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

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Fish Processors and Traders Training Module

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Abbreviations and Acronyms

ABC	Allowable Biological Catch
AEM	African Eco-Labelling Mechanism
AES	African Eco-Labelling Standard
ARS	African (Regional) Standard
ARSO	African Organization for Standardization
AU	African Union
AUC	African Union Commission
CAADP	Comprehensive Africa Agriculture Development Programme
CABI	Centre for Agriculture and Biosciences International
COFI	FAO Committee on Fisheries
COMESA	Common Market for Eastern and Southern Africa
CPUE	Catch per unit Effort
EAC	East African Community
EAF	Ecosystem Approach to Fisheries
ECOWAS	Economic Community of West African States
IOTC	Indian Ocean Tuna Commission
IPOA	International Plans of Action
IPOA-CAPACITY	International Plan of Action for the Management of Fishing Capacity
IPOA-IUU	International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing
IQF	Individually Quick Frozen
IUU	Illegal, Unreported and Unregulated Fishing
LVFO	Lake Victoria Fisheries Organization
PFRS	Policy Framework and Reform Strategy for Fisheries and Aquaculture
PFRS	Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa
UNCTAD	United Nations Conference on Trade and Development

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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.

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 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

(vi) Preview of processing technologies and innovation of fish products

(vii) Packaging and labelling as the weak link in fisheries marketing

(viii) Eco-labelling and sustainability standards for fisheries

(ix) Introduction to ARS/AES 02:2014, *Fisheries — Sustainability and eco-labelling — Requirements*

(x) Regional trade arrangements and mutual recognition of standards and conformity assessment

(xi) Hygiene and food safety in fisheries and aquaculture

(xii) Compliance with standards and certification as a tool for market access

3. Fish Processors and Traders

3.1 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.

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 bodies, fish processors and traders associations, PAQI and individual consultants will be considered.

3.3 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.

3.3.1 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. macropthalmus*

(2) Tilapias:

(3) Small pelagic fishes: *Rastrineobola argentea* (Dagaa/Omena/Mukene), *Stolothrissa tanganicae* and *Limnothrissa moidon* (Kapenta), *Poecilothrissa mweruensis* 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

Lakes	**Coverage (km^2)/ Countries**	**Production**	**Main species**	**Remarks**
Victoria	68.800 km^2 Kenya Tanzania and Uganda	900000 (2010)	*Lates niloticus (Nile Perch) Rastrineobola argentea (Daaga). Oreochroms niloticus (Tilapia) Haplochronis, Bagrus, Clarias Synodontis, Protopterus*	Dagaa (60%), Lates (30%) and Oreochronis (7%) 194,172 fishers and 65758 fishing crafts (2010)
Tanganyika	32.900 km^2 Burundi, DRC (45%) Tanzania (41%) Zambia	200.000 tons in (2011)	*Stolothrissa tanganiace and Limnothrissa moidon (Kapenta) Lates stappersii (Bukabuka Mukeke) Lates angustifrons (Capitaine) lates Marie (Ngonzi, Sangala) Lates microlepis (Nonzi/Nyunvi) Tilapiine*	About 94,800 active fishers (2011). Kapenta contributes 60% to total catch and lates stappersii 30%
Malawi/Nyasa	29600 km^2 Malawi, Tanzania and Mozambique	50.600 (2007)	*Haplochronis spp. (Mbuna). Copadichronis spp. (Utaka), Preochromis spp. (Chambo), Rhamphochromis spp. (Ncheni). Engraulicypris sandella (Usipa), Barbus paludinosus (Matemba). Bagrus meridionalis (Kapango) and Clarius, gariepinus (Mlamba)*	About 50.000 fishers and over 350000 fish processors, traders etc in Malawi
Turkana (Rudolf	7200(7570) km^2 Kenya and Ethiopia	2.493 (2005)	Nile perch, Tilapia, Labeo, bagrus, Barbus, Citharinus, Distichodus, Clusrius, Symodontis, Hydrocymus forskalii	New Supplier to regional trade for DRC
Albert	5270 km^2 DRC 46% and Uganda 54 %	More than 150.000 (in 2010)	*Atlestes baremose (Ngaar)n Hydrocynus forskahli (Ngasia), Lates niloticus, L. macropthalmus, Brycinus nurse (53 %), Neobola ()22% Bagrus bayad*	The small pelagic (Ragoogi) and Muziri) catch is over 60 % of the Lake in Uganda Production data is for Uganda only
Mweru-Luapula	4580 km^2 Zambia 58 % And DRC 42 %	More than 22.000 (in 2010)	*Poecilothrissa mweruensis and Bangeluensis(Chisesnse) Oreochromis macrochir(Tilapia) Hydrocynus vitattus (Tiger fish)*	About 25000 fishers in Zambian waters
Edward	2325 km^2 Uganda 29 % DRC 71 %	10.000 (2010)	*Tilapia,bagrus, barbus,Protopterus. Clarias, Haplochromis*	516 fishers (No. of fishers, boats and fishing gears are controlled/set in Uganda
Kariba	5400 km^2 Zimbabwe and Zambia	23226 (in 2001)	*Limnothrisa miodon Oreochromis spp. Tilapia rondalli, Labeo hydrocynus vittaus, Mormyrids, Clarias gariepinus*	Lake Kariba is famous for Cage fish farming. Kapenta
Kivu	2370 km^2 Rwanda 42 % DRC 58 %	7000 (1991)	*Oreochromis niloticus, (Ingerge), Stolothirssa tanganicae and Limnothrissa moidon (Kapenta) Barbus spp., Clarias spp. Haplochromis spp.*	About 6500 fishers Kapenta (Limnothrissa contribute over 80% of the total catch

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 Cr*assostria 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

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

(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

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Grain, Fish, Money: Financing Africa's Green and Blue Revolutions. African Progress Report 2014 (APP, 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)

Managing Africa's Natural Capital for Sustainable Development and Poverty Reduction (AMCEN 15, 2015)

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)

3.3.2 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:

(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.

