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Legal frameworks for sustainable aquaculture

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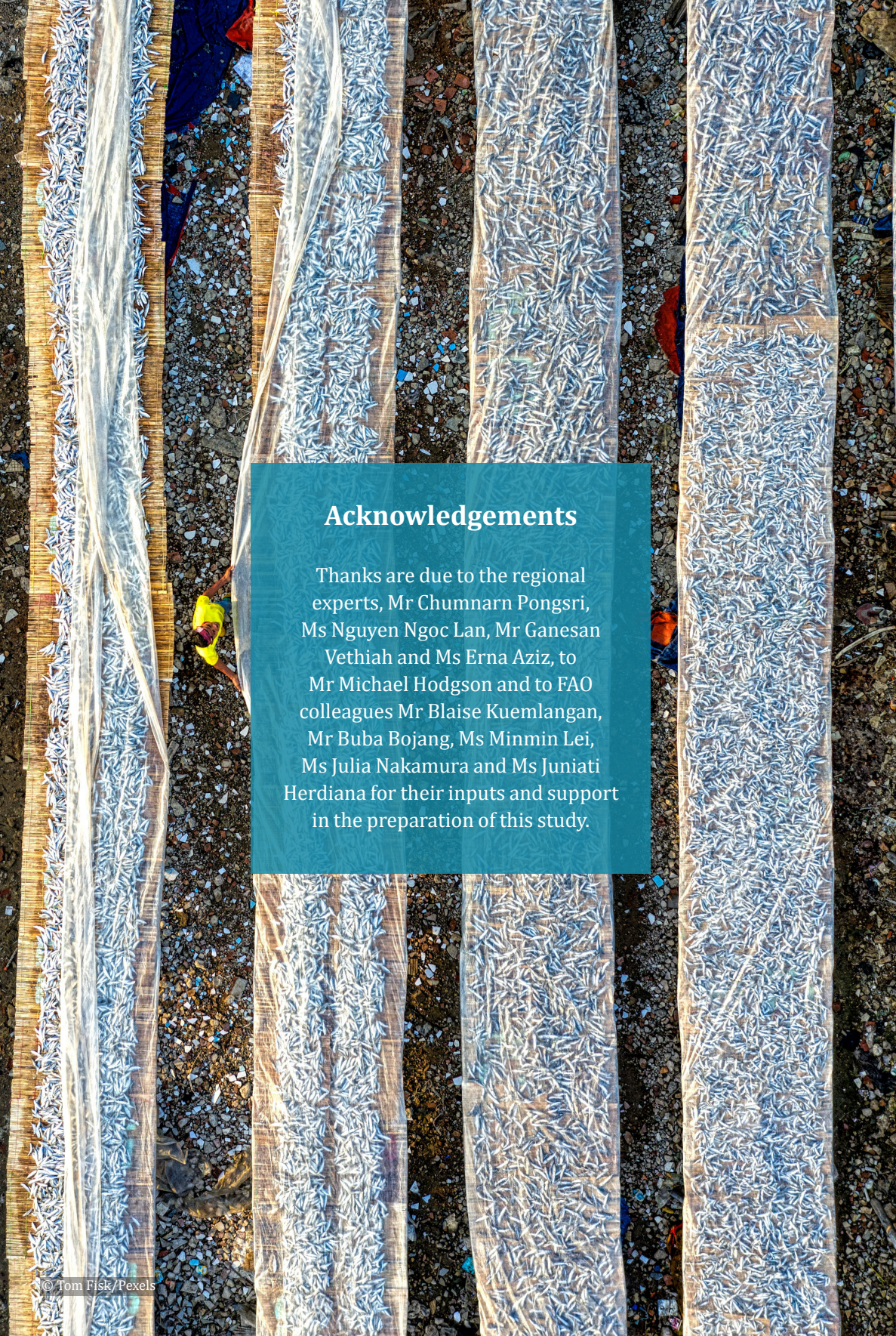
Contents

