buy them in the markets. The species consumed at household level are low market-value fish and other aquatic animals. Invertebrate and other aquatic animals are more likely to be kept for household consumption while high market-value finfish are exclusively sold at market.

Furthermore, fish supplied from common-pool resources are widely traded in the local markets and therefore fish sold in the local markets can nutritionally contribute to not only households
that engage in fishing for household consumption, but also large populations including those who do not engage in small-scale fisheries but purchase fish from local markets.

Figure 57: The Pathways through Which Small-Scale Fisheries Can Contribute to Nutritional Status (Kawarazuka, 2010)

F.8 Fish supplied by common-pool resources are also an important source of household income for the poor. The pathway is very similar to that of aquaculture, where cash from fish is primarily used to purchase staple foods in some studies. The proportions of fish catches sold varied from 30% to 90% among different countries. Many case studies showed the important role of small-scale fisheries as a seasonal part-time income source, contributing to diversifying livelihoods, especially during lean seasons when incomes from farming or labour wages are low. Furthermore, unlike fish produced by aquaculture which are mostly traded as fresh fish, fish supplied by small-scale fisheries are often seasonal and therefore many fish are processed during high production season. Hence, processing is also an important income source in seasonal small-scale fisheries, in particular, the areas where marketing network for locally processed fish (smoked and dried) to urban markets are well developed.
Improving dietary intake through diversifying the diet is one way to improve nutritional status. Adding small fish into the starch-based diet, as characteristic of the poor, increases micronutrient intakes effectively, with a high bioavailability, and fish carry other vegetables and some oil through a cooking process, contributing also to enhancing the bioavailability of the micronutrients in these foods. In this direct pathway, small-scale fisheries and aquaculture of nutrient-dense fish played an important role, while the nutritional effect of adding large fish into the diet was not fully analysed although it provided animal protein and PUFAs to some extent. Most nutrient-dense fish come from small-scale fisheries, and therefore conservation of these species and integrating them into already existing aquaculture systems is recommended. Food-based strategies which include the promotion and nutritional education of nutrient-dense fish have potential to strengthen this direct pathway.

Increasing purchasing power through the sale of fish for cash income which can be used to ensure household food security is an indirect pathway to improve overall dietary intake. Cash income from fish enabled households to add various food items into the diet, besides fish. Some studies reported that household income was used for purchasing animal-source foods or...
other food items. However there is a challenge that households with insufficient staple foods exchange fish for staple foods, but did not make enough cash from their fish sales to purchase other food items. In this case, households remain with starch-based diets, thereby their quality of diet is not improved.

Another pathway linking small-scale fishery and aquaculture activities with household nutritional outcomes was through women’s involvement in production, processing or sale of fish. Women often engage in fishing activities for household consumption, contributing to strengthen the direct pathway, while trading and processing contribute to empowering women which indirectly improves care for and diet of children.

This review analysed the role of aquaculture and small-scale fisheries separately. The pathways appeared however, to be basically the same. Aquaculture contributed to increasing household income with its high profitability and productivity. However owning a fish pond is an essential condition to initiate aquaculture, except in some cases where common-pool resources and seasonal fish ponds are abundant. On the other hand, fish supplied by small-scale fisheries were not only caught and consumed by household members, but also widely traded in the local markets, providing various livelihood opportunities for the poor, landless and women. Supporting small-scale fisheries through increasing capacity of sustainable resource management is required to keep fish supply from common-pool resources for the poor, as current aquaculture technologies and production systems cannot exactly replace the role played by small-scale fisheries. Nevertheless, aquaculture using common-pool resources such as river channels and floodplains, near shore, marine and lake waters, and seasonal water bodies, has potential for the sustainable supply of fish and household income for the poor, especially the landless and women.

Other linkages, such as health service and health environment of communities, and diseases were not examined as the data were scarce. To fully understand the determinants of nutritional status, integrated research and interventions are required.

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6.3.22 Poverty Reduction and Rural Development: Fisheries and Aquaculture as Strong Contenders

A. Introduction

Fisheries and aquaculture have an important role to play in global efforts to eliminate hunger and malnutrition through supplying fish and other aquatic products rich in protein, essential fatty acids, vitamins and minerals. Fisheries and aquaculture can also make significant contributions to development by improving incomes, providing employment opportunities and increasing returns on resource use.

Despite the significant contributions that fisheries and aquaculture make to employment, nutrition, and trade in the developing world, they are rarely included in national development policy and donor priorities. This is largely due to problems with valuation of small-scale fisheries, as policy makers often do not have access to data which reflect the importance of fisheries and aquaculture to development. The stagnation or decline of capture fisheries production in many parts of the world underscores the importance of fisheries policy, however, as the current state of stocks can be at least partially attributed to the difficulties of regulating fisheries and preventing their overexploitation. Even with improvements in regulation, however, pressures on capture fisheries will remain, due to continued population growth. Further development of sustainable aquaculture and improvements in the post-harvest sector to reduce losses could help to maintain fish supply and the contribution of fish to development.

B. Employment, production and trade

While data on fisheries in developing countries are often patchy, it is nevertheless possible to identify trends in the importance of fisheries and aquaculture for developing countries, particularly in the areas of employment, consumption, and trade.

B.1 Employment

Employment in fishing and aquaculture has grown rapidly over the past few decades, increasing more than threefold from 13 million people in 1970 to over 41 million in 2004. Employment in the fisheries sector has grown more rapidly than both world population and employment in agriculture. Most of this growth is in Asia, where over 85 percent of the world’s fisherfolk live, and is largely due to the expansion of aquaculture in this period (FAO, 2006).

While the number of people employed in fisheries and aquaculture in developing countries has been growing steadily, it has been stagnant or declining in most industrialised countries. This decline has been most pronounced in capture fisheries, while employment in aquaculture has increased in some industrialised countries.

Millions of women in developing countries are employed in fisheries and aquaculture, participating at all stages in both commercial and artisanal fisheries, though most heavily in fish processing and marketing. In capture fisheries, women are commonly involved in making and repairing nets, baskets and pots, baiting hooks, setting traps and nets, fishing from small boats and canoes, and collecting seaweed, bivalves, molluscs and pearls. They are rarely involved in commercial offshore and deep-water fishing. In aquaculture, women feed and harvest fish, attend to fish ponds, and collect fingerlings and prawn larvae. Women play a major role in fish processing in many parts of the world, both using traditional preservation methods and working in commercial processing plants.

In addition to affecting food supply, the status of fish stocks in capture fisheries is likely to threaten the livelihoods of small-scale fisherfolk and traditional fish processors as competition for limited resources increases. Larger-scale operators with greater access to capital and gear are already emerging in many areas, leading to changes in the structure and location of post-
harvest activities and concentrating ownership and control of resources. In India, for example, fishing practices are changing with rising investment, and higher levels of mechanisation and motorisation are leading to greater centralisation of landings and competition over the catch. In the past, small-scale traders were able to purchase fish from local fishers at decentralised beach-based landings, sometimes accessing fish through husbands or taking the fish on credit and paying once they had sold it. The increasing centralisation of landings, however, has led to fierce competition at landing sites, favouring those with greater access to credit and infrastructure and marginalising traditional fish processors and petty traders (Béné et al., 2007).

B.2 Production and consumption

Data on fisheries in developing countries often do not fully account for artisanal and subsistence production, as the magnitude of the landings of these fisheries is not generally known by the responsible fisheries administration. It seems clear, however, that capture fisheries worldwide are currently being fished at or near capacity, and that further growth in fish production will come primarily from aquaculture. FAO (2006) estimates that marine capture fisheries production will remain between 80 and 90 million tons per year, and freshwater fisheries, which face environmental degradation and competition for use of freshwater resources from other sectors such as hydropower and agriculture, are unlikely to expand significantly either.

Per capita fish supply in low-income food-deficit countries (LIFDCs) (excluding China) has increased from 5.0 to 8.3 kg since 1960, due primarily to the growth of aquaculture and to increased production from inland capture fisheries in developing countries (Béné et al., 2007). In Sub-Saharan Africa, however, per capita fish supply is declining, dropping from a peak of 9.9 kg in 1982 to 7.6 kg in 2003. This is due to rapid population growth, stagnant capture fishery production, and the slow expansion of aquaculture in the region (FAO, 2006).

Demand for fish continues to increase in most of the world – in line with population growth as well as increases in consumption of animal protein associated with urbanisation and rising incomes. In developed countries, demand for high-value carnivorous species such as salmon and shrimp has also increased, largely due to income growth and urbanisation, as well as a shift in preferences away from red meat and towards fisheries products (Delgado et al., 2003).

B.3 Trade

A large portion of fish production is destined for export, around 40 percent of global production being traded internationally, and exports from developing countries accounting for some 60 percent of this (see Ababouch, this volume). They are now net exporters of fish to developed countries, having shifted dramatically from being net importers (over 1.2 million metric tons in 1985) over the past two decades (Delgado et al., 2003).

Over 30 percent of fishery commodity production in developing countries is destined for export, and it is an important source of foreign exchange for many countries. While industrial fishing activity continues to produce a significant portion of fisheries exports in some countries, much of the recent increase in exports from developing countries has come from small-scale fisheries. Much of this is driven by rising demand for high-quality demersal fish in developed countries. The rapid growth in contribution of fish to total export earnings in Uganda (from less than one percent in 1990 to 17 percent in 2002), for example, was based largely on artisanal fishing of Nile perch in Lake Victoria (Béné et al., 2007).

An increasing amount of trade in fish products is between developing countries, however, rather than from developing to developed countries. Demand for fish in developing countries continues to grow, due both to population growth and increased per capita consumption, while overall demand in developed countries has stagnated since 1985. While there is increasing demand for higher value fish in developing countries, low-value fish continue to make up the
bulk of fish consumed there, and they are projected to remain net exporters of high value finfish and importers of low-value food fish (Delgado et al., 2003).

International trade in fisheries products has been shown to have a positive effect on food security in many developing countries, stimulating increased production, generating foreign exchange which can be used for food imports, and enhancing the trade-based entitlements of people engaged in fishing and fish processing. Much of the discussion around the food security impact of international fish trade has focused on whether fish production for export reduces the amount of fish available for local consumption, presenting fish exports as a trade-off between foreign exchange earnings and domestic food security. Such a perspective, however, fails to take into account that foreign exchange from fish exports helps to finance imports of other foods, including fish products, and that production for export helps to raise the incomes of poor fisherfolk and people employed in fish processing, enabling them to achieve greater food security through enhanced purchasing power. In Thailand, for example, a decrease in rural poverty has been attributed to the export orientation of the fisheries sector and concomitant increase in the incomes of poor fishers. Fish processing for export can also generate employment, particularly among young women, though export-orientation in fisheries reduces the quantity of fish available to traditional fish processors (typically middle-aged women with little education), affecting their livelihoods.

C. Fisheries in development policy

The contribution of fisheries and aquaculture to development has consistently been underestimated both in national development and poverty reduction strategies and in international cooperation. There are two factors which influence the degree to which fisheries are included in development policy in a given country: the sector's contribution to foreign exchange earnings and its contribution to food security and nutrition (measured by dependence on fish protein). The more reliant a country is on fisheries for its foreign exchange earnings and food security, the argument goes, the more likely that policy makers will recognise their importance and that this will be reflected in development policy. As farming and terrestrial livestock often both generate more foreign exchange and are perceived to make a larger contribution to food security than other renewable resource sectors such as forestry and fisheries, they generally receive much more attention in national development strategies and donor priorities.

When faced with resource allocation decisions, many governments prioritise water use for human consumption, agriculture, hydropower, and industry over inland fisheries and aquaculture. This is largely attributable to the perceived contribution of each sector to development, but also to the prevalence of single water-use systems. Encouraging multiple uses of water, however, can increase its productivity and allow for simultaneous development of several sectors. Use of freshwater for aquaculture and agriculture, for example, is not necessarily mutually exclusive, and integrated aquaculture-agriculture (IAA) systems have been shown to increase the productivity of agricultural activities on farms which have ponds. IAA ponds also contribute to the resilience of small farms, enabling them to maintain some degree of food production during droughts (Brummett, 2006).

The data problems identified in the first section also contribute to poor recognition of the contributions of fisheries to development. Since data on artisanal, subsistence and inland production, fish-based livelihoods and consumption patterns in developing countries tend to be fairly sketchy, they often under-represent the contribution of fisheries to development. Thus the perceived contribution of fish to foreign exchange earnings and food security is often lower than their actual contribution, further reducing the chances that fisheries and aquaculture will be adequately addressed in development policy.
D. Development aspects of health and nutrition

Even when consumed in small quantities, fish often comprises a nutritionally important part of many people’s diets in developing countries. It is a vital source of protein and micronutrients, and improves the quality of protein in largely vegetable and starch-based diets by providing essential amino acids. FAO (2006) has estimated that fish accounts for approximately 20 percent of animal protein consumption in LIFDCs. In some coastal and island countries (including Bangladesh, Indonesia, Senegal, and Sri Lanka), it provides over 50 percent of animal protein, and reaches 62 percent in Gambia and 63 percent in Sierra Leone and Ghana. It is a particularly important component of the diets of the poor, as it is often the most affordable form of animal protein.

Fish is also rich in iron, zinc, magnesium, phosphorous, calcium, vitamin A and vitamin C, and marine fish is a good source of iodine. Many of these vital nutrients are found only in small amounts, if at all, in staple foods such as maize, rice and cassava which make up the bulk of people’s diets in developing countries. Fish are an indispensable source of these nutrients for many people, and small low-value fish, which are largely consumed by the rural poor, provide more minerals than the same quantity of meat or large fish, as they are consumed whole, with the bones intact. Fish also contain fatty acids which are essential for the development of the brain and body, and are particularly crucial for the diets of babies, children, and pregnant and lactating women (Béné et al., 2005).

Consumption of omega-3 fatty acids during pregnancy reduces the risk of low birth weight, which is a key factor in both maternal and child mortality. These acids are also critical for the neurological development of infants, and are found almost exclusively in fish, making the consumption of fish during lactation and pregnancy especially important.