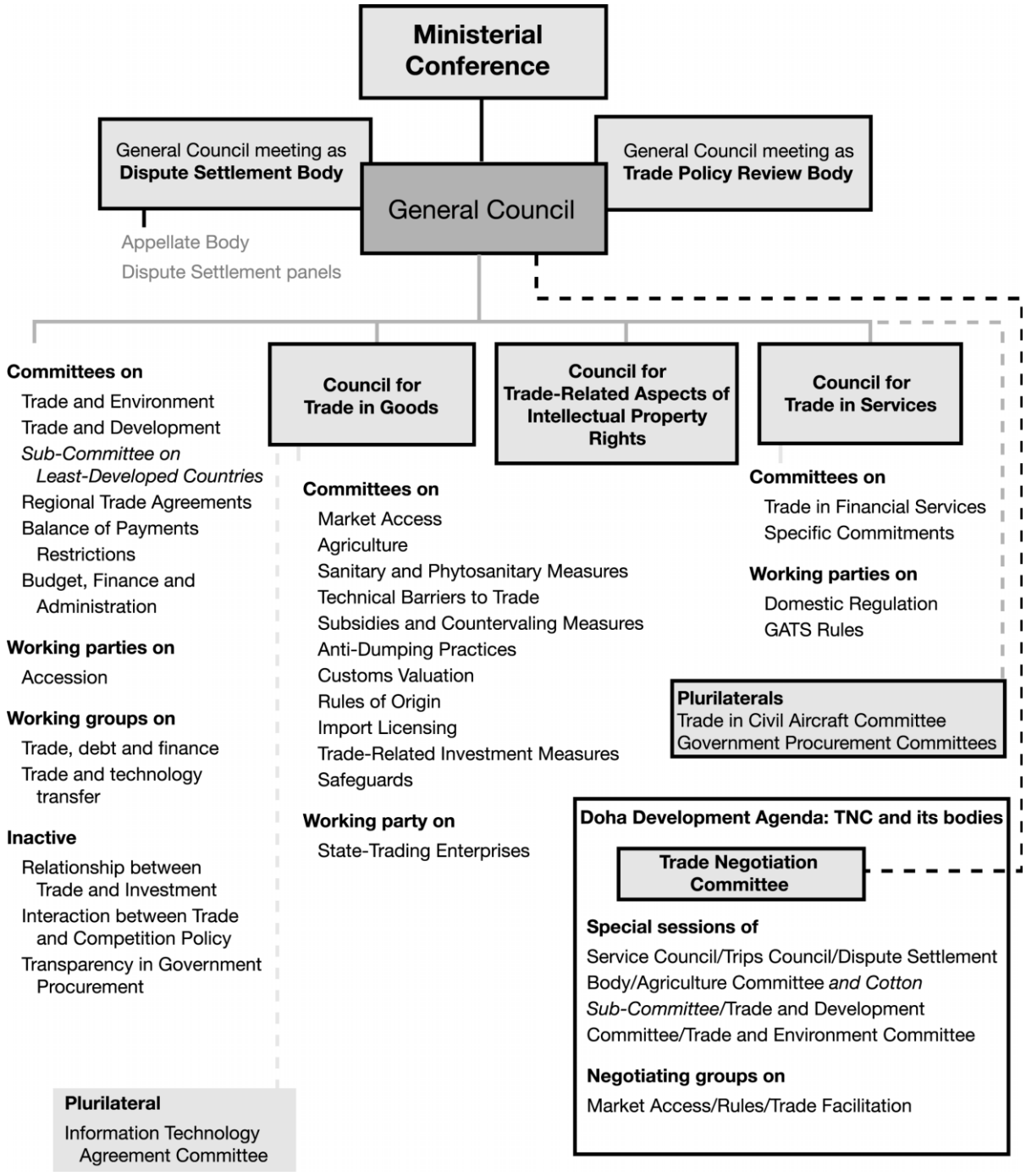

Figure 1: The structure of the WTO (Hoekman *et al.*, 2007)

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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3.3.3 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).

(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;

(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 2).

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.