Boxes, figures and tables

Acronyms and abbreviations

AMR	antimicrobial resistance
ASC	Aquaculture Stewardship Council
ASEAN	Association of South East Asian Nations
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
EEZ	exclusive economic zone
EIA	environmental impact assessment
FAO	Food and Agriculture Organization of the United Nations
ICCPM	International Code of Conduct on Pesticide Management
ILO	International Labour Organization
IPPC	International Plant Protection Convention
IWRM	integrated water resources management
MSP	marine spatial planning
NACA	Network of Aquaculture Centres in Asia and the Pacific
nm	nautical mile
RAS	recirculating aquaculture system
SDG	Sustainable Development Goal
SEA	strategic environmental assessment
SPS Agreement	Sanitary and Phytosanitary Standards Agreement
TBT Agreement	Technical Barriers to Trade Agreement
UNCLOS Sea	United Nations Convention on the Law of the Sea
WHO	World Health Organization
WOAH	World Organization for Animal Health
WTO	World Trade Organization



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1. Introduction

Aquaculture, the farming in water of aquatic animals and aquatic plants, has seen extraordinary growth over recent years in terms of production levels and as regards its share of production of aquatic animals and algae. In 2020, the latest year for which figures are available, global aquaculture production reached a record 122.6 million tonnes, including 87.5 million tonnes of aquatic animals worth USD 264.8 billion and 35.1 million tonnes of algae worth USD 16.5 billion (FAO, 2022). Aquaculture contributed 49 percent of total aquatic animal production (88 million tonnes), compared to the 51 percent contribution of the capture fisheries sector (90 million tonnes), as well as 97 percent of algae production (FAO, 2022). And while production from capture fisheries has largely plateaued, with many stocks now fully exploited or over exploited, continued growth in the aquaculture sector will be necessary to meet growing global food demand. It has been projected that 62 percent of seafood will be farm-raised by 2030 (World Bank, 2013).

Although the most recent figures slow a slight slowdown in the rate of growth of the sector (FAO, 2022), aquaculture is still seen to have tremendous potential. Many developing countries have high aspirations for rapid aquaculture development in order to feed their fast-growing populations and to increase export earnings. At the same time, new technologies (such as closed recirculating aquaculture systems (RAS), multi-trophic aquaculture and aquaponic systems) promise increased and more sustainable production while emerging blue biotechnology processes present new opportunities for the sector in terms of the production of biofuels, cosmetics, food and pharmaceutical products. As a result, many governments are keen to promote aquaculture in order to create employment and as part of 'blue growth", "blue economy" or "blue transformation" strategies and priorities.

Nevertheless, the aquaculture sector also faces a number of important challenges. One challenge is the environment. Although, by reducing

pressure on wild fish stocks, aquaculture can be said to make a positive overall environmental contribution, the fact remains that aquaculture can also have a number of negative local level environmental impacts. These include pollution from aquaculture facilities (including from chemicals and animal waste), the spread of fish disease to wild stocks and the risk of genetic contamination as a result of escapes. Other negative impacts may arise from the siting of aquaculture facilities in ecologically sensitive habitats such as mangroves, lagoons and wetlands and as a result of conflict with existing uses of land and water.

At the same time, the sustainability of the sector itself depends on a clean and healthy environment, and as regards freshwater aquaculture, the availability of sufficient water of appropriate quality. This is a growing challenge due to the global water pollution crisis (Damiana *et al*., 2019) coupled with increased pressure on water resources as a result of growing demand and the effects of climate change. Climate change also poses particular threats to aquaculture facilities in low lying areas, due to increased flood risk, and in coastal areas due to the impacts of sea level rise, coastal erosion and, particularly in tropical countries, storm surges and other extreme weather events. An effective legal framework is necessary to address these issues.