The nutritional benefits of fish consumption are also particularly important for people living with HIV/AIDS. Proper nutrition is essential for the effectiveness of anti-retroviral drugs, and fish has also been shown to contain combinations of nutrients which reduce susceptibility to secondary diseases.

E. Closing the supply gap

Though further increases in capture fisheries production are unlikely, demand for fish is projected to continue increasing due to population growth and urbanisation. This trend is likely to be particularly pronounced in sub-Saharan Africa where many capture fisheries have reached their limit, and aquaculture development is failing to keep pace with population growth. Per capita fish consumption in sub-Saharan Africa is lower than any other region, and it is the only part of the world where consumption is declining (Béné et al., 2005).

In order to meet growing global demand for fish, the further development of sustainable aquaculture and improvement in post-harvest processing deserve special attention. Most capture fisheries are being fished at or above their maximum sustainable yields, and are not projected to produce any further productivity gains. Therefore much of the increasing demand for fish will have to be met by increasing aquaculture production and reducing post-harvest losses.

Aquaculture is often easier to manage than capture fisheries, as aquaculture activities generally fall within national governance frameworks and do not face the same difficulties in resource management that transboundary fisheries do. Even fisheries which fall completely within national boundaries often face difficulties in managing levels of exploitation and controlling access, while property rights are much more clearly defined for aquaculture. Access to water is a key governance issue here, however, causing problems for landless wishing to farm fish in cages, for rice farmers wishing to abstract additional water for fish and for downstream users where large numbers of farmers wish to harvest rainwater for pond culture.
Coastal aquaculture is often carried out in publicly-owned water bodies for which there are competing demands.

E.1 The challenges facing African aquaculture
While much growth in fish production in recent years has been driven by the rapid expansion of aquaculture in Asia, it is developing more slowly in Africa. Asia and the Pacific accounted for 91.5 percent of world aquaculture production by quantity and 80.5 percent by value in 2004, while sub-Saharan Africa accounted for only 0.16 percent by quantity and 0.36 percent by value (FAO, 2006). An expansion of aquaculture production in sub-Saharan Africa could allow the region to better meet its rapidly increasing demand for fish, though there are many impediments which would have to be overcome for it to realise its full potential.

The vast majority of African aquaculture takes place at a very small scale, with over 90 percent of African aquaculture production coming from farms with one or a few earthen ponds, constructed and managed using family labour. While the ponds represent an important source of food and income for the families that have them, they have not yet been adopted on a scale capable of closing the “fish supply gap” in sub-Saharan Africa. Nonetheless, there is growing evidence of strong commercial interest in aquaculture in several countries.

Among the challenges facing aquaculture in Africa are limited access to quality seed and feed, underdeveloped credit markets, conflict over use of land and water resources, lack of access to information (both market information and information needed for the adoption of new technologies), and underdeveloped or inaccessible output markets.

E.2 Adopting an ecosystem approach to aquaculture
Like any food production system, aquaculture can have negative environmental impacts. Particularly when undertaken at a commercial scale, aquaculture places demands on land and water resources, often uses feed (including intensive formulated feeds) produced outside the immediate area, introduces alien species, may increase sedimentation or produce anoxia of local bottom sediments, and can involve the use of chemicals for disease control.

Aquaculture interacts with capture fisheries in several important ways, due both to the inputs it requires and its potential effects on the surrounding environment. Harvesting of rainwater or abstraction of river water can affect environmental flows and aquatic habitats. Fishmeal and fish oil are key components of formulated feeds used for carnivorous and omnivorous species, placing further demands on marine capture fisheries. Cage culture in coastal areas competes for space with small-scale fisherfolk, often restricting their access to the fishery, and can affect the coastal zone or lake in which it is based through the escape of farmed fish, and through sedimentation and eutrophication from uneaten feed, fertiliser, and fish waste products.

It is worth pointing out that aquaculture can also provide environmental services. For example, integrated pond-based aquaculture increases access to water for irrigation during drought periods. Seaweed, oyster and mussel farming removes anthropogenically derived nutrients released into coastal waters.

While many countries now carry out environmental impact assessments and routine environmental monitoring on aquaculture developments, these often do not take into account cumulative effects in association with other sectors such as agriculture, industrial development, tourism or hydropower. An ecosystem approach to aquaculture (EAA) could provide a more holistic approach to managing the interactions of a wide range of human activities with the natural environment. Building upon the ecosystem approach to fisheries, FAO (2006) define EAA as follows:

*An ecosystem approach to aquaculture (EAA) strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and
human components of ecosystems including their interactions, flows and processes and applying an integrated approach to aquaculture within ecologically and operationally meaningful boundaries. The purpose of EAA should be to plan develop and manage the sector in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by aquatic ecosystems.

This also allows for greater consideration of the social impacts of aquaculture, which are often overlooked when using a purely environmental approach. There is still a need, however, for any environmental planning approach to take into account the demands and impacts of all sectors, rather than taking an exclusively sectoral perspective, possibly through an integration of EAA with Integrated Watershed or Coastal Zone Management.

E.3 Social impacts of aquaculture development

The expansion of aquaculture production has profound implications for labour relations, rural poverty, and class formation. While fishing is often an employment of last resort for landless poor or an activity undertaken as one component of diversified rural livelihood strategies, aquaculture requires access to capital for start-up and running costs, and thus has much higher barriers to entry than fishing in capture fisheries does. Even at a very small scale, as in the case of IAA, there is a need to buy simple tools such as shovels and buckets, as well as seed, feed, and fertiliser. Russell et al. (forthcoming) found that smallholder households adopting fish farming are often those who have start-up capital, raising concerns about equity. Aquaculture is also generally more profitable at higher levels of capital intensity, as larger commercial enterprises benefit from economies of scale, and compliance with often expensive environmental and documentation requirements allow greater access to lucrative export markets (Delgado et al., 2003). Furthermore, aquaculture is less labour intensive than, for example, rice production, and changing from rice cultivation to fish farming can affect rural labour markets and limit employment opportunities for the landless poor.

Despite the challenges, however, aquaculture holds significant potential for pro-poor rural development. Agricultural incomes of IAA households in Malawi, for example, are 60 percent higher than non-IAA households, and their income per hectare is 133 percent higher (Dey et al., 2006). Adoption of IAA by poor smallholders could therefore enable them to increase their income several times over. Aquaculture development at a larger scale could also generate increased employment opportunities for the landless poor, if undertaken alongside continued or expanded agricultural activities rather than as a replacement for them. Most importantly, however, aquaculture can play a major role in terms of food security. As discussed above, fish comprises a nutritionally key part of the diets of the poor in many parts of the world, providing essential micronutrients and relatively affordable animal protein. As global population continues to grow with little prospect of further growth in capture fishery production, increased aquaculture production could help to keep fish affordable for the poor. In many parts of Asia, for example, there is significant aquaculture production of low-value freshwater fish, primarily for domestic consumption.

E.4 Improvements in the post-harvest sector

The post-harvest sector also provides an opportunity for both enhancing the livelihoods of the rural poor and meeting ever-increasing food needs. Post-harvest losses due to lack of adequate infrastructure, inadequate preservation technologies, and poor market access reduce revenues of fishers and traders and the overall food fish supply. In some countries in sub-Saharan Africa, an average of 30 percent of the catch is lost to bacterial and fungal infections or eaten by pests. Use of improved processing technologies such as screens against insects, improved ‘chorkor’ smoking kilns and mesh trays to elevate the fish off the ground can reduce these losses significantly, resulting in greater food security for consumers and increased incomes for processors and traders.
The post-harvest sector is also important for the poor in terms of employment, with the ratio of fishers to people employed in the post-harvest sector generally estimated at approximately 1:3. Small-scale, labour-intensive processing of fish products can greatly increase the contribution of fish production to the local economy, particularly where processing and trading facilities are locally-owned and labour rights are strong. There is also a strong gender aspect to fish-based livelihood activities, with women heavily involved in post-harvest processing and marketing, making the post-harvest sector an important one for strengthening women’s livelihoods.

F. Conclusion
Throughout the developing world, the fisheries sector provides the basis for the livelihoods and nutrition of millions of people, and constitutes a significant source of foreign exchange for many developing economies. Despite its considerable contributions to development, however, it is often not seen as a priority sector by policy makers or donor agencies, and activities such as aquaculture are frequently seen as relatively low-priority for the allocation of scarce resources such as water. This lack of attention to the sector is particularly problematic given that capture fisheries are currently being fished at capacity, and that further increases in production will have to come from expansion of aquaculture. There is, therefore, an important role for developing country governments to play, both in managing capture fisheries to prevent further stock depletion, and in regulating the development of aquaculture to ensure that it is both environmentally sustainable and pro-poor. Under such conditions, fisheries and aquaculture can realise their potential as an important and growing source of economic development in rural areas.

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6.3.23 Regulation for Development in the Fisheries and Aquaculture Sector

A. Need for Fisheries and Aquaculture Management

A.1 Fisheries make essential contributions to human well-being, providing basic food supplies, employment, livelihoods, recreational opportunities, sources of foreign currency or recreational opportunities for hundreds of millions of people (Cochrane et al., 2009). They are an integral component of communities and societies almost wherever humans have access to water bodies: oceans, seas, lakes and rivers. So far, so good, but a problem arises because, in addition to providing benefits for society, fisheries also have negative impacts which, if not sufficiently controlled, can not only destroy or diminish the benefits they provide but also lead to damage to the ecosystem with resulting negative impacts on other important goods and services for humans, including the conservation value of the ecosystems.
A.2  Fisheries management is the process that has evolved to ensure that fisheries operate in a manner that not only provides the immediate benefits but also does not result in excessive or irreversible damage to the exploited fish stocks or the diversity, integrity and structure of the ecosystem, so that the stocks and ecosystem will continue to provide the full range of benefits in the future. Fisheries management has been successful in some cases but it has become widely recognised in recent decades that there have also been many, many cases of failure. As a result, there is global concern about the state of most aquatic ecosystems and their ability to continue to provide benefits, not least the production of fish for human use.

A.3  There are many reasons for this widespread problem, including amongst others: scientific uncertainty; an inherent conflict between short-term social and economic needs and goals and the longer-term need for sustainability; poor management practices in the past, particularly the absence of long-term rights and failing to ensure that stakeholders participate in management; insufficient capacity within the management agencies and others.

A.4  Cochrane et al. (2009) outline the following key principles to serve to focus attention on the starting points for effective fisheries management:

1. The fishing sector consists of a number of dynamic components, also commonly interacting with other sectors through the ecosystem and biological resources, the stakeholders and the market. The overall evolution of the sector and its components is therefore hard to predict in the long term.

2. Fish stocks and communities are finite and biological production constrains the potential yield from a fishery.

3. Biological production of a stock is a function of the size and structure of the stock and of the ecological environment with which it interacts and is influenced by natural and human-induced changes in this environment.

4. Human consumptive demands on fish resources are fundamentally in conflict with the constraint of maintaining a suitably low risk to the resource. Further, modern technology provides humans with the means, and demand for its benefits provides the motivation to extract fish biomass at rates much higher than it can be produced.

5. In a multi-species fishery, which description encompasses almost all fisheries, it is impossible to maximise or optimise the yield from all species or stocks simultaneously.

6. Uncertainty pervades fisheries management and hinders informed decision-making. The greater the uncertainty, the more conservative should be the approach (i.e. as uncertainty increases, realised yield as a proportion of estimated maximum average yield should be decreased).

7. The short-term dependency of society on a fishery will determine the relative priority of the immediate social and/or economic goals in relation to the longer-term goal of sustainable utilisation.

8. A sense of security of tenure and a long-term stake in the resource for those (individuals, communities or groups) with access ought to be most conducive to maintaining responsible fisheries.

9. Genuine participation in the management process by fully informed stakeholders is consistent with the democratic principle, facilitates identification
of acceptable management systems and encourages compliance with laws and regulations.

A.5 In keeping with the integrated nature of fisheries ecosystems, these principles cannot be seen in isolation in considering how best to manage fisheries: their implications and consequences overlap, complement and confound each other, which is what makes fisheries management so demanding and challenging.

Figure 59: The hierarchical relationships between the different intentions (policy, goals and objectives), standards (reference points and indicators) and actions (management measures). Collectively these make up the management strategy and would be described in the management plan (Cochrane et al., 2009)
Figure 60: Historical and present-day perspectives on biological and ecological parameters and information of relevance for the sustainable management of aquatic natural resources (Cochrane et al., 2009).

NOTE The time axis moves from the past (left) to the present. In the early years of fishery science, the information used was catch and effort with no biological or ecological components. As dynamic pool models developed, a few biological parameters shown lower left were applied. Awareness and understanding of the need for more detailed information has resulted in a much wider range of data being necessary for management (boxes on the right).

A.6 Figure 22 illustrates a hypothetical coastal area in which several property-rights regimes are found together. On the coast is a private aquaculture area, next to a fishing territory controlled by a village. The coastal fishery within the territorial sea (up to 12 miles) and the offshore fishery in the Exclusive Economic Zone (EEZ usually up to 200 miles) are under state property. Beyond the EEZ there may be an international regime in force on the high seas, but the area may have many of the characteristics of an open-access situation with fishing fleets opportunistically targeting resources that acquire high market value. Resources may be effectively open-access within the territorial sea and the EEZ as well, if the state is unable to enforce its regulations, a common situation in many developing countries. The private and the communal areas may both be mixed regimes, as it is the state that normally leases aquaculture areas and enables a community to control its fishing area, as in co-management.

Although the example is hypothetical, many coastal areas in fact have co-existing and overlapping property-rights regimes. Resource managers cannot function effectively unless they know the property-rights regimes they are dealing with, and the implications of each with respect to dealing with the ‘tragedy of the commons’.
A.7 The term management, which carries implications of domination of nature, can be updated to highlight governance, social relationships, adaptation and the maintenance of the productive potential of the ecosystem. Most of the objectives commonly stated for fisheries management fall into three categories. One set relates to resource sustainability, ensuring that the biological productive capacity of the resource is maintained. The other two sets are social and economic, and relate either to the optimization of returns from the fishery (efficiency) or to the fair distribution of those returns among stakeholders (equity). Some 22 fishery objectives are recognized (Table 13) relating to sustainability (six of them), efficiency (twelve) and equity (eight) (Cochrane et al., 2009). Any of these objectives may be a valid goal for a fishery, but it is not possible to achieve them all for a single fishery. Some of the objectives are incompatible with one another. For example, management can aim to maximize the biological yield or the economic yield but not both.