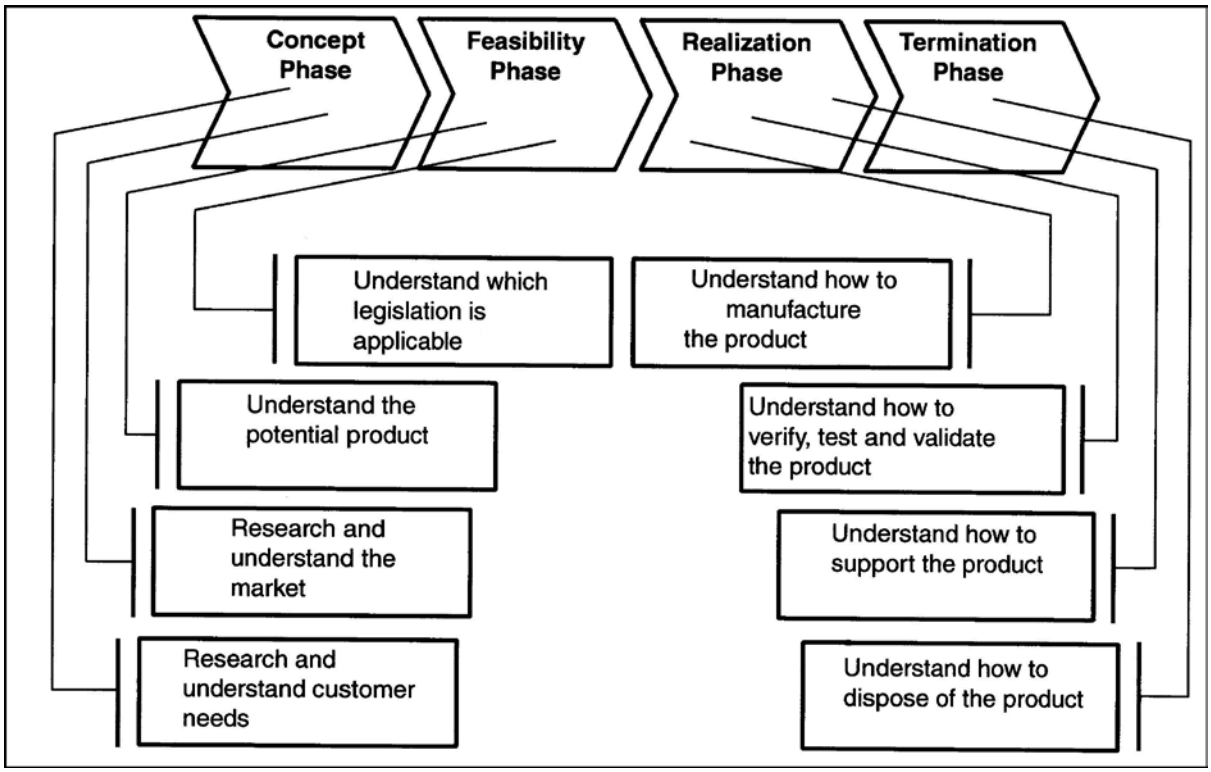

Figure 2: Steps in identifying the criteria

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 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.

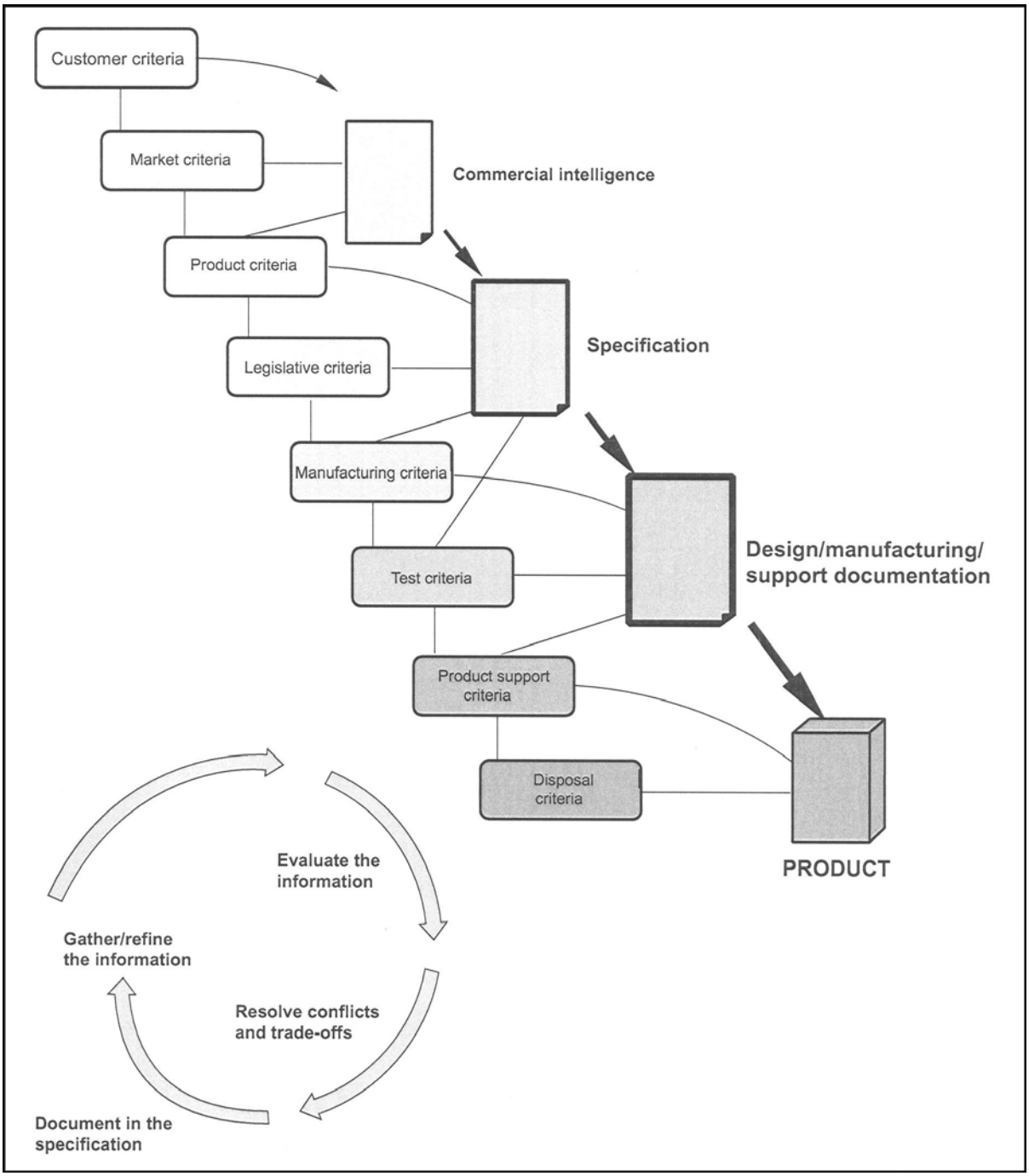

Figure 3: How Acquiring Criteria Builds up the Documentation

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.