Another major threat to the sustainability of the sector stems from the risk of aquatic animal and aquatic plant disease. Recent years have seen a number of well-publicized fish and shellfish disease outbreaks, leading to economically devastating export restrictions and market closure amid consumer health concerns. Disease, particularly in aquatic animals although also in aquatic plants, is one of the most serious constraints to the expansion and development of sustainable aquaculture (FAO, 2019). Even in the European Union, where extensive legislation on animal health applies and where there has been a lot of publicly funded research into the topic, infectious diseases are understood to be a very significant constraint on aquaculture productivity (European Commission, 2021). An increased focus on aquaculture biosecurity, in terms of controlling of the spread of aquatic animal and aquatic plant diseases and invasive pests, and the production of products that are safe to eat, is an essential pre-requisite for a sustainable future for the sector. And of course, aquatic animal and aquatic

plant diseases and environmental threats are closely linked. A degraded environment makes disease more likely as recognized by the "One Health" principle: animal, plant and human health are directly linked to a healthy environment.[1] Again, a clear legal framework has an important role to play in terms of advancing the One Health agenda.

The aim of this study is to identify the essential elements of a legal framework for sustainable aquaculture. For the fact is that in many countries the growth of aquaculture appears to have outpaced the development of the legislation and legal frameworks to govern aquaculture (FAO, 2020b). As one commentator, has noted:

> (m)any countries, not having specifically tailored aquaculture legislation, have struggled to control aquaculture access and operations through dated and marginally relevant legislation such as old fisheries acts, navigable waters protection laws and general environmental protection statutes (VanderZwaag and Chao, 2006).

In these circumstances, the lack of an appropriate enabling policy environment for aquaculture can be a major constraint for the growth of the sector in both developed and developing countries.

At the same time, a further challenge for policymakers arises from the sheer diversity of the sector itself in terms of:

- the number of species and species groups that are farmed (622 aquaculture "species items" including individual species, hybrids and various types of species groups were recorded in 2018 in contrast to 50 or so species used in terrestrial livestock raising) which include fin fish for food consumption as well as ornamental fish, a range of crustaceans and shell fish (mostly for food consumption) and other aquatic animals in addition to marine and freshwater seaweeds (macroalgae), used as industrial inputs and for food (including supplements) as well as microalgae used for food products and in the manufacture of biofuels, cosmetics and pharmaceutical products;

[1] See, for example: www.fao.org/one-health/en

- the different aquatic environments in which aquaculture takes place including freshwater, where the majority of food fish production takes place, brackish water (in lagoons and mangroves where salinity levels vary) and seawater;
- the diversity in terms of places where aquaculture is undertaken which range from paddy fields to irrigation ditches, to tanks, raceways, public and privately-owned ponds, land based self-contained hydroponic recirculating systems, to pens, fixed structures, tethered cages and rafts in reservoirs, rivers or coastal areas, to floating cages towed far out to sea as well as the types of technology used; and
- the commercial and physical scale of operations, which may range from a single aquaculture pond on a family farm to a large commercial prawn farm laid out over many tens of hectares of land, as well as the intensity of aquaculture production.

This diversity not only complicates understanding of the sector but can in turn have legal implications in terms of determining precisely which legislation is applicable. For example, different legal rules typically apply to aquatic animals compared to aquatic plants used in aquaculture or the use of freshwater as opposed to seawater. At the same time, the design and substance of regulatory frameworks may vary depending on the scale and size of aquaculture facilities: what works best for a commercial prawn farm may not be appropriate for aquaculture in a family-farm pond.

In short, aquaculture is a complex topic that is subject to a complex legal framework. The issue is not simply the sheer number of different laws involved (and thus the complexity of the legal framework), although this can be daunting for anyone wishing to enter the sector. It is also a question of coordination: coordination between the substance of the different laws themselves and coordination between the large number of different agencies responsible for the implementation of those laws at both central and local government levels and the issuance of a range of different approvals in the form of permits, licences and consents. Obtaining all of the necessary approvals can be a time-consuming, complex and expensive process.

Another result of this complexity is the generation of a "silo" effect for the agencies and their staff (including their lawyers) responsible for the implementation of different components of that framework under which different people are expert in different aspects of the legal framework for aquaculture but where no-one has a particularly clear grasp of the entire framework.