Figure 61: Different property-rights regimes in a coastal area
Table 37: Some objectives of fishery management

<table>
<thead>
<tr>
<th>Objective</th>
<th>Main purpose</th>
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<tbody>
<tr>
<td>1. Maximize catches</td>
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<tr>
<td>2. Maximize profit</td>
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<tr>
<td>3. Conserve fish stocks</td>
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<td>4. Stabilize stock levels</td>
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<td>5. Stabilize catch rates</td>
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<tr>
<td>6. Maintain healthy ecosystem</td>
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<tr>
<td>7. Provide employment</td>
<td></td>
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<tr>
<td>8. Increase fisher’s incomes</td>
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<tr>
<td>9. Reduce conflicts among fisher groups or with non-fishery</td>
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<tr>
<td>stakeholders</td>
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</tr>
<tr>
<td>10. Protect sports fisheries</td>
<td></td>
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<tr>
<td>11. Improve quality of fish</td>
<td></td>
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<tr>
<td>12. Prevent waste of fish</td>
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<tr>
<td>13. Maintain low consumer prices</td>
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<tr>
<td>14. Increase cost-effectiveness</td>
<td></td>
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<tr>
<td>15. Increase women’s participation</td>
<td></td>
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<tr>
<td>16. Reserve resource for local fishers</td>
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<tr>
<td>17. Reduce overcapacity</td>
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<tr>
<td>18. Exploit under-utilized stocks</td>
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<tr>
<td>19. Increase fish exports</td>
<td></td>
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<tr>
<td>20. Improve foreign relations</td>
<td></td>
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<tr>
<td>21. Increase foreign exchange</td>
<td></td>
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<tr>
<td>22. Provide government revenue</td>
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</tbody>
</table>

B. Legal and Institutional Considerations

B.1 The fisheries law facilitates and supports fisheries management by implementing the general fisheries policy, defines the scope of its application and establishes institutional mechanisms for fisheries management. It also defines management responsibilities, recognises and regulates the interests of fishers and other stakeholders and the relationship between them to facilitate the attainment of fisheries management objectives. The ultimate purpose of fisheries law is to guarantee that the terms and conditions under which fisheries are managed and the mechanisms that regulate conflict are enforced. The latter is guaranteed through established processes for compliance and enforcement of assigned rights and duties in a judicial or other forum, for example, courts or administrative enforcement mechanisms or processes.

B.2 Matters Typically Addressed by Principal Fisheries Legislation

(a) Objectives – States general development policies and management objectives of policies and the law.

(b) Definitions – Defines terms and phrases used to assist in interpretation and application of the law.

(c) Scope – Defines the extent of application of law [including extraterritorial applications, e.g., to nationals or persons within the territory, fisheries waters or types of fisheries.]
(d) **Administrative and management institutional framework** – Establishes or designates the public management authority, executive head and staff, boards, committees, etc. and their powers and functions.

(e) **Management approaches, principles and planning** – Stipulates specific management aspirations or management approaches, guidelines, management plans including formulation, content and endorsement. A different or specific fishery that is to be managed and the approach to be used may also be described.

(f) **Statement of general fishing access and entitlements** – Sets out the prerequisites for fishing and the persons or groups of persons who can participate in fisheries, e.g., nationals, locally based foreign operators/vessels or foreign vessels.

(g) **Management tools and related processes** – Establishes and describes the management tools to be utilised for regulating input and output, such as concessions, licences and other authorisations, fishing rights, quotas including individual transferable quotas and spatial and temporal limits.

(h) **Monitoring, Control and Surveillance (MCS)† (Bio-economic and enforcement information requirements)** – Establishes and defines the MCS schemes and tools including scientific observer programmes and inspection schemes, procedures, powers and rights, for example, rights of observers or inspectors to access all parts of the vessel and stop, board and inspect vessels.

(i) **Prohibitions, violations and sanctions and enforcement processes** – Creates or describes prohibitions and violations, the administrative or criminal enforcement process to deal with violations including evidentiary provisions. This part of the law also establishes and describes sanctions for violations.

(j) **Alternative approaches to management** – Establishes the ability for the State or management authority to delegate, devolve or enter partnership or cooperative arrangements for management or to engage in other management approaches as appropriate.

(k) **Regulations** – Sets out requirements including standards, restrictions, procedures etc. that are too elaborate to be stated in principal legislation but are required for implementation of the principal law.

**B.3 National Fisheries and Related Legislation**

Fisheries law, primarily as a body of national or domestic laws, is unique to the country or territorial subdivision within which the law applies. The manner in which the law is elaborated, interpreted and applied is subject to the country's legal and judicial system (e.g. civil or common law) as shaped by the governance framework and the country's legal history, philosophy, case law and customs.

Managers should be familiar with the principal sources of law they administer and where their management powers and functions come from. As a minimum, managers should know the fundamental elements of the principal fisheries legislation and appreciate that other laws that govern other sectors, to the extent that they operationally impact on any aspect of fisheries, are also considered part of the fisheries legal framework. Managers must then work within the ambit of that framework. Fisheries managers should be aware of a 'non-fisheries-specific' category of laws that govern other sectors but indirectly impact on fisheries such as fundamental laws (e.g. the Constitution) and laws on local government or decentralisation, shipping, veterinary, customs and excise, environment and conservation, health (food safety
and quality), trade and commerce. A basic awareness of these laws will facilitate the identification of the person or office within the other sector's regulatory authority that should be consulted on operational matters. In some instances, the manager is clearly instructed by the primary fisheries law to ensure that certain management interventions are consistent with other laws.

**B.4 International Instruments**

**B.4.1** A plethora of international instruments in capture fisheries addressing various fisheries management issues have emerged in the last two decades. Binding instruments include:


(b) Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessel on the High Seas


**B.4.2** The LOS Convention, often referred to as the constitution for the oceans, codifies customary international law of the sea and lays the foundation for all subsequent international arrangements and agreements relating to the use of the oceans and seas. Arising directly from the LOS Convention and designed to strengthen its provisions on high seas fisheries and transboundary stocks is the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement) and the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement).

**B.4.3** The influence exerted by binding fisheries instruments on national policies and legislation is remarkably visible. For example, in anticipation of entry into force of the LOS Convention, many coastal states enacted national legislation claiming 200 nautical miles exclusive economic zones (EEZs). As a consequence of Article 73 of the LOS Convention, there is a growing trend to limit sanctions against the crew of foreign fishing vessels found in contravention of the coastal state’s fisheries-specific laws in the EEZ to monetary and non-custodial sanctions in the absence of an agreement to the contrary between the states concerned. Coastal states now require vessels flying their flags, including those operating on the high seas, to be licensed and subjected to conditions set out in the Compliance Agreement and the UN Fish Stocks Agreement.

**B.4.4** A non-binding fisheries instrument of global significance is the FAO Code of Conduct. Although a voluntary instrument, the FAO Code of Conduct is of high value. It is implemented in numerous policy documents and national legislation. The FAO Code of Conduct, in issuing guidelines on areas where legislation is required for promoting responsible fisheries, is useful in policy and legislative development. The international plans of action (IPOA) developed under the auspices of the Food and Agriculture Organization of the United Nations (FAO) to implement certain aspects of the FAO Code of Conduct are similarly useful. The International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU) warrants special mention. The IPOA-IUU contains valuable guidelines for legislative implementation particularly in MCS. An increasing number of states have adopted National Plans of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated fishing (NPOA-IUU) modelled on the IPOA-IUU.
B.5 Relationship between International and National Fisheries Legal Frameworks

International law and international fisheries instruments are vital to fisheries management as they reflect state commitments to recognised conservation and management doctrines, standards, rights and best practices (Figure 23). The manager is required to develop sufficient familiarity with international binding and voluntary instruments concerning fisheries to ensure their effective translation and application at the domestic level. This is necessitated by the often overlooked fact that international law and commitments by states as stipulated in conventions and agreements may bind states, but in many instances they will not be applied or enforced domestically against natural or juridical persons unless they are reflected in ‘enabling legislation’. For example, the requirement of a state party to the Compliance Agreement to record and license vessels flying its flag cannot be imposed on the owners or operators of such vessels unless there is in place national legislation that has the same requirement. Domestic enabling legislation is vital for non-binding instruments, such as the FAO Code of Conduct and IPOAs, as national legislation can translate the calls for voluntary action into legal requirements by enforcing rights and responsibilities and sanctioning non-compliance.

Figure 62: Representation of a typical national fisheries legal framework showing the relationship between international, non-fisheries-specific and fisheries-specific law.

B.6 Regional Fisheries Entities and Arrangements

Regional fisheries bodies (RFBs) and regional fisheries management organizations (RFMOs) and arrangements, to the extent allowed by their constitutions, have important institutional, advisory, regulatory and coordinating functions in fisheries management. These entities are the principal medium for multilateral cooperation for the management of shared resources as mandated by the LOS Convention and reinforced in the UN Fish Stocks Agreement, the Compliance Agreement, the FAO Code of Conduct, the IPOA-IUU and other binding and non-binding fisheries instruments. The management, regulatory or coordination regimes of these entities are often pragmatic and are of immediate relevance to state parties in terms of how management advice, measures and regulations are tailored to the region concerned. This in
turn often translates into efficient domestic implementation or enforcement of management measures, regulations or advice. The documented growing role of RFBs in preventing, deterring and eliminating IUU fishing clearly underlines the significance of their contribution to global fisheries management.

As a result of the duty for states to cooperate through RFBs, RFMOs and arrangements and the increasing role and involvement of RFBs in combating IUU fishing, more countries than in the past will become members of one or more regional bodies, including RFMOs, such as the various tuna bodies (e.g. the Indian Ocean Tuna Commission (IOTC)). Managers must be aware of the RFMOs or RFBs in which their country is involved, and the implications and obligations of membership or in becoming a ‘cooperating non-party’ particularly where the RFMO or RFB has the competence to adopt binding decisions.

C. Fisheries Management Approaches and Tools

Typically, the approaches or tools that can be used to manage fisheries are determined or restricted to those set out in the fisheries legislation as outlined below:

C.1 Fishery Plans: Many countries have embraced the management planning approach in regulating and managing fisheries by requiring the development of fishery plans in fisheries legislation. The manager should determine whether the law requires general (national) plans or specific fishery plans to be developed. The manager should also be familiar with the process for development and promulgation of the fishery plan, any mandatory elements of the plan, the legal status of such plans and their implementation, enforcement and review requirements. Examples of matters that can be regulated include the following:

(a) measures for the conservation, management, development, licensing and regulation of fisheries or any particular fishery, including total allowable catch and quota system as appropriate

(b) licensing any vessel or class or category of vessels to be used for fishing and related activities or any other purpose

(c) licensing or registration of fishing gear and other equipment or devices used for fishing

(d) types and sizes of fishing gears and other fishing devices including the sizes of fishing nets that may be used for fishing, where they may be used and prohibited fishing nets

(e) manufacture, importation and sale of fishing nets

(f) landing requirements for any vessel or class or category of vessel or licence

(g) catching, loading, landing, handling, transhipping, transporting, possession and disposal of fish

(h) tuna fishing or fishing for any specified species of fish

(i) importation, export, distribution and marketing of fish and fish products

(j) licensing, control and use of fish aggregating devices, and, the rights to the aggregated fish and prescribing times and the minimum distance from such devices to for fishing
(k) standards and measures for the safety of fishers
(l) matters relating to satellite monitoring of fishing activities
(m) aquaculture
(n) recreational fishing
(o) canoe fishing including markings and identity of canoes
(p) the provision of statistical and other information related to fisheries
(q) control, inspection or operation of fish processing establishments
(r) returns concerning fishing operations required to be submitted by licensees
(s) licences and logbooks to be carried on board motor fishing vessels
(t) further conditions for fishing licences
(u) conditions for the approval of charter agreements
(v) general matters for the achievement of the purposes of the principal fisheries legislation

C.2 Effort and Catch Management: The regulation of effort would most likely be achieved through the implementation of an authorisation (licensing or permitting) system. Many jurisdictions require in their fisheries laws that no person shall engage in fishing without a concession or an authorisation in a form of licence or permit issued in accordance with the fisheries law with effort control measures such as gear restrictions, fishing day limits and spatial restrictions in order to achieve better results in managing effort.

The typical catch management measure, the total allowable catch (TAC), is often prescribed in the fisheries law. For certain stocks, such as highly migratory tuna stocks, the requirement to specify the TAC is required by the LOS Convention and is restated in the national fisheries law as a matter of course. The only difference between the broad international commitment for setting the TAC stated in the LOS Convention and the requirements relating to TAC in national legislation is that the latter would normally elaborate how the TAC would be determined and allocated as fishing entitlements by the state.

At the multilateral and regional level, the RFMO that has been accorded the appropriate competencies by its members would be the authority that determines and allocates TAC entitlements. Many jurisdictions, particularly those employing quota management systems, would naturally have a requirement in the law for setting the TAC for a fishery.

C.3 Fishing Rights: Legally, a ‘right’ is the ability of the claimants to call upon others without such claims to acknowledge their duty to honour the claim, with any violation of such a duty sanctioned by the state or by an authority. It is ‘a capacity . . . of controlling, with the assent and assistance of the State, the actions of the others.’ The licence or permit to fish is one form of right while a TAC allocation as a quota is another form. An individual transferable quota (ITQ) is at the end of the spectrum which has more rights or valuable characteristics often referred to as ‘property rights’ as it possesses the elements of exclusivity – the ability to hold and manage the right without outside interference; duration, from long term to perpetuity as appropriate; security of tenure – the ability to withstand challenges of others to the title; and transferability, with varying degrees of restriction on transferees.
C.4 Use of Technical Measures: Two categories exist: (a) 'prohibitions' category, e.g., the use of explosives or toxic substances to take fish or the taking of fish using spear guns and electric shocks, or the taking of protected species are prohibited; (b) subsidiary legislation (regulations, decrees, by-laws or administrative orders) to regulate the use of, for example, fishing gear such as nets and vessels and their specifications including the requirements or conditions relating to the taking of certain species and temporal and spatial closures and conditions that apply to these closures.