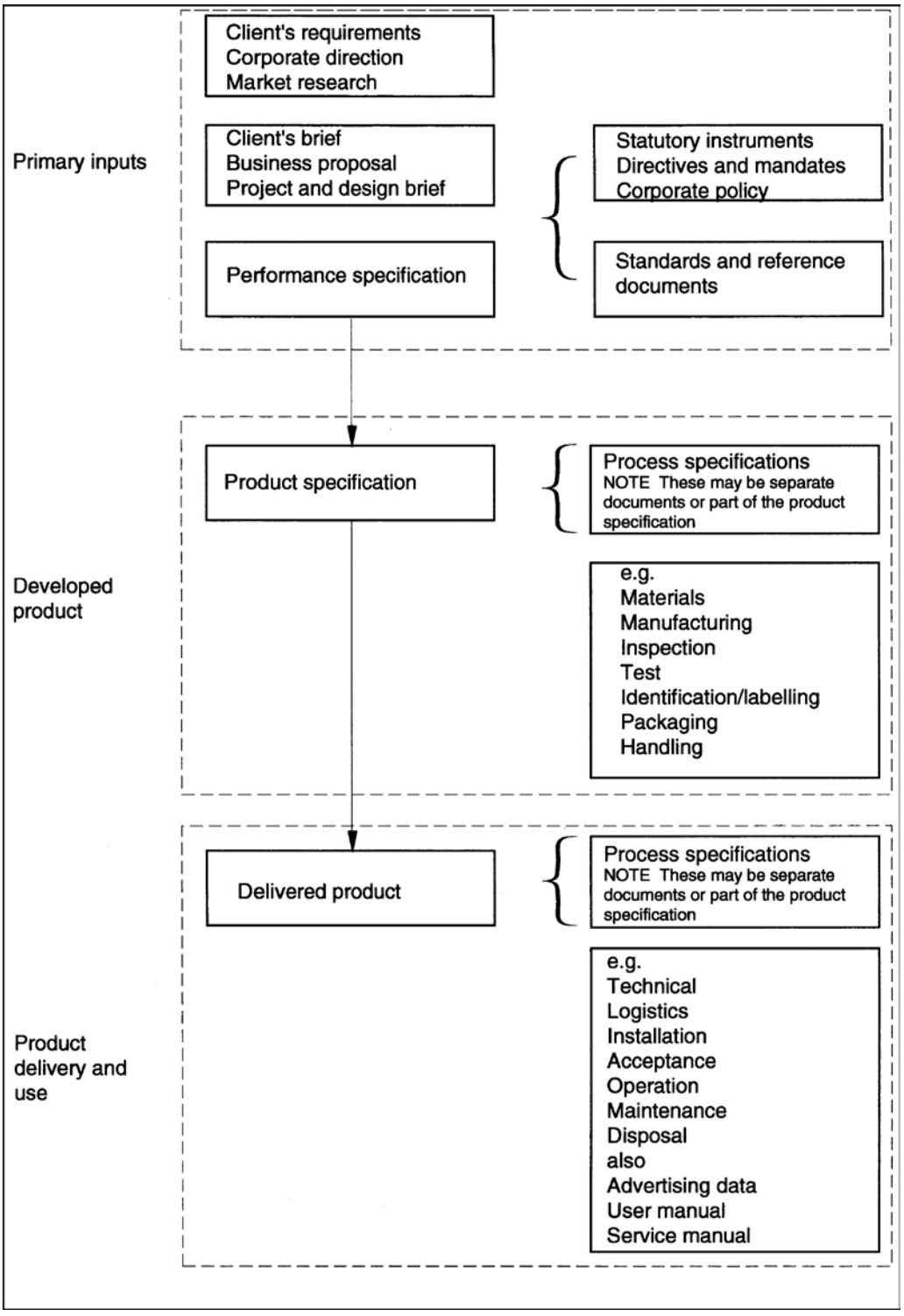

Figure 4: Order of Use of Specification Types

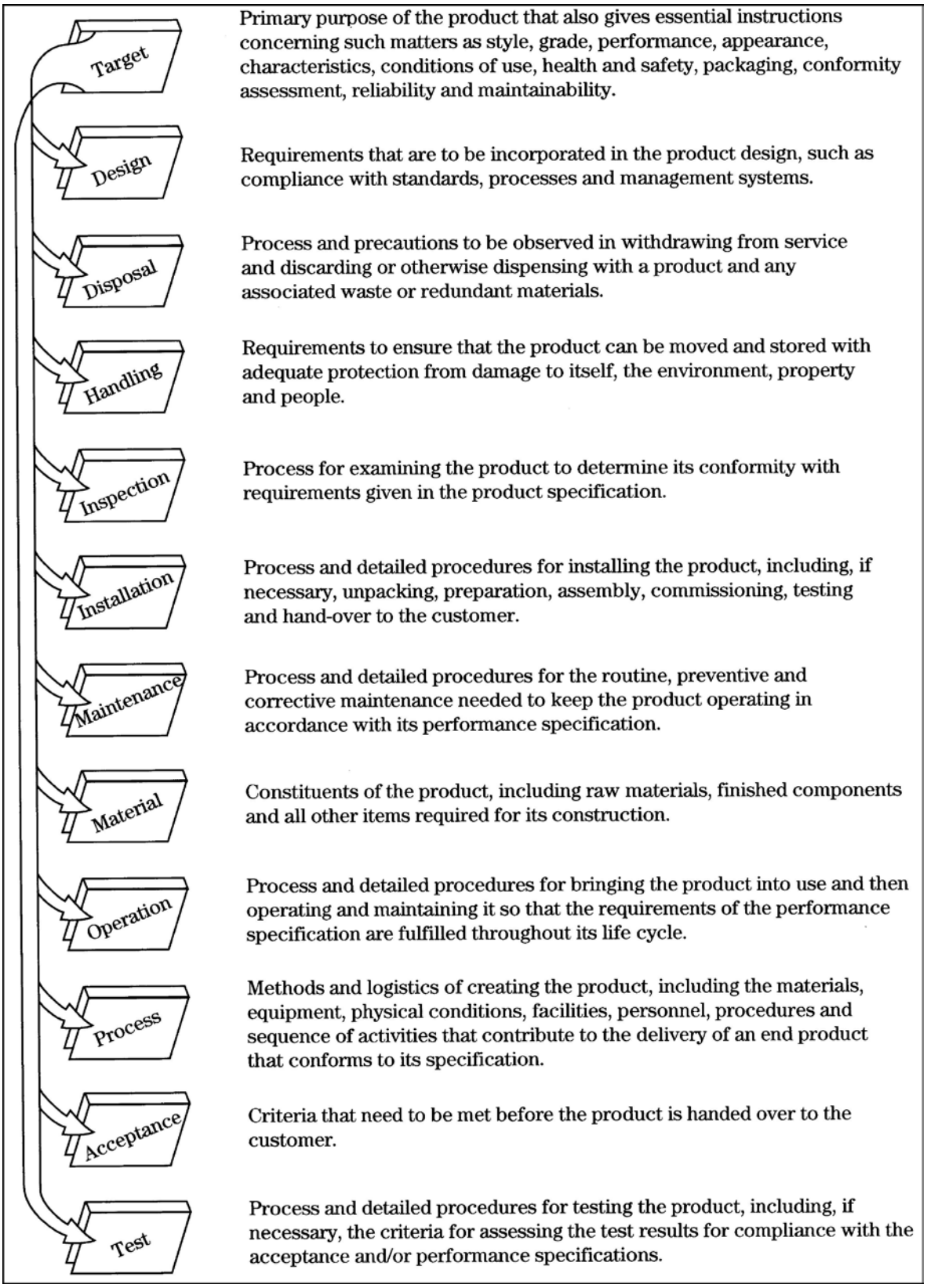

Figure 5: Some Types of Specifications

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 6. 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.