This study is intended both to act as a guide to the complexity of legal frameworks for aquaculture and also to serve as the background or resource document for the "Aquaculture Legal Assessment and Revision Tool" (ALART). The ALART has been developed as a detailed analytical tool for systematically assessing national legal frameworks for aquaculture in order to identify potential gaps, weaknesses and issues for possible reform with a particular focus on environmental protection and animal and plant health. The ALART is intended to be universally applicable while at the same time recognizing that the style and form of legislation varies from country to country depending on legal tradition.

The study is set out in five chapters including this introduction. Chapter two examines the normative frameworks at the international level that are of most relevance to aquaculture. These include frameworks created on the basis of international law, soft law instruments and guidelines, and private aquaculture certification schemes.

Chapter three contains an examination of national legal frameworks for aquaculture and the role and evolution of aquaculture legislation within those frameworks. In other words, it sets out the context for using the ALART. Chapter four follows the order of the ALART in analysing the key elements that or should be found within the legal framework for aquaculture. Finally, some conclusions are drawn in chapter five.

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2. The international normative framework for aquaculture

The international normative, in the sense of "rulemaking" or "standard setting", framework for aquaculture derives from a mixture of international law, a range of non-binding "soft-law" instruments and, increasingly, a number of private sector certification schemes.

2.1. International law

International law is the body of law that regulates the rights and duties of States and other actors recognized by international law (such as international organizations). The main sources of international law are: (1) the customs and practices of States; and (2) international agreements between States (also described as treaties and conventions).

Unlike, say, marine capture fisheries, no agreements concluded under international law are specifically concerned with aquaculture. There are no "aquaculture conventions" or "aquaculture agreements" of global or regional application. But this does not mean that international law is irrelevant to the aquaculture sector.

a) The United Nations Convention on the Law of the Sea

Although the United Nations Convention on the Law of the Sea (UNCLOS)[2] contains relatively detailed provisions on marine capture fisheries, it is silent on the topic of aquaculture. It does, however, set out the legal basis for a coastal State to authorize and regulate aquaculture within its adjacent marine waters (see Box A).

[2] United Nations Convention on the Law of the Sea, Montego Bay, 10 December 1982. In force: 16 November 1994, 1833 *United Nations Treaty Series (UNTS)* 396. www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

Box A
UNCLOS and the right of a coastal State to authorize and regulate aquaculture in its adjacent marine waters

UNCLOS recognizes that the sovereignty of a coastal State extends beyond its land territory and internal waters to an adjacent belt of sea, described as the territorial sea. The maximum breadth of the territorial sea is 12 nautical miles (nm) measured from the baseline (which is usually the low watermark). Within the territorial sea the authority of the coastal State is in principle absolute except as restricted by UNCLOS and other rules of international law. The most important restriction included in UNCLOS is the right of "innocent passage" through the territorial sea which is enjoyed by ships of all States. Otherwise, a coastal State may adopt laws and regulations on activities within its territorial sea including the safety of navigation, maritime traffic, the protection of facilities or installations, cables and pipelines as well as the construction of wind farms and aquaculture facilities and the conservation and management of fisheries and other natural resources. Beyond its territorial sea, a coastal State may claim an exclusive economic zone (EEZ) that can extend up to 200 nm from the baseline. Within its EEZ, a coastal State has "sovereign rights" for the purpose of exploring and exploiting, conserving and managing the natural resources there, including living resources, as well as "other activities for the economic exploitation and exploration of the zone" (Article 56(1)). A coastal State also has the exclusive right to construct, or authorize and regulate the construction, operation and use of "installations and structures" necessary for such activities within its EEZ, including installations for aquaculture.