C.5 Participatory or Partnership Management: Fisheries resources being res communes (of the public domain) are vested in the state and its agents to be regulated for the public good, meaning that law and institutional structures, were not designed historically to support partnerships or co-management. Thus partnerships, co-management arrangements and other forms of participatory management systems must have a legal basis. Co-management must be unhindered, enabled and supported by the fisheries legal framework so that rights and responsibilities, including decision-making for the management of common pool resources, are redistributed, protected and enforced.

Figure 63: Levels of Partnership Arrangements That Can be Legislated

The illustration of the levels of co-management in Figure 24 shows the varying degrees of partnership arrangements that exist. The legal framework is not likely to expressly label that which is essentially a cooperative arrangement as a 'partnership', particularly where such arrangements do not involve substantive management interventions. The prevailing practice indicates that the legal frameworks for co-management arrangements are largely 'framework' laws in that they primarily enable the use of co-management by vesting powers in the manager to use co-management where appropriate. These framework laws for co-management set out the basic essentials to provide for

(a) the designation of the co-management unit (e.g. fisher or other stakeholder groups);

(b) choice in demarcation of areas or fisheries for co-management;
(c) allocation of the mandate or such rights and responsibilities as are required for an effective co-management arrangement;

(d) elaborated regulatory framework governing behaviour and relations between various partners in the co-management arrangements and between designated co-management units;

(e) avenues for enforcement of rights and responsibilities and conflict resolution.

It is worth restating here that the manager should appreciate his or her role in the management or support of the prescribed or designated co-management system to ensure that it is well-coordinated and functions in an efficient manner.

D. Fishing Access Agreements

Many developing country coastal states with vast EEZs assign, under bilateral or multilateral access agreements, access rights to fish for foreign fishing vessels. Such agreements should contain the following essential elements:

(a) Provision of fisheries access, related activities and such other matters as are provided for by the fisheries legislation

(b) The granting of preferential access to vessels of certain countries or groups of countries

(c) The requirement that fishery allocations under the agreements do not exceed a level consistent with the conservation and management of fishery resources and the protection of fishing by citizens of the State and must be consistent with all fishery management plans

(d) The requirement to implement minimum terms and conditions of fisheries access as agreed from time to time including:

(1) establishing the responsibility of the foreign party to take all measures necessary to ensure compliance by its vessels with the terms and conditions of the access agreement and with all applicable laws;

(2) requiring the operator or any other person responsible for the operation of a licensed vessel not to tranship fish at sea whether or not such transhipment is done within areas under national jurisdiction or on the high seas, and only tranship through designated ports or as provided by the access agreement;

(3) requiring the operator or any other person responsible for the operation of a licensed vessel to ensure compliance with requirements relating to:

   (i) the appointment of a resident local agent;

   (ii) the placement of observers;

   (iii) reporting requirements as to entry into and exit from the State waters;

   (iv) the maintenance of catch figures and log books;
(v) the provision of data and information;
(vi) the imposition of any other control required by law or necessary for the proper management or conservation of any fishery.

(e) The issuing of licences for fishing and related activities, and for any matter provided for under the fisheries legislation

(f) Requiring such other matters as may be necessary for the effective implementation of the access agreement

E. Monitoring, Control and Surveillance

E.1 MCS and the Law: The fisheries law fulfils the following basic functions in relation to MCS:

(a) defines the powers, duties and obligations of the management authority especially in regulating entry and the behaviour of persons engaged in the fishery (e.g. prohibiting certain activities, requiring that other activities be undertaken only under the authority of a licence, and prescribing the manner in which fishing and related activities must be conducted);

(b) establishes or designates the competent entity for MCS including the fisheries monitoring centre;

(c) designates or provides a mechanism for the designation of observers and enforcement officers;

(d) provides the basis for developing MCS plans and implementing various MCS tools, for example, vessel monitoring systems (VMS);

(e) protects the interests of fishers (e.g. confidentiality of information);

(f) grants enforcement powers to officials (e.g. to arrest, detain and seize);

(g) safeguards basic civil rights of alleged wrongdoers in enforcement action; and

(h) establishes the judicial or alternative enforcement system for penalising those who violate fisheries rules, the procedures in that enforcement system and the applicable sanctions.

The manager is essential to the process of identifying weaknesses or gaps in the management and MCS with a view to rectifying them.

E.2 Fisheries Management and MCS in the Fisheries Legal Framework: The need to have information on the behaviour and consequences of the behaviour of fishers and other stakeholders in a fishery, so that appropriate management action or the review thereof can be undertaken, is the core incentive for MCS interventions. The actions to furnish information can be set in motion prior to, during and after fishing operations. The means to procure the kind of information required (e.g. inspections, at-sea monitoring by observers or VMS surveillance) is by and large facilitated by the fisheries law. The manager should be sure to adhere to rules protecting the rights of the person providing information (e.g. ensuring confidentiality). Where enforcement becomes necessary, the fisheries law enables the enforcement authority to utilise available information or gather specific information (e.g. evidence of contraventions) to support enforcement action.
E.3 Participatory Management and MCS: Co-management and other participatory management systems could contemplate an MCS role for the co-management unit or participants. For the reasons elaborated above relating to the nature and implications of MCS interventions, it is vital that any MCS responsibility envisaged for the co-management unit be sanctioned by law. Compliance and enforcement functions for co-management units, particularly those that rely heavily on self-regulation, may not be provided for in the law, as the primary focus of such participatory management systems would be on voluntary compliance, but this is not necessarily true in all cases.

E.4 Vessel Monitoring Systems: VMS like other modern monitoring and near-real-time information systems is a relatively new technology in the MCS toolbox not fully utilized by most developing countries. Among the essential components for the regulatory framework for implementing VMS are:

(a) the enabling power of the FMA to introduce and implement VMS as an MCS tool;
(b) the VMS components and technical standards or specifications for the components;
(c) the rights and responsibilities of the FMA in managing the VMS system and the persons required to implement VMS;
(d) the ownership and the primary and secondary uses of VMS information;
(e) the requirements and specifications for ensuring confidentiality and security of information;
(f) the rules for ensuring efficient operation, maintenance and operational performance of VMS components supported by enforcement and sanctions against violations;
(g) the use of VMS information as evidence in a court of law.

The further use of existing VMS policy or MCS plans which will define how VMS will be used to achieve the objectives set out in such plans, or the formulation of new VMS policies and MCS plans, would greatly assist the development of such a regulatory framework.

E.5 Enforcement: The rules governing enforcement for non-compliance or contraventions of fisheries laws are usually precise. Strict adherence by enforcement officers to these rules, which should be broad enough to enable enforcement officers to carry out their duties but sufficiently strict to protect fishers against the abuse of power, is crucial. Initial enforcement actions such as boarding and inspection on suspicion of contraventions, collecting evidentiary material, directing an alleged offending vessel to port and fixing a bond or security for prompt release of a foreign fishing vessel and its crew are typically located in the principal fisheries legislation. In many developing countries, utilisation of existing enforcement agencies through cross-authorisation to enforce another sector’s law and close collaboration between law enforcement agencies ensures sensible utilisation of scarce resources. Ensuring where possible that there is standard or joint training of fisheries and ordinary law enforcement officers, coordinated exercises and cooperation between the management authority and other law enforcement agencies is essential for effective MCS.

E.6 IUU fishing: IUU fishing as defined in the IPOA-IUU is essentially a description of the problems that MCS and its supporting legal framework are set up to address. The ‘illegal’ and ‘unreported’ problems are typical aspects of the IUU fishing problem – the terms, fundamentally, refer to situations where regulatory regimes exist and apply to the persons involved in the activities, but the persons who commit the ‘unlawful’ or ‘unreported’ acts deliberately choose to ignore the applicable rules. The compliance and enforcement
components of MCS deal with these first two aspects of the IUU fishing problem. The ‘unregulated’ aspect of IUU fishing basically means that there is no regime governing the fisheries (i.e. there are no conservation or management measures in place) or a specific behaviour and therefore compliance and enforcement rules cannot be invoked. The IPOA-IUU and its related technical guidelines are a manager’s essential guidebooks on MCS. They present a wide range of MCS options including legal options to tackle the IUU fishing problem and are indispensable tools to the manager in fulfilling their MCS mandate.

**E.7 Port States Measures:** The use of Port State Measures (PSM) to complement other means to fight IUU fishing is becoming increasingly crucial. PSM are considered effective weapons against IUU fishing due to the fact that ports lie wholly within a state’s territory and general international law recognises that a state has wide discretion over what happens in its ports. PSM may include denial of access to ports or use of port facilities, refusal of permission to land or tranship catch and inspections to ensure that catches have been taken in accordance with applicable conservation and management measures.

**F. Regulation of Fishing Gears and Methods**

**F.1 The need for fisheries management arises as the surplus production from fish stocks is overtaken by the catching capacity of fishing fleets.** Catching capacity is the product of the fishing effort and the combined efficiency of the fishing gear and the fishing vessel (e.g. loading capacity, engine power, range capacity, fish finding and navigational equipment), as well as the skills of the crew.

**F.2 Fishing gears**

**F.2.1 The Ideal Fishing Gear:** Some criteria for the ideal fishing gear could be:

(i) highly selective for the target species and sizes, with negligible direct or indirect impact on non-target species, sizes and habitats;

(ii) effective, giving high catches of target species at lowest possible cost;

(iii) quality orientated, producing catches of high quality

**F.2.2 Classification of Fishing Gears:** Fishing gears are commonly classified in two main categories: passive and active. This classification is based on the relative behaviour of the target species and the fishing gear. With passive gears, the capture of fish is generally based on the movement of the target species towards the gear (e.g. traps), while with active gears capture is generally based on an aimed chase of the target species (e.g. trawls, dredges). A parallel on land would be the difference between the trapping of and hunting for animals.

**G. Area and Time Restrictions**

**G.1 Defining Area and Time Restrictions**

Practitioners refer to area closures (whether temporary, seasonal or permanent) by various names, each of which may have a particular formal definition, depending on the legislative or cultural context. Of these various terms, however, ‘Marine Protected Area’ is, perhaps, the most widely used. The International Union for Conservation of Nature (IUCN) defines a Marine Protected Area (MPA) as

Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment. Other jurisdictions define an MPA as:

an area of the sea . . . (that) has been designated . . . for special protection for one or more of the following reasons:
(a) the conservation and protection of commercial and non-commercial fishery resources, including marine mammals, and their habitats;
(b) the conservation and protection of endangered or threatened marine species, and their habitats;
(c) the conservation and protection of unique habitats;
(d) the conservation and protection of marine areas of high biodiversity or biological productivity; and
(e) the conservation and protection of any other marine resource or habitat.

The objectives for establishing area or time restrictions may be placed into three broad categories:

1. Fisheries management issues
2. Broader conservation considerations
3. Equity issues.

G.2 As a fishery-management measure

States should prevent overfishing and excess fleet capacity and should implement management measures to ensure that fishing effort is commensurate with the productive capacity of the fishery resources and their sustainable utilization. Area and time restrictions can help in achieving these objectives in the following ways:

1. Limiting harvest of specific life stages: Often it is desirable to prevent fishing on particular stages of a species life cycle that are especially vulnerable to capture or are critical to overall production. One example is of species that aggregate in particular areas to spawn. There might also be a need to protect areas where juveniles live. Fishing for the adults in an area with a high proportion of juveniles may lead to high juvenile bycatch that fishers cannot land for legal or practical reasons. Closing the area would allow those fish to grow and contribute to the landed catch in later years. Closed seasons, for example, are most often used for fast-growing species with a short recruitment period, such as prawns and shrimps. In fisheries for such species, closing the fishery early in the season allows individuals to grow to larger and more valuable sizes.

2. Protecting depleted stocks and their habitats during the rebuilding phase of a fishery: If a fishery has collapsed, or is close to collapse, the action one must take to allow the stock to rebuild is likely to be severe, including a total ban on fishing or in some circumstances, allowing fishing in some areas but preventing it in those that are critical to the rebuilding.

3. Protecting genetic reservoirs: Protected areas to help preserve genetically diverse sub-populations may in some settings provide insurance against such possibilities.

4. Protecting habitat that is critical for the sustainability of fished populations: Some types of fishing gear can have large negative effects on benthic (sea, lake or riverbed) habitat that may be important for the sustainability of fished populations. Often such habitats will be inshore, where juvenile fish aggregate in areas with high physical structure such as seagrass beds or mangroves. Article 6.8 of the FAO Code of Conduct makes specific reference to protecting such critical fisheries habitat as a guiding principle for responsible fisheries.

5. To restrain excess fleet capacity and optimise the value of the catch: When there is excess fishing capacity, a short, properly chosen fishing season can prevent overexploitation of the stocks. With this approach, choosing the right time to open the fishery can have a big effect.
G.3 As a wider conservation measure

1. Protecting benthic habitats of high conservation value: management measures should provide that ‘biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected’.

2. Limiting bycatch: In some groundfish fisheries, for example off Alaska, the authorities set closed seasons to minimise bycatch rates or potential effects on marine mammals.

3. Protecting attributes of the ecosystem that are critical for preserving ecosystem services, in particular the provisioning and regulatory services

G.4 To resolve equity issues

1. Providing a mechanism to resolve conflict over multiple use of areas or resources, for example artisanal fishers versus industrial fishers, tourism, shipping and recreational fishing, where the only tractable solution is to restrict activities to certain areas by some form of zoning arrangement, either permanently or seasonally.

2. Reserving valued marine and coastal resources for the preferred use of residents or traditional users: Often indigenous cultures have traditional (and sometimes exclusive) claims on certain lands or resources. Providing exclusive use in an area or season is a way to honour such claims. Similarly, local fishers’ cooperatives or communities might benefit from area-based rights protection.