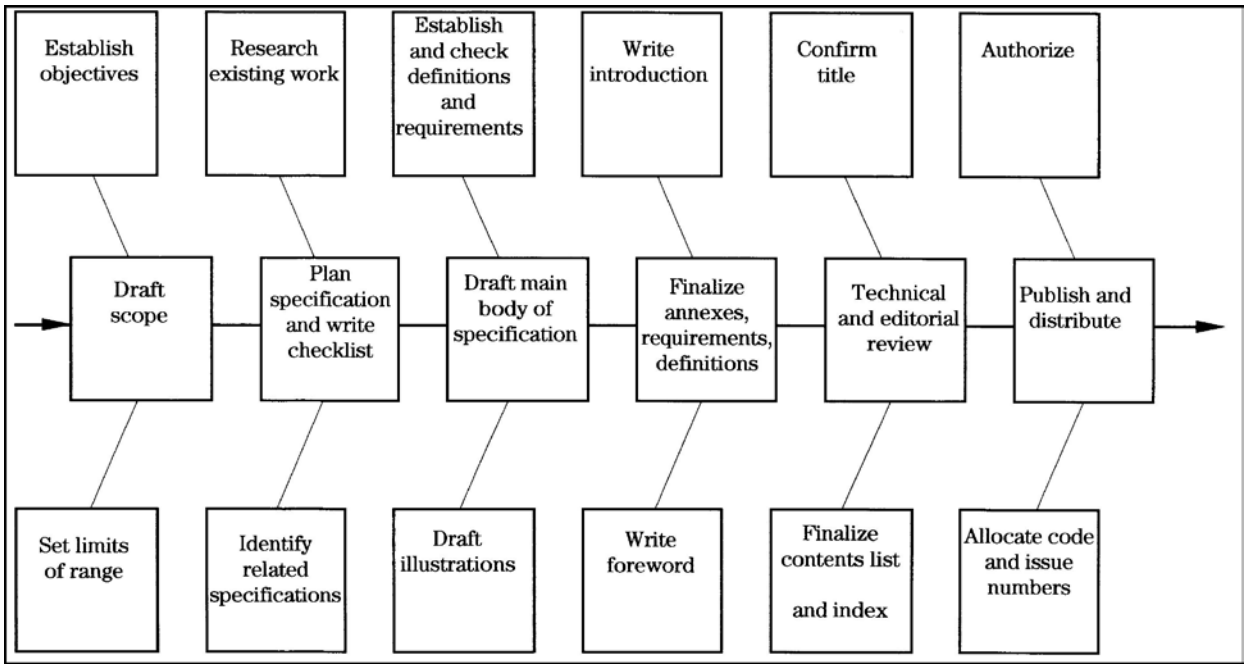

Figure 6: Stages in the preparation of a specification

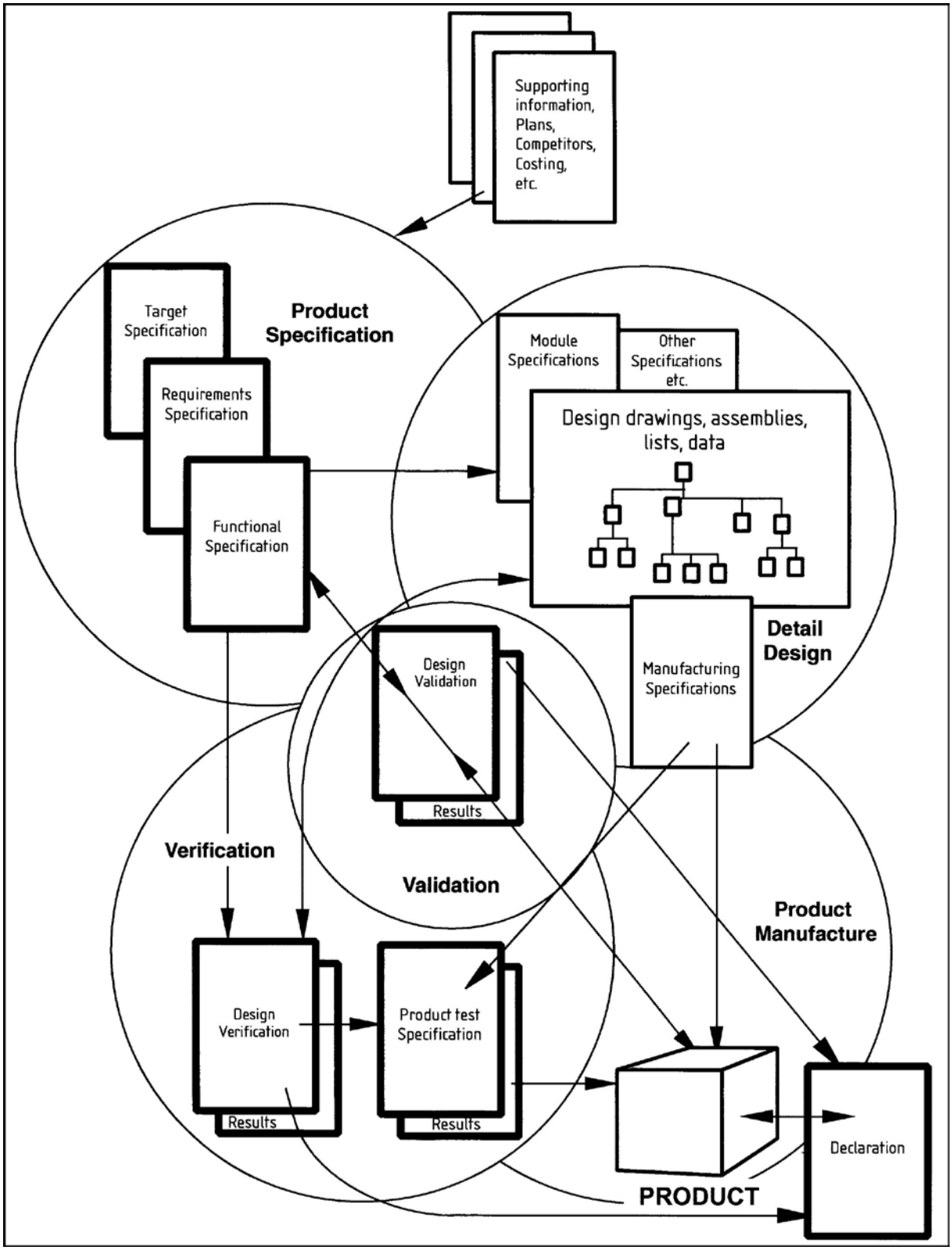

Figure 7: Interrelationship of Product Documentation

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 7) 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

BS 7373-1:2001, *Product Specifications — Part 1: Guide to Preparation.* (BS 7373-1, 2001)

BS 7373-2:2001, *Product Specifications — Part 2: Guide to Identifying Criteria for a Product Specification and to Declaring Product Conformity.* (BS 7373-2, 2001)

BS 7373-3 (2005), *Product Specifications — Part 3: Guide to Identifying Criteria for Specifying a Service Offering* (BS 7373-3, 2005)

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

ISO/IEC Directives, Part 1: Procedures for Technical Work + Consolidated ISO Supplement, 2015

(ISO, 2015)

ISO/IEC Directives, Part 2: Rules for the Structure and Drafting of International Standards (ISO, 2011)

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)

3.3.4 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 (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)

A Handbook on Risk Communication Applied to Food Safety (FAO/WHO, 2015)

3.3.5 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

BS 7373-2:2001, *Product Specifications — Part 2: Guide to Identifying Criteria for a Product Specification and to Declaring Product Conformity*. (BS 7373-2, 2001)

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)

3.3.6 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

Tuna and mackerel

Crustacea

(v) Conformity and metrology assessments: Applicable standards

(c) **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 - Drying - 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 micro-organisms known as 'halophilic bacteria' are salt-loving and will spoil the salted 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:

Process/product	***Gut***	***Wash***	***Treat with salt***	***Dry***	***Smoke***	***Dry***	***Pack***
Dried fish	+	+		+			+
Dried and salted fish	+	+	+	+			+
Dry-salted and smoked fish	+	+	+	+	+		+
Brined and smoked fish	+	+	+ Brine solution	+	+	+	+

Equipment required

Processing stage	***Equipment***
Gut	Cutting equipment
Wash	
Salt	Weighing and measuring equipment
	Brine meter
Smoke	Smoking equipment
Dry	Solar dryer
	Fuel-fired dryer
	Electric dryer
Pack	Packaging materials
	Sealing machine

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 micro-organisms. 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*l)
- 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*)

(f) **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

Processing stage	***Equipment***
Wash	Clean water
Drain	

Gut	Cutting equipment
Add salt (approx 5 per cent)	Weighing and measuring equipment
Leave to ferment (for several months)	Fermentation bin
Add colouring (optional)	
Pack	Sealing machines

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

(g) 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

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3.3.7 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):

Table 3: Definitions of packaging

(1)	A coordinated system of preparing goods for transport, distribution, storage, retailing and end-use
(2)	A means of ensuring safe delivery to the ultimate consumer in sound condition at minimum overall cost
(3)	A techno-economic function aimed at minimizing costs of delivery while maximizing sales (and hence profits)

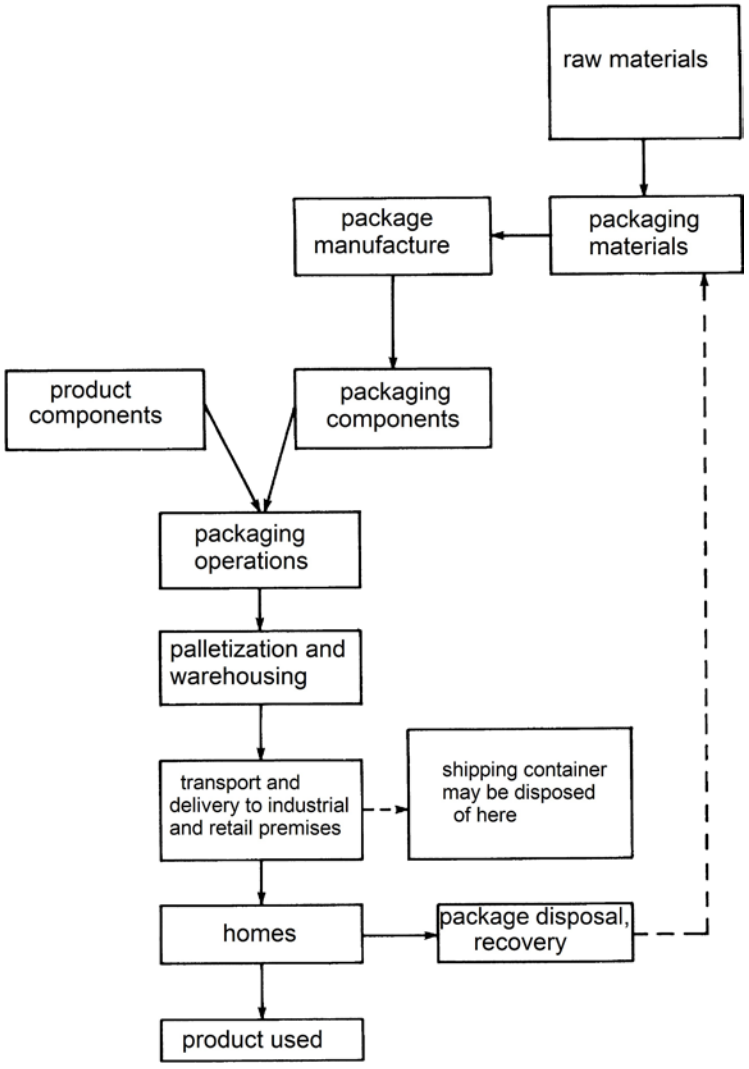

Figure 8: The marketing process and the packaging cycle

Table 3 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 8).

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 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 4: Fish products in lacquered metallic cans: metal contamination

Fish product	Average values (mg/kg)				Max. allowed limits (mg/kg)			
	Lead	Cadmium	Mercury	Tin	Lead	Cadmium	Mercury	Tin
Tuna in olive oil	0.02	0.02	0.15	<3.0	0.30	0.05	1.0	200
Mackerel filet in olive oil	<0.03	<0.03	<0.1	<3.0	0.30	0.05	1.0	200

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 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).

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3.3.8 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.

(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.

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-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.

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-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)

3.3.9 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.

3.3.10 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)

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)

Assuring Food Safety and Quality: Guidelines for Strengthening National Food Control Systems (FAO/WHO, 2005)

Quality Systems and Standards for a Competitive Edge (Guasch *et al.*, 2007)

3.3.11 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.1.1.2 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

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Hygiene Requirements, Controls and Inspections in the Fish Market Chain (Çaklı *et al.*, 2013)

Handbook of Fermented Meat and Poultry (Toldrá *et al.*, 2007)

Regulation 853/2004 of the European Parliament and of the Council of 29 April 2004 Laying Down Specific Hygiene Rules for Food of Animal Origin (EC, 2004)

Regulation (EU) 1379/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Organisation of the Markets in Fishery and Aquaculture Products (EC, 2013)

3.3.12 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.