UNCLOS also imposes a number of broad duties on coastal States to protect and preserve the marine environment that are of potential relevance to aquaculture undertaken in marine and brackish waters. These include the duty: to reduce and control pollution from any source using best practicable means and in accord with their capabilities (Article 194(1)); to ensure that activities under their jurisdiction or control do not cause damage by pollution to other states or their environment and to ensure that pollution from activities under their jurisdiction or control does not spread beyond areas where they exercise sovereign rights (Article 194(2)); to carry out environmental impact assessments where planned activities under their jurisdiction or control may cause substantial pollution or significant and

harmful changes to the marine environment (Article 206); to take necessary measures to protect and preserve rare or fragile ecosystems and the habitat of depleted, threatened or endangered species (Article 194(5)); and to prevent, reduce and control the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes (Article 196(5)).

b) The Convention on Biological Diversity

The Convention on Biological Diversity[3] (CBD), together with its implementing protocols, is similarly silent with regard to aquaculture but is nonetheless relevant to the sector. Among other matters, the convention imposes a general obligation on States to conserve biological diversity through the in-situ conservation of ecosystems, habitats and species. This is to be achieved through a range of measures including the establishment of protected areas, the protection of ecosystems and natural habitats, regulating the use and release of living modified organisms, preventing the introduction of alien species which threaten ecosystems, habitats or indigenous species and the adoption of legislation necessary for the protection of threatened species or populations (Article 8).

As regards aquaculture, the CBD is most relevant in terms of: (a) the siting of aquaculture facilities (coastal and riverine areas suitable for aquaculture are often particularly rich in biodiversity); (b) the use of living modified organisms (some see potential for the use of genetically modified species in aquaculture to improve growth and to prevent disease): (c) the use of alien species and stocks (aquaculture often involves the farming of non-native species while even if the species used are indigenous, escaped farmed stocks can adversely impact wild fish stocks); and (d) as regards measures to combat predator species (which may themselves be endangered).

The provisions in the CBD on living modified organisms were subsequently further developed in two protocols. The first is the Cartagena Protocol on

[3] Convention on Biological Diversity, Rio de Janeiro, 5 June 1992, 1760 *UNTS*, 79.

Biosafety,[4] which is based on the principle of Advanced Informed Agreement between exporting and importing countries, information exchange and the use of risk assessments. The second is the Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress[5] which is concerned with response measures in the event of damage resulting from living modified organisms, or where there is sufficient likelihood that damage will result if timely response measures are not taken.

Finally, the Nagoya Protocol[6] is also of potential relevance to the aquaculture sector as regards access and benefit sharing arrangements relating to genetic material used in blue biotechnology processes.

At the national level, the obligations of the parties to the CBD are usually given effect through the adoption of a range of environmental laws including framework environmental laws and legislation on protected areas and protected species. Such laws form an important part of the legal framework for aquaculture.

c) Other international environmental agreement

A number of other international environmental agreements are of potential relevance to the aquaculture sector. While the United Nations Watercourse Convention[7] is primarily concerned with the non-navigational use of transboundary watercourses, it also requires States to take all measures necessary to prevent the introduction of alien or new species into a shared international watercourse where this may have detrimental effects on the ecosystem of the watercourse resulting in significant harm to other watercourse States (Article 22).

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4 Cartagena Protocol on Biosafety to the Convention on Biodiversity, 29 January 2000, 2226 *UNTS* 208 (BSP).

5 Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol On Biosafety, Nagoya, 15 October 2010. https://treaties.un.org/doc/Treaties/2010/12/20101215%2005-26%20PM/Ch_27_8_c.pdf

6 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, Nagoya, 29 October 2010. https://treaties.un.org/doc/Treaties/2010/11/20101127%2002-08%20PM/XXVII-8-b-Corr-Original.pdf

7 United Nations Convention on the Non-Navigational Uses of International Watercourses (21 May 1997, entered into force 17 August 2014) 36 *International Legal Materials* (ILM) 719.

The Convention on the Conservation of Migratory Species of Wild Animals[8] creates a legal framework for the conservation of migratory species, their habitats and migration routes and may have an impact on the siting of aquaculture facilities. The Ramsar Convention,[9] which is concerned with the protection and wise use of wetlands, may be relevant in terms of how aquaculture is undertaken in such places although it does not, as such, preclude it.