References

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Tanzania Fisheries Sector Development Programme (MLFD, 2010)

Review of Fisheries and Aquaculture Development Potentials in Georgia (Khavtasi, 2010)

A Fishery Manager’s Guidebook (Cochrane et al., 2009)

A Model Strategic Framework for Prioritization and Development of Inland Water Bodies under Fisheries and Aquaculture (Roy, 2015)

6.3.24 The Case for an Enhanced Regional Fish Trade Framework

A. Introduction

Cocker (2014) reports that fish and fishery products are important to Africa in dietary terms and also add substantially to national and regional economies through employment (Africa has 4 million fishers) and generate much needed foreign revenue through exports streams. The exports are mainly to developed nations (high value fish exports from Africa generated USD$5 billion in 2009, 5% of the global total). Fish are Africa’s leading agricultural export commodity above those such as coffee and bananas. Currently, the continent is a net importer of fish and fish products in order to supply the demand from rising populations, increasing urbanization and the continued economic growth Africa has seen over the past decade. Recent estimates for the continent put intra-African fish trade at approximately US$615million (a significant underestimate as a major factor is the high level of informal, often illegal fish trade within Africa). Aquaculture in Africa, particularly sub-Saharan Africa (SSA), has been viewed with renewed interest in recent years as a means of alleviating the supply gap which is currently filled by imports.
Aquaculture in SSA has been viewed with renewed interest in recent years and in some regions is expanding rapidly. Over time, it is therefore expected to develop and supply a substantial proportion of national/regional markets, thus reducing pressures on capture fisheries and SSAs reliance on imports. There is now a real drive to steer efforts away from earlier subsistence and production-led strategies and focus on best strategies for meeting market demand. Issues such as the minimization of post-harvest losses and ensuring the quality of product for consumers are equally important for growing an effective production sector. SSA also has the potential to supply inter-continental markets with high value, quality and safe aquaculture products (as it does now with capture fishery exports), complying with the phytosanitary, traceability and certification demands insisted upon by developed markets such as the EU.

**B. Opportunities for Growth of Aquaculture and Fisheries Trade**

Future fish production must be able to supply a quality product to the market in a timely manner, whether these are local, regional or international. As markets for fish farmers could be dualistic i.e. to supply local, community markets for instance and/or larger, more demanding foreign, importing customers such as supermarkets (demanding in terms of food hygiene standards, traceability and often certification requests), this could either be achieved through larger ventures or cooperative assemblages of small producers or a combination of both, instigating codes of practice and standards that ensure compliance with phytosanitary and traceability issues.

![Figure 64: Dualities in Fish Supply Chains in Developing Countries (Cocker, 2014)](image)

Increased supply and quality would enable the establishment of new fish market chains, with aquaculture products that by their very nature can be differentiated from wild caught counterparts in terms of freshness and availability. Improvements in distribution expand the market for producers and enable production volumes to be increased without immediately impacting on local prices. Conversely, up-scaling production results in economies which can allow prices to fall and the market to expand even further as the product becomes affordable to a larger proportion of the population. The more affordable aquaculture products become, the greater the health benefits for poorer consumers who have to spend proportionately more of their available income on food according to Engels Law. For example lower retail prices due to increased aquaculture production have seen per capita fish consumption double in Egypt since 1995.
Factors to be considered for growth of demand for fisheries and aquaculture products in Africa include the following (Cocker, 2014):

(a) Rising domestic and intra-African demand due to growing economies, rising populations, increasing urbanization and depleting wild fish stocks

(b) Dualities in fish quality between fish for domestic consumption and fish destined for export

(c) Fish species familiarity, availability, taste and price are very important marketing issues and paramount purchasing priorities for domestic consumers

(d) Aquaculture products are competing with domestic capture fisheries and foreign imports. There is little or no differentiation between farmed and wild caught fish

(e) Current traditional market chain traders deal with both wild caught and aquaculture production

(f) Domination of small traditional traders dictating prices and distribution particularly for small aquaculture producers who often have no option but to sell their product low down in the market/value chain

(g) Large presence of women as small-scale traders in the traditional fish marketing chains

(h) Large presence of women as small-scale processors in the traditional fish marketing chain

(i) Predominance of traditional retail/open air markets for domestic fish sales

(j) Supermarkets are establishing themselves

(k) Little/limited information dissemination and communication occurs between stakeholders throughout the current traditional fish marketing chains and producers themselves are often ignorant of current market prices and consumer demand trends

(m) Predominance of small-scale aquaculture producers

(n) Current lack of access to formal credit/finance particularly by small-scale producers

(o) Growing presence of medium/large scale aquaculture producers

(q) Little or no direct marketing is undertaken by producers, particularly small producers

(r) Little processing and/or value addition is undertaken by producers, particularly small-scale producers

(s) Poor infrastructure continues to hamper aquaculture production and marketing, including unreliable electricity supplies, cold-chain issues, poor storage facilities and lack of transportation which can all lead to potentially high post-harvest losses in quantity and quality and undermines distribution channel efficiency

(t) Opportunities to satisfy growing market demands in-country in high fish consumption areas for example via urban and peri-urban fish farms and expansion opportunities into geographic areas with lower fish consumption levels

(u) Opportunities for integrating aquaculture with agricultural systems, particularly in small-scale ventures
(v) Opportunities to expand aqua-product distribution to adjacent countries and/or export intra-Africa and/or inter-continentally

C. Fish Trade and Sustainable Development

For many developing countries, the fisheries sector represents a major source of foreign exchange revenue through trade with developed countries and through foreign fishing licence agreements. Fish exports can strengthen income and employment opportunities for local people in domestic fisheries in coastal and inland regions. However, in many countries, policy related to fish trade cannot keep pace with this rapidly growing and evolving sector. Inappropriate policy frameworks put at risk the benefits of increased trade for national development and local communities. Weak governance in the presence of expanding fish trade could aggravate overexploitation of vulnerable fish stocks and diminish access of local markets through traditional trading links and market chains.

Table 38: Factors that Influence the Contribution of Fish Trade to Development in West and Central Africa (FAO, 2007)

<table>
<thead>
<tr>
<th>Historical Context</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• well-established local, national and international fish producing areas, markets and trade routes</td>
<td>• production sources and markets at all levels are subject to unpredictable changes and shocks (e.g. weather, fish stock productivity, market changes)</td>
</tr>
<tr>
<td>• increasing demand for fish across most markets</td>
<td>• risks can be reduced in more diverse trading conditions – e.g. multiple suppliers, stocks, markets, transport options</td>
</tr>
<tr>
<td>• traditional trade between Africa and Europe</td>
<td></td>
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<tr>
<td>• Africa now a key supplier; Europe a key market but changing patterns</td>
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<tr>
<th>Actors</th>
<th>Impacts</th>
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<tbody>
<tr>
<td>• wide range of stakeholders with evolving linkages and market power; usually highly competitive</td>
<td>• contribution to gross domestic product (GDP) and to wider trading options</td>
</tr>
<tr>
<td>• fish trade requires specific business skills and knowledge to deal with changes and manage risk</td>
<td>• local ‘winners’ and ‘losers’ through effects of competition, power and economic redistribution</td>
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<table>
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<tr>
<th>Supply Factors</th>
<th>Regulation</th>
</tr>
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<tbody>
<tr>
<td>• raw material access, post-harvest quality and careful handling of perishable products</td>
<td>• national and international laws; challenges of compliance</td>
</tr>
<tr>
<td>• basic infrastructure: roads, shipping, air transport</td>
<td>• leading role of the World Trade Organization (WTO)</td>
</tr>
<tr>
<td>• adequate and timely flow of information on supply, demand and prices</td>
<td>• erosion of trade preferences for developing countries</td>
</tr>
<tr>
<td></td>
<td>• quality and certification are increasingly important</td>
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<table>
<thead>
<tr>
<th>Trade Mechanisms</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>• selling and buying goods (fish products) and services (fishing services) and adding value to them</td>
<td>• rapidly changing trade patterns: new products, markets,</td>
</tr>
<tr>
<td>• direct and indirect contribution to income, employment, food supply and distribution</td>
<td>• participants and regulations with different impacts on different countries</td>
</tr>
<tr>
<td>• need effective and reliable financial and regulatory mechanisms</td>
<td>• unknown impact of trade expansion on fish resource sustainability in conditions of weak fisheries management</td>
</tr>
<tr>
<td></td>
<td>• wider contexts of change in governance, resource base, skills, human resources and political influence.</td>
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<tr>
<th>Wealth/Profit</th>
<th>Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• attracts entrepreneurial activity and diverse investment at all operational levels</td>
<td>• vital for harnessing fish trade for development by encouraging wealth generation and widening opportunities (e.g. enabling trade and market access)</td>
</tr>
<tr>
<td>• reinvestment of generated income and profit can take place in the sector and the wider economy</td>
<td>• opportunities to use wealth generated for positive development investments in and outside sector</td>
</tr>
<tr>
<td>• potential redistribution benefits through taxation and government investment</td>
<td>• limit negative impacts, manage risks and ensure future opportunity and equitable benefit sharing</td>
</tr>
<tr>
<td>• negative aspects include rent-seeking by individuals/groups; asymmetric information and access to capital</td>
<td></td>
</tr>
</tbody>
</table>
D. Establishing an Enhanced Regional Fish Trade Framework

Within this overall context, there are three major areas in which to identify issues and prioritize policy interventions to maximize the contribution of fish trade to development and minimize potentially negative distributional and sustainability impacts. These cover trade mechanisms, economic and livelihood impacts and trade policy and change management.

Figure 65: Establishing an Enhanced Regional Fish Trade Framework

D.1 Trade Mechanisms: Intra-African Trade

Consumer issues which need to be addressed for trade to take place include:

**Food safety**: primarily based on recognized standards for products, hygiene and processes
The ‘SPS’ and ‘TBT’ Agreements: Forming the basis for nations to establish food and safety regulation for plant and animal products intended for trade.

HACCP: Sanitary control systems are now applied by many importing countries to the whole supply chain, such as the HACCP system.

Traceability: A traceable ‘chain of custody’ is vital in applying SPS and related standards and another major issue to exports.

Certification and Branding: In addition to public regulations of food safety and quality, a range of related standards have been introduced by the private sector. Branding is the independent process through which a company promotes certain quality attributes in order to differentiate a product, process or service from others in the marketplace and generate a preferential purchasing attitude towards that brand/logo, thus create loyalty and premium prices and/or stronger access to specific markets.

BMPs and GAPs: Adoption of Better Management Practices (BMPs) – focusing on environmental and social issues, and Good Aquaculture Practices (GAP) – focusing on food safety aspects.

Numerous barriers exist to intra-African trade including cumbersome import and export procedures, border crossing delays, corruption, limited Information and Communication Technology (ICT) usage, inconsistent electricity supply, lack of storage facilities and infrastructure. Major exporters such as Mauritania and Senegal have overcome some constraints, i.e. domestic supply, by investing in infrastructure and fishing fleets. Other countries still have unrealized fish trade potential (Guinea, Liberia, Sierra Leone).

D.2 Economic and Livelihood Impacts

Fish trade policy in African countries must cope with the dynamic nature of global market opportunities and trade patterns. Declining domestic supplies, rising incomes and changing consumer preferences increase the gap in fish supplies in developed countries. This situation generates new opportunities for developing countries to successfully engage in international fish trade. Studies project an increase in demand in developing countries triggered by increased purchasing power and urbanization. Despite the guidance of international trade theory – indicating that any trade is better than no trade – concerns about increased trade persist, especially in situations where domestic food supplies are potentially threatened. The key question is whether emerging trade in fish with Asia is a threat to local people in Africa or an opportunity for benefits from free-trade and the globalization of fish markets.

The impact of foreign competition on regional and local fish trade in Africa is growing. Small pelagics (sardinellas) — an important fish for human consumption in the region, are traded through three routes: local, national and regional trade based on small-scale fisheries, regional trade from industrial fisheries and international trade based on distant water fleets under fishing agreements. Trade with Asia – particularly China – is increasing. This could affect fish supplies in local markets by reducing the supply of inexpensive fish in local markets. There are concerns that this would have negative impacts on the food security of poor people.

D.3 Trade Policy and Change Management

Fish trade can contribute to development, primarily through the trade mechanism for wealth generation. In turn, wealth contributes to economic growth, for example, through reinvestment in other parts of the economy. In order for this mechanism to function properly, an appropriate policy framework and policy process is required. Policy-making processes for economic development and poverty reduction have often overlooked the fisheries sector and fish trade,
indicating a general weakness in the policy process. Fisheries and trade-related government institutions often lack capacity, finances and support from central government to develop strong policy processes to support the contribution of fish trade to development, evaluate investment options and make appropriate decisions, including investments in new forms of trade.

Trade policy and development-related policies often lack coherence. For instance, while free trade is promoted as a mechanism to generate wealth and economic growth based on empirical evidence from countries such as the ‘Asian Tigers’, there is also concern on the impact of liberalized trade in other countries. Free trade can have a negative impact on the livelihoods of marginalized and poor groups. The key question is whether liberalized trade can be pro-poor under conditions of weak governance and lack of policy coherence. A strategic long-term vision on the role of fish trade, supported by effective fisheries management systems, is needed.

A conflict exists between fish trade policy and fisheries management policy due to trade-offs and limitations of unilateral actions. Often there is a case for limiting fish trade development unless adequate fisheries management systems are in place to offset trade-driven overexploitation. In the short-term, it will be necessary to prioritize certain actions such as limiting trade in overexploited or vulnerable fish stocks.

To fully exploit the potential of fish trade to contribute to development in Africa at all levels, effective implementation of trade and fishery management policies will be decisive. If governance is weak, the ‘losers’ in fish trade are likely to be the poor and marginalized. Fish trade policies and actions which ignore this problem, e.g. by capitalizing on trade liberalization but failing to compensate with other livelihood inputs or opportunities, do not add effectively to pro-poor growth.