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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)

Annex I: Possible Standards for Fish and Fishery Products (EAC)

1. CD-K-510:2010, *Fresh dried rastrineobola argentea (Omena/Dagaa) — Specification*
2. CD-K-511:2010, *Fresh frozen prawns/shrimps — Specification*
3. CD-K-512:2010, *Dried prawns/shrimps — Specification*
4. CD-K-513-1:2010, *Fresh and frozen fin fish — Part 1: Whole fish — Specification*
5. CD-K-513-2:2010, *Fresh and frozen fin fish — Part 2: Fish fillet — Specification*
6. CD-K-514:2010, *Frozen tuna loins — Specification*
7. CD-K-515:2010, *Frozen octopus — Specification*
8. CD-K-516:2010, *Dried and dry-salted fish — Specification*
9. CD-K-517:2010, *Quick frozen lobsters — Specification*
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*
12. CD-K-520-1:2010, *Canned fish — Part 1: Fish canned in tomato sauce — Specification*
13. CD-K-520-2:2010, *Canned fish — Part 2: Fish canned in brine — Specification*
14. CD-K-520-3:2010, *Canned fish — Part 3: Fish canned in oil — Specification*
15. CD-K-521:2010, *Code of practice for fish and fishery products*
16. CD-K-522:2010, *Code of practice for salted fish*
17. EAS 62-1:2000, *Fish handling, processing and distribution — Code of practice — Part 1: Fresh fish handling and processing*
18. EAS 62-2:2000, *Fish handling, processing and distribution — Code of practice — Part 2: Code of hygiene for the handling, processing, storage and the placing in the market of fish and fishery products*
19. CD-K-523:2010, *Code of practice for the handling, processing, storage and distribution of molluscan shellfish*
20. CD-K-524:2010, *Canned clam meat — Specification*
21. CD-K-525:2010, *Code of hygienic practice on commercial fishing vessels*
22. CD-K-526-1:2010, *Test methods for fish and fishery products — Part 1: Collection and storage of samples for analysis*
23. CD-K-526-3:2010, *Test methods for fish and fishery products — Part 3: Determination of parasites in finfish by candling*
24. CD-K-526-4:2010, *Test methods for fish and fishery products — Part 4: Determination of total, inorganic and organic mercury*
25. CD-K-526-5:2010, *Test methods for fish and fishery products — Part 5: Determination of selenium*
26. CD-K-526-7:2010, *Test methods for fish and fishery products — Part 7: Determination of lead by atomic absorption spectrophotometry*
27. CD-K-526-8:2010, *Test methods for fish and fishery products — Part 8: Determination of organochlorides, pesticides, PCBS, and PCB congeners*
28. CD-K-527:2010, *Transport of live fish seeds for inland pisciculture purposes — Code of practice*
29. CD-K-528:2010, *Canned tuna and bonito in water or oil — Specification*

30. CD-K-529:2010, *Canned crab meat — Specification*

31. CD-K-530:2010, *Canned Salmon — Specification*

32. CD-K-531:2010, *Quick frozen finfish, eviscerated or uneviscerated — Specification*

33. CD-K-532:2010, *Quick frozen shrimps or prawns — Specification*

34. CD-K-533:2010, *Transport of fresh water aquarium fish — Code of practice*

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*

37. CD-K-536:2010, *Salted fish and dried salted fish of the Gadidae Family of fishes — Specification*

38. CD-K-537:2010, *Dried shark fins — 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*

45. CD-K-544:2010, *Code of hygienic practice for lobsters*

46. CD-K-545:2010, *Code of hygienic practice for smoked fish*

47. CD-K-546:2010, *Code of hygienic practice for crabs*

48. CD-K-547:2010, *Code of hygienic practice for the processing of frog legs*

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*

53. CD-K-552:2010, *Prawns/shrimp canned in brine — Specification*

54. CD-K-553:2010, *Frozen frog legs — Specification*

55. CD-K-554:2010, *Shark liver oil for veterinary use — Specification*

56. CD-K-555:2010, *Frozen lobster tails — Specification*

57. CD-K-556:2010, *Tuna canned in oil — Specification*

58. CD-K-557:2010, *Fresh pomfret — Specification*

59. CD-K-558:2010, *Frozen whole pomfret — Specification*

60. CD-K-559:2010, *Sardine oil — Specification*

61. CD-K-560:2010, Lactarius spp *canned in oil — Specification*

62. CD-K-561:2010, *Frozen seer fish (*Scomberomorus spp.*) — 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*

66. CD-K-565:2010, *Solid packed crab meat — Specification*

67. CD-K-566:2010, *Frozen cuttle fish and squid — Specification*

68. CD-K-567:2010, *Fish protein concentrate — Specification*

69. CD-K-568:2010, *Edible fish powder — Specification*

70. CD-K-569:2010, *Mussels canned in oil — Specification*

71. CD-K-570:2010, *Tuna canned in curry — Specification*

72. CD-K-571:2010, *Frozen minced fish meat — 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*

77. CD-K-576:2010, *Cured fish and fishery products — Processing and storage — Code of practice*

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*

80. CD-K-579-1:2010, *Code of hygienic conditions for fish industry — Part 1: Preprocessing stage*

81. CD-K-579-2:2010, *Code of hygienic conditions for fish industry — Part 2: Canning stage*

82. CD-K-580:2010, *Fresh, frozen and canned mackerel — Specification*

83. CD-K-581:2010, *Fresh and frozen threadfin — Specification*

84. CD-K-582:2010, *Accelerated freeze dried prawns (shrimps) — Specification*

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