Mention can also be made of the Convention on International Trade in Endangered Species of Wild Fauna and Flora[10] (CITES) which prohibits commercial trade in species threatened with extinction listed in its Appendix I, while permitting commercial trade in species listed in its Appendices II and III on the basis of an export permit issued by the exporting State. Some species of sturgeon (Acipenser brevirostrum and Acipenser sturio) are listed in Appendix I, while only a few listed marine species are the subject of aquaculture operations, including other species of sturgeon, hump head wrasse, seahorses, giant clams, European eel and sea cucumber (Bankes *et al.*, 2016). Again, the obligations of the parties to these agreements are usually implemented at the national level through environmental laws as well as, in the case of CITES, provisions in legislation relating to international trade.

d) International trade agreements

Fish and fishery products are some of the most globally traded food commodities. In 2020, world exports of aquatic products, excluding algae, were worth USD 151 billion accounting for 11 percent of total agricultural trade (excluding forestry) (FAO, 2022). This figure does not include the value of trade in aquaculture services such as consulting, and aquaculture inputs including live aquatic animals and plants, aquaculture feed and medicines (FAO, 2022). International trade law is therefore clearly relevant to the sector even though, like the other international instruments mentioned above, it does not contain specific provisions on aquaculture.

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8 Convention on the Conservation of Migratory Species of Wild Animals (23 June 1979, entered into force 1 November 1983) 1651 *UNTS*.

9 Convention on Wetlands of International Importance especially as Waterfowl Habitat (2 February 1971, entered into force on 1 December 1975) 996 *UNTS* 245.

10 3 March 1973, 993 *UNTS* 243.

The legal framework for international trade is currently governed by the rules of the World Trade Organization (WTO), established in 1995 as a successor to the General Agreement on Tariffs and Trade (GATT). A key objective of the WTO is to promote trade flows through the successive reduction and removal of tariffs as well as the reduction of trade barriers and the elimination of discriminatory treatment in international trade.

While classical trade theory suggests that increased trade in inputs will result in lower production costs while also promoting the development of new products, trade in live animals and plants is also associated with the inherent risk of moving aquatic animal and plant pathogens along with their hosts across international frontiers (Subasinghe and Bondad-Reantaso, 2008). In other words, international trade in aquaculture inputs can also be the vehicle for spreading aquatic animal and plant disease. At the same time, while imported aquaculture feed, medicines and chemicals may be cheaper than their nationally produced equivalents, an importing country is also entitled to satisfy itself that such products are safe and meet minimum quality requirements. The issue here is that while, on the one hand, a country may have legitimate grounds to prevent or control the import of goods, including aquaculture inputs, such controls should not be used as a disguised method to restrict imports in favour of national producers.

Two separate agreements, concluded under the auspices of the WTO seek to address this issue namely the Technical Barriers to Trade Agreement[11] (the "TBT Agreement") and the Sanitary and Phytosanitary Standards Agreement (the "SPS Agreement").[12] While they have a slightly different focus, both are relevant to trade in aquaculture inputs and products.

The basic objective of the TBT Agreement is to ensure that:

> technical regulations and standards, including packaging, marking and labelling requirements, and procedures for assessment of conformity with technical regulations and standards do not create unnecessary obstacles to international trade.[13]

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11 5 April 1994, 1868 *UNTS* 120.

12 15 April 1994, 1867 *UNTS* 493.

13 TBT Agreement, recital 2.

In brief, it prohibits discrimination between domestic products and foreign products on the basis of technical regulations and standards. It is relevant to trade in both aquaculture inputs and products and seeks to ensure that regulations, standards, testing and certification procedures do not create unnecessary obstacles.