Faced with limited information on the fish trade and its economic and social impacts, specific policy prescriptions are inappropriate to the highly varied sectoral and national contexts in West Africa. Given these current information constraints, appropriate policy actions by governments, public and private-sector actors in trade, development and fisheries management can include:

**D.4 Roadmap for Regional Fisheries and Aquaculture**

Priorities include the following:

- Developing sector-wide strategies at national level for expansion and intensification of aquaculture
- Harnessing the opportunities for SME development provided by expanding domestic markets for fish, including growing urban demand
- Harnessing the opportunity of expanding export markets for high-value products to increase investment in African aquaculture production and processing
- Encourage formation of national, sub-regional, regional and international networks for information exchange
- Strengthen producers’ understanding of aquaculture socio-economic aspects (business plan, record keeping, etc.) and assist them with business plans for aquaculture
- Provide public sector support to private entrepreneurs in setting up the technological infrastructure required for aquaculture (e.g. cold chains, storage facilities, etc)
The removal of market barriers through policy reviews, support to small and medium scale aquaculture enterprises to meet market demand and standards, and improving market information systems are crucial. There is now a clear trend towards the establishment of various types of standards that can be measured, monitored and certificated by independent bodies to provide producers with clear guidelines and consumers and market chain participants with confidence in the environmental or social provenance of the product. Certification and quality assurance schemes are needed with brand development and marketing favourable to aquaculture products from smaller producers.

**Figure 66: Aquaculture Markets and Marketing: A Roadmap (Cocker, 2014)**

When it comes to actually aiding and encouraging the marketing of aquaculture production governments should:

- Make available information to producers and consumers through newspapers, newsletters, radio or other ICT media
- Protect local producers against unfair foreign competition (via imports) provided that protective measures are permissible within the international trade conventions/agreements
- Provide basic marketing infrastructure, such as roads and communication channels
- Assist producers in promoting aquaculture products in order to stimulate demand through agricultural fairs and other such opportunities
- Encourage commercial producers to develop market channels which can be accessed by smaller producers
Prepare, publish and regularly monitor guidelines on quality standards of aquatic products to protect public health as well as to improve the acceptability of aqua-products

Aquaculture growth has been (and will continue to be) driven by rising demand from growing and urbanizing populations, stagnating supplies from capture fisheries, investment in education and technology research, a dynamic private sector and high levels of public investment in infrastructure to support agricultural development. By improving production, processing and access to regional and global markets through improved policies and investments infrastructure, quality control, capacity, MISs, and sector management, SSA aquaculture, will see substantial growth and sustainable production.

References
Making Fish Trade Work for Development and Livelihoods in West and Central Africa: Policies Linking Trade to Fisheries Management (FAO, 2007)

6.3.25 Best Practices in Securing and Enforcing of Fisheries Resource Instruments

A. Introduction

Securing and enforcing fisheries resource instruments should attract the same efforts as those put towards securing land-based resources. There are international, regional and subregional fisheries governance instruments which seek to ensure that fisheries resources are sustainably utilized. The effectiveness of these instruments vary across the continent, but for the most part these instruments have issues of improvement.

B. International Fisheries Governance Instruments

B.1 The United Nations Convention on the Law of the Sea in 1982 (UNCLOS, the Convention) and other associated agreements provide an essential framework for establishing a more adequate system of ocean governance. The Convention elaborates a comprehensive regime for governance of the oceans, covering all aspects of ocean space from delimitation to environmental control, scientific research, fishing and other economic and commercial activities, technology and the settlement of disputes relating to ocean matters.

B.2 Exclusive Economic Zone (EEZ): The exclusive economic zone (EEZ), (UNCLOS, Arts. 55-75), was the most significant innovation in relation to the governance of marine fisheries resources in the second half of the twentieth century. By the time the Convention was agreed in 1982, more than 80 coastal States had declared EEZs, mostly of 200 nm. Within this zone, the coastal State enjoys "sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living" (Art. 56). It has the right to set a total allowable catch on the basis of the best scientific evidence available to it (Art. 61). This has established a legal right for coastal States to manage fisheries off their coasts and a framework within which coastal States can effectively limit access to their fisheries.

B.3 Fish Stocks Agreement: In the early 1990s, a consensus among States developed that the general provisions of the Convention requiring cooperation between States in the conservation and management of high seas fisheries resources (Arts. 117-120) needed strengthening. This led to the 1995 Agreement for the Implementation of the Provisions

(i) All States have a duty to ensure that their nationals comply with conservation measures adopted for high seas stocks (UN-LOSC 1982, Art.117).

(ii) On the high seas, States have jurisdiction over vessels flying their flag (UN-LOSC 1982, Arts. 90-98).

The Agreement provides for the establishment of regional fisheries management organizations. The Agreement sets out comprehensive areas in which such an organization will have competence covering scientific research, stock assessment, monitoring, surveillance, control and enforcement (Art. 10). The organization can limit participation by new entrants according to a set of criteria listed in Art. 11.

B.4 **FAO Code of Conduct for Responsible Fishing:** A number of other multilateral agreements further elaborate the evolving set of rules for fisheries governance. The Code of Conduct for Responsible Fishing (1995) inter alia spells out flag State responsibilities for the activities of fishing vessels flying its flag and seeks to advance management measures, by agreement among States, that improve the optimal and sustainable use of fisheries resources. The Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Resolution 15/93) similarly builds on flag State responsibility for fishing vessels flying its flag (Art. III) and operating on the high seas. A range of other global and regional treaties exist that, in some cases, have a direct bearing on the governance of the fisheries sector.

C. **National Fisheries Instruments**

Fisheries regulations focus on sustainable exploitation of fisheries resources and providing wholesome fish food for human consumption. The rules and regulations are embedded into the Fish (Fisheries) Act of each country. Fish trade may be provided for within the specific fisheries regulation or provided as an annex or through a specific Statutory Instrument.

The License is the major statutory instrument used to regulate fish trade by the countries within the region. Some countries use gear selectivity measures and some add on the slot size measures to regulate fish production and control trade in undersized fish. Some fisheries regulations are not specific on trade aspects but generally imply under fishing areas. A few of the countries have detailed specific trade requirements included in the fish quality and safety rules.

The fisheries regulations of the selected countries are at different levels. Some are outdated and hence, with many subsidiary statutory instruments, others are being updated and some are new.

C.1 **Fish and Fisheries Regulations:** An overview of the lists of principle and subsidiary legislations in countries in Sub-Saharan African countries in which the four corridors of the Fish Trade Programme are focused to highlighted in line with earlier study titled *Regional Analysis/Mapping of Certification Procedures and Standards in Africa.*
C.2 Observations on the Fish and Fisheries Regulations: The following observations can be made from the various laws and regulations of the listed Member States:

(1) All Member States have laws and regulations and national institutional structures to enforce the implementation of the laws and regulations. However, the institutional structures are not identical.

(2) The laws and regulations in some Member States (e.g., Burundi, D. R. Congo, Malawi and Sudan) are fairly outdated and cannot seem to have been aligned with current best practices in the governance of fisheries and aquaculture.

(3) Most of the laws and regulations are geared towards regulating the exploitation of the fisheries resources with a view to sustainability. In this respect, the laws provide for:

(i) Maturity of harvest taking into account the growth characteristics of the fish species, the breeding seasons and grow-out characteristics. Some regulations specify timings for closing of the fishing areas to avoid negatively affecting these fish species at these vulnerable seasons.

(ii) The type and nature of equipment to be used for particular target fish species. This includes the types of nets and their mesh sizes and types of fishing vessels.

(iii) Many Member States have regulations detailing the amount of fishing in tonnage which can be extracted from their specific fishing waters. These regulations also specify necessary actions with respect to by-catches and requisite penalties and sanctions for violations.

(4) Most of the laws and regulations do not reflect an ecosystem-based fisheries management approach and thus miss out on important sustainability perspectives.

(5) A number of Member States have progressive laws which define areas to be accessed by artisanal fisher groups by banning foreign access and specifying equipment which can be used in those areas.

(6) Licensing and registration of fishing vessels features in most laws and regulations.

(7) More recent laws and regulations (like those of Zambia) exhibit a coherent consolidation as opposed to outdated laws which are littered with amendments, repeals and subsidiary decrees which are sometimes difficult to comprehend.

(8) Older laws are often at loggerheads with the current trade and integration arrangements of Member States, thus creating barriers to trade and a source of disharmony among Member States.

(9) Some countries, e.g., Angola, Cabo Verde, Mozambique, Namibia, and South Africa, seem to have laws and regulations which are rather comprehensive and can serve as references for other Member States in Africa.

(10) Many African countries have not domesticated the FAO Code of Conduct for Responsible Fisheries.
(11) Some laws and regulations provide for the full value chain while others are only concerned with the fisheries up to the landing points.

(12) Many Member States have not promulgated aquaculture legislation despite this have a high potential to contribute to their fisheries resources, poverty reduction and rural development strategies.

(13) Most of the laws and regulations do not emphasise on generation and maintenance of fisheries data and statistics.

C.3 Impacts of Fish and Fisheries Laws and Regulations of Trade Facilitation: The disparities evident in the laws and regulations of Member States should raise the first red flag with respect to the potential trade barriers which could arise. The following is a summary of the possible impacts of the regulatory frameworks in this context:

(1) The outdated laws such as those in Burundi, DR Congo, Malawi and Sudan predispose these countries to internal and external vulnerabilities. Internal vulnerabilities include the underdevelopment and underperformance of the fisheries sector leading to failure of realizing its potential to contribute to the national food and nutrition security, employment and wealth creation and lack of professional development.

The external vulnerabilities include dependence on imports contributing to trade deficits; lack of capacity to control safety and quality of imports; inability to quantify national income forfeited and unfavourable foreign exploitation of the countries fisheries resources with low resource rents.

(2) Unresponsive national laws and regulations create a barrier to trade since they do not create trust and confidence in trading partners. Trading partners need to be convinced that the national regulatory framework can create conditions to attain food safety and quality before they can engage in trade with any given country.

(3) Most laws and regulations are either focused on internal circulation of fish products or are geared towards exports outside of Africa. There is always an underestimated internal market which can be supplied by other African countries but the overwhelming attitude is that imports from other African countries are overlooked by an unsubstantiated national self-reliance. Wherever there are attempts to import fish products from other African countries, fears of unfair competition with local fishers quickly lead to erection of barriers based on the discretionary interpretation of national laws and regulations.

References
Code of Conduct for Responsible Fisheries (FAO, 2011c)

Governability of Fisheries: Theory and Applications (Bavinck et al., 2013)

6.3.26 Ecosystems for Water and Food Security: Security of Watersheds and Hinterlands

A. Introduction
Fisheries and aquaculture activities take place within the aquatic environment which is a dynamic ecosystem hosting a large number of live forms.
Many species of fish occupying inland waters of the world during all or part of their lifespan reside in watersheds that were or still are surrounded by forests and are dependent in major ways upon such cover. The complexity of interactions between fishes and forests has only been recognized in the last few decades. These interactions are multifaceted, dynamic processes involving most inland surface waters (streams, rivers, marshes, lakes, reservoirs, estuaries), forests, subsurface waters, geology and soils, climate and its changes, and the biotic components of the relevant ecosystems. The latter range from bacteria to birds and mammals that interact in many ways with fish. The interactions also include the aspects of forestry tied to human development, economics, population growth, and even philosophies.

Gradual natural weathering of watershed rocks and soils are carried by runoff into the aquatic environment and their accumulation can impact the quality of the water and the aquatic environment in which the fish grows. Anthropogenic activities can accelerate the flow of materials into the aquatic environment, creating conditions for multiplication of toxins and accumulation of heavy metals to unsafe levels. Anthropogenic activities contribute elevated levels of heavy metals such as mercury, copper, cobalt, chrome, iron, manganese, lead, zinc, arsenic and cadmium. Additional water pollution activities result from agricultural and human settlement activities in the form of agro-chemicals and wastewater systems.

Trash, especially plastic and litter cause adverse effect on fish. Plastics do not degrade easily in environment and therefore remain in the same stable / undegraded form in water bodies. Fish mistakenly confuse plastics as food materials and ingest them which causes blockage in the digestive system and kill the fish. There is also probability that fish and other marine life often get stuck in plastic items. Plastic often cause fish to starve to death by getting stuck around their mouth making them unable to eat. Plastic items can also cause slow choking of marine life to death by getting stuck around the neck of marine life. Apart from plastic, metal, rope, nets and ‘styrofoam’ are among other human made trash items which are disposed off in water bodies and harm marine life.

Tannery effluents contain both organic and inorganic solids in high concentration in either suspended or dissolved forms which results to high oxygen demand in water including admixture of harmful elements like toxic metal salts and chromium metal ion in the water. Without proper treatment and discharge of untreated wastes in water bodies causes serious harm to both environment and life threatening for the aquatic flora and fauna. It has deleterious effect on the soil also adjacent to the water bodies are characterized by high contents of dissolved, suspended organic and inorganic solids giving rise to high oxygen demand and potentially toxic metal salts and chromium metal ion. The tannery effluent, if not treated properly, can cause serious damage to soil and water bodies resulting to increase in soil salinity, reduced fertility and soil infertility and reduces potentiality for growth of crops. In many underdeveloped countries, the harmful and climatic unfriendly effluents from the tanneries are discharged directly into large water bodies even without proper treatment which is a grave and serious issue of concern for the environmental, climatic and public health. Oil spills from industrial sources runoff into the water sources which coat the skin of fish and kill them. Oil provides a source of toxins for fish that can cause disease, genetic defects/alterations and death. The oil damages the surface protective activity of skin which keeps the marine mammal warm. Some sewage feed algae that also flow off in the ocean. These algae grow at a rapid rate and have a high nutrient concentration producing red tides. They are called red tides because of the red appearance of the foam of the ocean waves. Red tides kill fishes by releasing toxins.

Excessive noise production from boats and drilling causes stress on fish and other marine life which make them sick and lethargic. This affects their mating behavior adversely. Fluctuations in water temperature from power plants and factories kill off coral and cause marine life to migrate for relocation in an attempt to find waters with a more sustainable thermal condition. Radioactive waste generated from industrial and military wastes enter the water bodies and are
absorbed by fish and can cause genetic, mutagenic and teratogenic defects in them.

**B. Purpose**
The purpose of this section is to highlight how direct and indirect human activity affect the availability, safety and quality of capture and aquaculture fisheries. Standardization focus for fisheries and aquaculture should take into account parameters which are likely to affect the quality and safety of fisheries and aquaculture products arising from environmental degradation in the immediate aquatic environment and the upstream sources of the water.

This section outlines the possible health and safety hazards arising from environmental degradation.

**C. Possible Health and Safety Hazards**

1. Quality of Seafood from Aquaculture
2. Safety Aspects of Seafood
3. Abiotic Environmental Factors Affecting Seafood Safety and Properties
4. Biotic Environmental Factors Affecting Seafood Quality
5. Seafood Quality Assurance for Algal Toxins
6. Fish and Shellfish Diseases and Seafood Quality

**D. Best Environmental Management for Healthy Fisheries and Aquaculture**

The link between the health and safety of the environment and the fisheries and aquaculture resources calls for drastic action on the part of the environmental protection and fisheries authorities in order to assure the quality, safety and health of the fisheries and aquaculture products.

The securing of the watersheds and the strict observance of non-discharge of wastewater into water courses should be enforced without reservation since the consequences of not taking this kind of action seriously compromises the safety and health of fisheries and aquaculture products with assured deleterious impacts on human health and safety.

Lax regulations along watersheds, waterways and water bodies should be reviewed if Africa is to safeguard its fisheries and aquaculture resources availability, quality and safety. The reaction to clean up the environment only on account of export requirements should desist as it implies that national populations are of less concern while in effect the political economy of a healthy population demonstrates the converse.

Notorious discharge of industrial waste into water systems on account of industrialization and job creation excuses is not to be accepted under any circumstances since the costs cannot be justified. Infringements into watersheds on account of population increases should be reviewed and mitigated to offset the costly impacts such infringements would manifest on fisheries and aquaculture resources downstream.

**References**

*Environmental Effects on Seafood Availability, Safety, and Quality* (Daczkowska-Kozon et al., 2011)

*Environmental Regulation and Food Safety: Studies of Protection and Protectionism* (Jha, 2005)
6.3.27 Securing Africa’s Fisheries Resources for Development: Marine and Shared Water Resources (Stopping the Looting)

A. Introduction

Many African States with fisheries resources have demonstrated unmitigated inabilitys to manage these resources on a sustainable basis. Major problems experienced in African fisheries arise from: illegal, unreported and unregulated (IUU) fishing; overfishing and degradation of the fisheries resources.

This section is intended to highlight the IUU problem and its effects as a means of creating a strong background to inform the development of good practices and credible sustainability criteria for sustainable fisheries. Experiences from the past standardization initiatives have indicated that many standardization experts underestimate the IUU problem, sometimes considering it as constituting a barrier to fisheries trade. Examples of the current problems are intended to reinforce the section and provide avenues for sustainability principles, criteria, indicators and verifiers.

B. Illegal, Unreported and Unregulated (IUU) Fishing

The threat posed by illegal, unreported and unregulated (IUU) fishing is widely recognized by the international community (RoNam, 2007; OECD, 2004). The IUU fishing problem affects both domestic waters and the high seas, and all types of fishing vessels, regardless of their size or gear.

But a fundamental question is – why does IUU fishing happen at all? We all know the answer, unless we like to pretend not to! There exists a plethora of excellent and fully available legal and institutional instruments such as the UN Fish Stocks Agreement, the Compliance Agreement, as well as voluntary instruments such as FAO’s Code of Conduct and the various International Plans of Action. Many other States, spent precious time and resources developing these! So then, why does this rape of the sea continue? Why are IUU vessels still able to offload at ports under the noses of certain port states and find lucrative markets for their illicit cargoes? The answer is simple – it is because fishermen, vessel owners, governments and international bodies have to date failed to stop it. In particular, it is because of a lack of political will to tackle the problem. We should control our vessels and nationals. IUU fishing is not an accident – it is carefully planned and, unfortunately, tolerated. Those who finance it make great profits. Some may have high contacts in the right places. As a result, some States continue to offer ports of convenience. Again, there must be real political commitment to stop it.

Many states have signed up to laudable and prudently crafted international conventions, agreements and arrangements. It is however a pity that we are simply failing to meet our obligations to such instruments. But why is this? It seems that we agree on these plans and instruments just as a formality, a diplomatic nicety, but that’s all! It would appear that individual states, be they coastal, flag or port states, are the main culprits for allowing IUU fish to be landed in the first place. Why should the political leaders of this world abdicate from their responsibilities? We can talk and develop prudent and well-intended plans and instruments to
our heart’s content, but if real political will is lacking for implementation, then we are all wasting our time, and the rape will continue unabated!

One might reasonable question whether States will not abuse and disrespect voluntary instruments such as the FAO IPOA on IUU fishing, given that so many are after all failing to abide to their legally-binding duties under international instruments.

C. Defining and Categorizing IUU

IUU or illegal, unreported and unregulated fishing is fishing that is conducted contradictory to legal conservation and management measures currently in place around the world. The FAO International Plan of Action to prevent, deter and eliminate illegal unreported and unregulated fishing FAO IPOA-IUU (FAO, 2002) contains the accepted definitions:

C.1 Illegal fishing refers to activities:
   (i) conducted by national or foreign vessels in waters under the jurisdiction of a state, without the permission of that state, or in contravention of its laws and regulations;
   (ii) conducted by vessels flying the flag of states that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the states are bound, or relevant provisions of the applicable international law; or
   (iii) in violation of national laws or international obligations, including those undertaken by cooperating states to a relevant regional fisheries management organization.

C.2 Unreported fishing refers to fishing activities:
   (i) which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations; or
   (ii) undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.

C.3 Unregulated fishing refers to fishing activities:
   (i) in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, or by those flying the flag of a state not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or
   (ii) in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with state responsibilities for the conservation of living marine resources under international law.

D. Dimensions of IUU
   (1) unregulated fishing takes place in nations that lack the resources to establish fisheries laws or monitoring, including the monitoring and supervision of foreign ships licensed under unfavourable agreements;
   (2) some unreported fishing stems from a lack of scientific data collection; and
(3) While other unreported catches conceal illegal activity.

These three dimensions of illegal fishing are a major threat to the oceans, consumers and seafood businesses around the world.

E. Contributing Factors to IUU

E.1 Too many fishers chasing too few fish: Overcapacity in fishing — The fishing industry has too much capital invested in vessels that it must operate to realize a return. More and more boats remove more and more fish, not allowing for their reproductive needs. Fish are being caught younger, some being harvested before they can reproduce. Some commercially targeted fish require only a few years to reach a reproductive age while others may take more than 30 years. The result of this is the catch per unit effort (CPUE) has gone up, meaning more effort is being expended to catch fewer available fish. Therefore, in an era of overfished fish stocks and substantial excess fishing capacity, IUU fishing is recognized as a major threat to the long term sustainability of the world’s oceans.

E.2 High and growing demand for seafood: As world populations continue to soar, the demand for seafood, an attainable protein resource, increases, and fisheries stocks are harvested beyond their ability to sustainably reproduce. “Fishing down the food chain” is the result. Fish that were previously discarded as “trash fish” are now fisheries targets. While aquaculture is one potential measure to meeting high consumer demand and reducing soaring wild harvest levels in the future, the gap between supply and demand continues to widen.

E.3 Highly profitable: IUU fishing is highly profitable so a strong economic incentive exists to participate. It is simply more “expensive” to be a responsible fisher in the global market. The complexity of the fishing industry and the many levels of organization involved leave it vulnerable to the influence of organized crime and corruption. Fishing vessels may also be used in activities such as drug or human trafficking.

E.4 Weak Enforcement: Many countries do not dedicate sufficient enforcement resources to fight illegal fishing and lack capacity to prevent trade of stolen fish. Even vessels that have been blacklisted for illegal fishing activities by international organizations are intercepted at port only 25 percent of the time. Lack of government oversight and resources, poor enforcement and corruption all contribute to the failure of fisheries enforcement. Reviewers of illegal fishing and compliance reform in South Africa specifically noted budget cuts, including a two-thirds decline in natural resources agency staff over the course of a decade, which prevented South African officials from conducting any visible policing.

E.5 Few Laws: Some fisheries are not bound by any law at all. Authorities can only carry out enforcement when their nation provides regulatory and legal backing, including adoption of international conventions. Unregulated fishing may also include fishing in remote locations or by seasonal participants who are not part of a local community. Remote locations include the majority of the ocean’s waters that are beyond national boundaries, known as the high seas. There is no designated police force responsible for the high seas, and the laws binding fishing and other activities in international waters are minimal. In a notorious chase, an Australian patrol boat pursued a Chilean sea bass fishing vessel across the high seas for 4,000 miles – yet this kind of enforcement is the exception rather than the rule. Sections of the ocean are managed with varied success by “regional fisheries management organizations (RFMOs)” which include Antarctica’s Commission for the Conservation of Antarctic Marine Living Resources. In
one study, half of ports visited by known illegal vessels were located in nations that belong to a regional fisheries management organization, though these visits did not always lead to enforcement action. The effectiveness of RFMOs is limited by the political will, regulations and capacity of participating nations, suffering the same weaknesses as the United Nations.

E.6 The Shell Game: Illegal fishing is a shell game, with constantly moving vessels that change names to stay ahead of enforcement authorities. When the ship returns to port, fraud, bribery, false documentation and money laundering facilitate the sale of stolen seafood. Finally, some of the most valuable illicit catches tap into organized crime networks for international distribution. Fraud, crime networks and the lack of government controls or traceability systems make it easy to distribute stolen seafood around the globe.

E.6.1 Fake IDs for Fish: Flags of convenience are notoriously used to cover up crimes committed at sea. The United Nations Law of the Sea requires that all vessels fly their national flag while on the high seas. Every vessel is required to be registered in its home country and issued an identification number and documents for the purposes of law enforcement and safety at sea. The state of registry is known as the “flag state” and linked to the vessel through its owner, manager or nationality. Pirate vessels deliberately evade policing efforts by hiding their flag, identity and ownership. This deception can be as simple as not flying a flag, or covering its name and registration while conducting illegal activity. Panama and other countries began allowing non-nationals to fly their flags for a fee in the early 1900s in response to U.S. Prohibition laws against alcohol. Ever since then, countries in need of foreign income compete for ship registration fees and have neither the incentive nor capacity to enforce regulations that ensure safety at sea, environmental, labour and other standards. Illegal fishing vessels use flags of convenience like a fake ID to conceal stolen fish and reduce liability for the owners if the vessel is captured. Illegal vessels also register in international tax havens, through front companies or joint ventures and frequently change their registration to new countries. Vessels registered under flags of convenience do not necessarily have nationals from that country as owners or crew and may never visit the country issuing the flag. During the 1990s and 2000s, long-standing flags of convenience from Panama and Belize were joined by flags from Togo, Equatorial Guinea, Mongolia (landlocked), Russia, China and North Korea among others, as suspected criminals continually sought new places to hide. Fraudulent identities also extend to shipping manifests and catch documents.

E.6.2 Mixing Fish at Sea: One of the most common ways that stolen fish enter mainstream seafood trade is by mixing legal and stolen catches together at different steps along the supply chain. Some countries require fishing vessels to report how much fish they catch, where it is caught and other details to monitor compliance with fishing laws. By mixing in stolen fish, they then take on all of the documentation of the legal fish and are effectively laundered. Transfer of fish at sea, known as trans-shipment, is one of the ways that legal and stolen fish are combined. Refrigerated cargo vessels collect catches from many different fishing vessels. Because they do not catch fish, cargo vessels are exempt from catch documentation and monitoring and provide a gap in the chain of custody.

E.6.3 Mixing Fish in Aquaculture Pens: Transfer through aquaculture facilities provides another way to mix stolen fish in with legal fish. Bluefin tuna ranches in particular have been identified as a place where undersized fish are accepted from fishing vessels and exact numbers of fish are not reviewed by inspectors, facilitating misreporting of catches. Tuna ranches are aquaculture facilities where wild-caught tuna, often juveniles, are kept in pens until they reach a marketable size.
E.6.4 Corruption and Bribery: Corruption and bribery of authorities can happen anywhere seafood is being inspected. When government observers are on-board fishing vessels, they are vulnerable to attacks, harassment and bribery. Individual relationships between fishing businesses and local officials can develop over time, leading to tolerance of illegal activity, bribery and collusion. Stolen fish can move with the assistance of fees paid to local officials or through gangster-controlled transportation networks. Institutionalized corruption can trickle through an agency or corporation. Pirate fishing operations forge or alter paper catch documents, bribing inspectors to accept entry of stolen fish as legal product. Customs and border patrols are also vulnerable and have in some cases have accepted bribes, signed off on blatantly false catch documents or allowed stolen seafood to enter without proper documentation.

F. Effects of IUU

IUU fishing can have far reaching consequences. Some effects include the following:

(i) **Unsustainable harvest of fish stocks and other marine wildlife**: IUU products often come from fisheries lacking the strong and effective official conservation and management measures. IUU fishing most often violates conservation and management measures, such as quotas or bycatch limits, established under international agreements. By adversely impacting fisheries, marine ecosystems, food security and coastal communities around the world, IUU fishing undermines domestic and international conservation and management efforts. Furthermore, IUU fishing risks the sustainability of the official industry.

(ii) **Destruction of marine habitats and loss of fish for future harvest**: IUU fishing often raids officially designated marine parks hosting vulnerable species. Stiles *et al.* (2013) states that pirate fishermen often target the richest and most vulnerable ecosystems in spite of efforts to protect them and cites cases from Australia, Thailand and Guinea Bissau.

(iii) **Loss of nutrition and food safety**: The conditions on ships engaged in IUU fishing often do not meet safety standards and pose food safety and health hazards. IUU fishing also deprives coastal communities of access to fish proteins from their diets.