The SPS Agreement aims to prevent the use of sanitary and phytosanitary measures as disguised barriers to international trade. To this end, while the right of WTO members to take sanitary and phytosanitary measures necessary for the protection of human, animal or plant life or health is explicitly recognized, measures that may constrain imports may only be imposed on the basis of: (a) a risk assessment; or (b) on the recommendations of international standards, guidelines or recommendations of standard setting bodies.

Standard setting bodies relevant to the aquaculture sector are: (a) the World Organization for Animal Health which is designated as the standard-setting body for animal health; (b) the Secretariat of the International Plant Protection Convention which is designated as the standard setting body for plant health; and (c) the Codex Alimentarius Commission which is the standard setting body regarding food quality in terms of food additives, veterinary drug and pesticide residues, contaminants, methods of analysis and sampling, and hygienic practice.

When WTO member countries apply these standards, they are likely to be safe from a legal challenge under the WTO disputes resolution procedures. Member countries may in addition impose stricter standards but only in accordance with a risk assessment and a number of other requirements set out in the SPS Agreement. This explains how jurisdictions with major import markets such as the European Union, Japan and the United States of America can require exporting countries to put in place control systems that provide equivalent guarantees of the safety of the food produce to those applicable to produce from those jurisdictions.

e) The Aquatic Animal Health Code

The World Organization for Animal Health (WOAH) (set up in 1924 as the Office International des Epizooties and previously known by its former acronym, OIE) is an intergovernmental organization that has its headquarters in Paris. The basic mandate of the WOAH is to improve animal health by: (1) informing governments of the occurrence and course of animal diseases and of ways to control disease outbreaks; (2) coordinating international scientific research on the surveillance and control of animal diseases; and (3) facilitating the harmonization of regulations pertaining to trade in animals and animal products.

The main normative document of the WOAH relevant to aquaculture is the Aquatic Animal Health Code which was most recently amended at its 87th General Session in May 2019 for inclusion in the 22nd edition.[14]

The WOAH maintains lists of animal pathogens/diseases that meet certain criteria relating to their consequences (pathogenicity and resulting socio-economic impacts), spread and diagnostics namely: "diseases notifiable to the OIE" and "other significant diseases." The WOAH regularly updates the lists as such diseases, especially notifiable diseases, are directly relevant to international trade. The WOAH Member Countries are required to report outbreaks of notifiable diseases to WOAH headquarters within 24 hours as well as new strains, changes in distribution, incidence, virulence, morbidity etc. Member Countries are subsequently also required to send periodic reports regarding the presence and evolution of listed diseases as well as a final report once the country, or a "zone" or "compartment" within the country becomes free of diseases (as well as other routine periodic reporting requirements).

The listing and information procedures under the Aquatic Animal Health Code provide the legal basis for countries to restrict and control imports in accordance with the SPS Agreement because, as described in the previous section, the WOAH is the designated standard setting body for aquatic animal health.

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[14] Available at: https://www.woah.org/en/what-we-do/standards/codes-and-manuals/aquatic-code-online-access

Box B
The Aquatic Animal Health Code in outline

The Aquatic Animal Health Code is set out in 11 sections as follows:

Section 1, **"Notification, diseases listed by the OIE and surveillance for aquatic animals"**, sets out standards for the implementation of measures for the surveillance and notification of pathogenic agents, including the criteria for listing aquatic animal diseases, the diseases which are listed by the OIE, procedures for notification to the OIE, and criteria for listing species as being susceptible to infection with a specific pathogen.

Section 2, "Risk analysis", sets out standards to guide an importing country in conducting import risk analysis in the absence of OIE standards and/or to use such standards to justify import measures which are more stringent than existing OIE standards.

Section 3, "Quality of aquatic animal health services", contains standards for the establishment, maintenance and evaluation of "Aquatic Animal Health Services, including communication standards.

Section 4, "Disease prevention and control", prescribes measures for the prevention and control of pathogenic agents, including through zoning, compartmentalization, disinfection, contingency planning, fallowing, disposal of aquatic animal waste and the control of pathogenic agents in aquatic animal feed.