(iv) **Loss of income and employment for legitimate fishers**: IUU fishing activities reduce the available stocks to local communities and negatively impact incomes and employment opportunities.

(v) **Deplete local, and potentially global, fish stocks** to the point where they become commercially unviable or even push them to the brink of extinction.

(vi) **Undermine labour and safety standards**: Use of unsafe vessels prone to sinking in the seas; unsafe working environments compared to onshore regulations and practices with some akin to medieval era (Stiles *et al.*, 2013);

(vii) **Distort markets of legally harvested fish**: IUU products are routinely low priced since the illegal operators do not meet the same environmental or sanitary standards. This undercut the business model for legitimate operators by as much as 10 to 15%. The targeting of overfished species reduces the chances of recovery and can lead to fisheries industry collapse. Cracking down on illegal fishing can boost the economy, restoring profitability to the fishery. By
eliminating illegal small-mesh nets in Guinea-Bissau, profits for other fishermen could increase between 50 and 100 percent.

(viii) **Contribute to the loss of economic stability in developing coastal nations:** Foreign vessels often perpetrate illegal fishing in the waters of developing countries. Plundering this critical food supply can bankrupt local fishing businesses and stall long-term economic growth. In Somalia alone, illegal, unreported and unregulated fishing removes $300 million from the national economy each year. West Africa is especially vulnerable to illegal fishing by foreign fleets, in addition to heavy fishing pressure from officially sanctioned foreign vessels. Fishermen in Cameroon report wanton destruction to artisanal fishing gear by illegal trawlers from China and the EU (Belhabib et al., 2015; GreenPeace, 2015), who also overexploit coastal fisheries. The combined losses for artisanal fishermen in West Africa due to poachers represent nearly 35 percent of their total catch.

**G. Stopping the Looting of African Fisheries**

**G.1 How can the problem of illegal fishing be stopped?** Effective at-sea enforcement will require much greater investment by individual nations in their detection and patrolling capacity, prosecution and penalties against poachers. In China’s fisheries, the number of violations dropped from the 1990s to the 2000s after modest increases in both penalties and enforcement for illegal fishing. Another enforcement study predicted that an increase in the chance of being caught is even more likely to prevent fishing crime than a similar increase in fines. In addition to at-sea enforcement, more systemic concerns must also be addressed to stop illegal fishing. Pirate fishing happens quickly, sometimes in a few hours, making detection by law enforcement even more difficult. The actual fishing is then followed by days to months of elaborate transactions designed to disguise the origins of stolen fish. Each fish is shuffled and relabelled many times in the black market to break any obvious links to the scene of the crime. By the time stolen fish arrives on consumers’ plates, its true identity is a mystery. The global problem of pirate fishing involves the “entire range of economic transactions associated with catching fish and bringing them to market” and will require a suite of reforms in fisheries management. Harmful government subsidies currently distort the fishing fleet, propping up corrupt businesses involved in illegal fishing and inflating the total number of vessels beyond what can be sustained by the world’s fish populations. These subsidies must be redirected to transition the fleet toward a sustainable future.

There is a wide range of possible measures that can be undertaken to address the problem of IUU fishing. These will need to cover legal, institutional, economic and social dimensions and will require the involvement of multiple players in the national, regional and international fisheries sectors. Determining the cost-effectiveness of alternate approaches to addressing IUU fishing problems should be undertaken to help identify priorities amongst the possible options so that the best results can be obtained from the limited resources that are available to national governments and international organisations.

**G.2 Seafood Traceability Deters Illegal Fishing:** Industry and government initiatives to stop illegal fishing are increasingly focused on traceability — tracking seafood from boat to plate. Despite increased at-sea enforcement, it will always remain a challenge to catch poachers in the act of illegal fishing. However, traceability provides an opportunity to catch poachers each time stolen seafood is sold or transported. It may be intercepted at the dock, in the warehouse for processing and freezing, at the airport customs desk and all along the distribution channels for seafood. The European Union is currently implementing regulations to ensure that seafood imports are fully
documented and legally caught. Similar catch documentation is already in place elsewhere and being refined for the fisheries with the most illicit activity, including bluefin tuna and Chilean sea bass. Experience from the Chilean sea bass traceability system emphasizes how important it is for traceability to include the entire supply chain across all fishing gears, products and jurisdictions. This includes the need to ban any imports that do not participate in traceability. Additional lessons learned include the need for centralized data and surveillance systems, online documents and advance notification of landings to allow inspectors to verify the catch. The U.S. has no traceability requirements for domestic or imported seafood and few regulations for imports or catch documentation. Additionally, the majority of U.S. seafood imports are neither inspected nor labelled with basic information as to when, where and how the fish was caught.

(1) **Full chain traceability of seafood:** Tracking seafood from boat to plate is essential to keep illegally caught fish from entering the U.S. market. Traceability requires documentation to follow the fish through the entire supply chain. In order to stop flow of illegal seafood products, a traceability system must be transparent and verifiable. Frequent inspections confirming the identity of seafood products is critical to the success of any documentation scheme.

(2) **Global information systems:** A global fishing vessel database is needed to connect existing vessel registers maintained separately by different governments and regional fishery management organizations. Though global vessel identifier numbers are issued by the International Maritime Organization, these numbers focus on shipping and are not currently required for fishing vessels. The High Seas Task Force identified information-sharing between agencies as a critical gap in intelligence currently exploited by illegal operators to evade enforcement. A minimum standard must be established for vessel and catch documentation to facilitate information sharing across jurisdictions and through the supply chain.

(3) **Trade flow analysis:** Patterns in trade and financial flows that indicate suspicious activity could be applied to identify pirate fishing, similar to their use in anti-terrorism efforts. Identifying critical points in the supply chain where trade flow analysis will help will assist in directing enforcement interventions.

(4) **Cooperation between authorities:** Pirate fishing sometimes escapes detection due to overlapping jurisdictions within the U.S. government and between member countries of regional fishery management organizations. As recommended by the Government Accountability Office report on seafood fraud, fighting fraudulent fish requires increased sharing of information and inspection resources between the Food and Drug Administration, Customs and Border Patrol and the National Oceanic and Atmospheric Administration. Most cases where pirate vessels are apprehended on the high seas have involved cooperation between authorities from several different countries.

**G.3 Flag State Actions:** Links between flags of convenience and tax havens have been established and a more concerted approach towards both could be undertaken. There is a need to improve transparency on the procedures and conditions for re-flagging and de-flagging. More countries could usefully investigate the possibilities for applying extra-territorial rules for their nationals. The penalties for IUU fishing offences should be significantly increased and harmonised between jurisdictions.

**G.4 Port State Actions:** The development of minimum guidelines for port state controls and actions against IUU fishers, particularly with respect to the use of prior notice and inspection requirements (including health and safety conditions), should be
encouraged. The harmonisation of these controls and actions should be a priority. There is a need to ensure a broader use of port state control measures including inspections, preventing access to services and goods of IUU vessels. There needs to be an agreement to make it illegal to tranship, land and trade in IUU fish. There is also a need to improve the monitoring of the provision of at-sea services and transshipment of fish and fish products.

G.5 Coastal State Actions and International Trade Responses: It is necessary to augment monitoring, control and surveillance capacities and improve fisheries management across the board, but in particular in developing countries. Improving and extending the use of catch and trade documentation schemes could help provide additional information on IUU fishing activities. Fair, transparent and non-discriminatory countermeasures should be adopted, consistent with international law, against countries that do not comply with the conservation and management measures adopted by RFMOs, or fail to effectively control the vessels flying their flag, in order to ensure they comply with the conservation and management measures adopted by RFMOs. Countries should identify the area of catch, name of fishing vessels and their past history (of name and flag) in order to collect information necessary for better fisheries management and elimination of IUU fishing.

G.6 RFMO Actions: Strengthening the mandate and role of RFMOs and RFBs, in particular their possibilities for tracking IUU fishing, is an important requirement. There is a need to improve information sharing and co-operation among RFMOs, particularly in terms of linking and integrating their data on IUU fishing activities. More RFMOs should consider publishing lists of companies and vessels engaged in high seas IUU fishing activities and lists of vessels that are authorized to fish. The use of positive and negative lists of IUU fishing vessels and companies is strongly encouraged in this regard. The creation of a global record/register of authorised fishing vessels that are technically capable of engaging in high seas fishing should be considered.

G.7 International Co-ordination: Resources matter: more technical and financial resources are needed for capacity building, in particular in the developing states, for monitoring, control and surveillance, and in all activities to combat IUU activities. The international community should move to ratify relevant international treaties on labour and working conditions in the maritime sector in order to strengthen international hard and soft laws to protect fishing crews in general. Improved monitoring of foreign direct investments (out-going and in-coming) in the fishing sector will assist in tracking potential IUU fishing operations. Work should be undertaken nationally and multilaterally to lift the veil of corporate secrecy surrounding the companies undertaking IUU fishing activities and related services. Partnerships between public authorities and businesses offer important scope in the fight against IUU fishing. In this regard, the OECD Guidelines for Multinationals offer some possibilities that could be followed-up by national regulatory authorities. A major effort is required, in particular by regional fisheries management organisations and market countries, to collect and disseminate relevant information. The efforts already underway to improve information at all levels and mechanisms to share information need to be supported and strengthened.

G.8 NGO and Private Sector Actions: Whenever possible, governments should consider bilateral consultation with businesses engaged in IUU activities to determine if alternative means of getting IUU vessels out of the business can be found. There should be continued efforts to communicate the IUU problem, for example through promotional/educational campaigns with the market, including intermediate buyers, processors, distributors and consumers. Such activities will help raise awareness of the problem and improve the knowledge of the social, economic and environmental
consequences of IUU activities. Industry and NGOs should be encouraged to continue to self-organise their response to IUU fishing and information collection.

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Stolen Seafood: The Impact of Pirate Fishing on Our Oceans (Stiles et al., 2013)

Improving Management and Governance of Fisheries and Aquaculture in the Asia-Pacific Region (FAO-RAP, 2012)


Fisheries Management. 4, Marine Protected Areas and Fisheries (FAO, 2011a)

Economic Tools for the Management of Marine Protected Areas in Eastern Africa (IUCN, 1999)

A Handbook for Negotiating Fishing Access Agreements (Martin et al., 2001)

Governability of Fisheries and Aquaculture: Theory and Applications (Bavinck et al., 2013)

Fisheries Governance: A Coming of Age for Fisheries Social Science? (Symes, 2006)

Guidelines for Applying Protected Area Management Categories (Dudley, 2008)

7. Compliance Assessment for Pilot Cross-Border Trade

ARSO will develop a Compliance Assessment scheme for fish trade and support countries to use it on a pilot cross-border trade facilitation, using the COMESA-CABI Breaking Barriers Project (COMESA-CABI, 2015), in partnership with East African Community (EAC) and Lake Victoria Fisheries Organizations (LVFO) (on Uganda-Kenya Border).

ARSO will also make use of the existing Simplified Trade Regime instruments in both the EAC and COMESA as legislative leverages in developing the compliance assessment scheme.
Annex I: Possible Standards for Fish and Fishery Products (EAC)

10. CD-K-518:2010, Canned shrimps or prawns — Specification
11. CD-K-519:2010, Fresh, frozen and canned sardines and sardine-type products — Specification
17. EAS 62-1:2000, Fish handling, processing and distribution — Code of practice — Part 1: Fresh fish handling and processing
27. CD-K-526-8:2010, Test methods for fish and fishery products — Part 8: Determination of organochlorides, pesticides, PCBS, and PCB congeners
29. CD-K-528:2010, Canned tuna and bonito in water or oil — Specification
32. CD-K-531:2010, Quick frozen finfish, eviscerated or uneviscerated — Specification
33. CD-K-532:2010, Quick frozen shrimps or prawns — Specification
35. CD-K-534:2010, Quick frozen blocks of fish fillets, minced fish flesh and mixtures of fillets and minced fish flesh — Specification
36. CD-K-535:2010, Quick frozen fish sticks (fish fingers), fish portions and fish fillets — Breaded or in batter — Specification
39. CD-K-538:2010, Quick frozen fish fillets — General specification
40. CD-K-539:2010, Quick frozen raw squid — Specification
41. CD-K-540:2010, Crackers from marine and freshwater fish, crustaceans and molluscan shellfish — Specification
42. CD-K-541:2010, Salted Atlantic herring and salted sprat — Specification
43. CD-K-542:2010, Live and raw bivalve molluscs — Specification
44. CD-K-543:2010, Code of practice for the processing and handling of quick frozen foods
46. CD-K-545:2010, Code of hygienic practice for smoked fish
47. CD-K-546:2010, Code of hygienic practice for crabs
49. CD-K-548:2010, Model Certificate for Fish and Fishery Products
50. CD-K-549:2010, Guidelines for the sensory evaluation of fish and shellfish in laboratories
51. CD-K-550:2010, Code of practice for frozen battered and or breaded fishery products
52. CD-K-551:2010, Pomfret canned in oil — Specification
55. CD-K-554:2010, Shark liver oil for veterinary use — Specification
57. CD-K-556:2010, Tuna canned in oil — Specification
60. CD-K-559:2010, Sardine oil — Specification
61. CD-K-560:2010, Lactarius spp canned in oil — Specification
63. CD-K-562:2010, *Fresh seer fish (Scomberomorus spp.) — Specification*
64. CD-K-563:2010, *Crab meat canned in brine — Specification*
65. CD-K-564:2010, *Fish species of economic importance — Glossary*
70. CD-K-569:2010, *Mussels canned in oil — Specification*
71. CD-K-570:2010, *Tuna canned in curry — Specification*
73. CD-K-572:2010, *Fish and fisheries products — Methods of sampling*
74. CD-K-573:2010, *Beche-de-mer — Specification*
75. CD-K-574:2010, *Frozen clam meat — Specification*
76. CD-K-575:2010, *Fish pickles — Specification*
78. CD-K-577:2010, *Fish processing industry — Water and ice — Technical requirements*
79. CD-K-578:2010, *Fish industry — Operational cleanliness and layout of market — Guidelines*
82. CD-K-580:2010, *Fresh, frozen and canned mackerel — Specification*
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