Section 5, "Trade measures, importation/exportation procedures and health certification", sets out standards for the implementation of general sanitary measures for trade including certification and the measures applicable by exporting, transit and importing countries.

Section 6, "Antimicrobial use in aquatic animals", contains standards that are designed to ensure the responsible and prudent use of antimicrobial agents in aquatic animals.

Section 7, "Welfare of farmed fish", contains standards that cover the general principles for welfare of farmed fish, including during transport, stunning and killing for human consumption, and when killing for disease control purposes.

Sections 8-11, "Diseases of amphibians, crustaceans, fish and molluscs", lists currently known diseases and susceptible species and sets out standards that take into account the nature of the traded commodity, the aquatic animal health status of the exporting country, zone or compartment, and the risk reduction measures applicable to each commodity.

While the basic reporting obligations are mandatory, other elements of the Aquatic Animal Health Code are recommendatory by nature (see Box B). Of course, all of these issues are directly relevant to aquaculture and as will be seen below, should (to the extent appropriate and possible) be reflected in aquaculture sector governance mechanisms and legislation. In particular, the issue of bacterial resistance has emerged as a significant public health concern over recent years as a result of the widespread, and arguably excessive, use of antimicrobial products (antibiotics) in different sectors such as animal husbandry, agriculture and human medicine (Bondad-Reantaso *et al.*, 2018). The use of antimicrobials in aquaculture is of particular concern to due to its potential to spread antibiotic resistant bacteria directly into the aquatic environment.

f) The International Plant Protection Convention

The basic purpose of the International Plant Protection Convention, 1997[15] (IPPC) is to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. The IPPC deals with the protection of plants whether cultivated, managed or wild. This is to be achieved through the establishment by each contracting party of an official national plant protection organization which among other matters is charged with the issuance of phytosanitary certificates, confirming that plant products and other regulated articles and consignments thereof are in conformity with the certifying statements relating to the occurrence, outbreak and spread of pests.

In order to prevent the introduction and/or spread of regulated pests into their territories, contracting parties to the IPPC may regulate the entry of plants and plant products and other regulated articles. To this end they may: (a) prescribe and adopt phytosanitary measures concerning the importation of plants, plant products and other regulated articles, including, for example, inspection, prohibition on importation, and treatment; (b) refuse entry or detain, or require treatment, destruction or removal from the territory of the contracting party, of plants, plant products and other regulated articles or consignments thereof that do not comply with

[15] International Plant Protection Convention (New Revised Text) (With Annex). Rome, 17 November 1997. 2367 *UNTS* A-1963.

the phytosanitary measures prescribed or adopted under subparagraph (a); (c) prohibit or restrict the movement of regulated pests into their territory; (d) prohibit or restrict the movement of biological control agents and other organisms of phytosanitary concern claimed to be beneficial into their territories (Article VII(1)).

Pursuant to the IPPC a series of International Standards for Phytosanitary Measures (ISPMs) have been adopted by the Commission on Phytosanitary Measures (CPM), the governing body of the IPPC. There are currently 44 ISPMs in force as well as 29 Diagnostic Protocols and 39 Phytosanitary Treatments.[16]

Like other plants, aquatic plants can be infested by pests, provide a pathway for pests or themselves be pests to other plants. However, although the definition of "plants" ("living plants and parts thereof, including seeds and germplasm") and "plant" ("unmanufactured material of plant origin (including grain) and those manufactured products that, by their nature or that of their processing, may create a risk for the introduction and spread of pests") is broad enough to include aquatic plants the IPPC does not explicitly refer to them.

However, at the 9th Session of the Commission on Phytosanitary Measures in 2014, Recommendation CPM-9/2014/1 covering IPPC Coverage of Aquatic Plants was adopted whereby the contracting parties were encouraged to:

> (a) include an assessment of pest risks to aquatic plants in their pest risk analysis processes;
> (b) ensure that relevant government agencies, importers, exporters, shipping service companies and/or agencies (for ship ballasts and tanks) and other stakeholders are aware of the pest risks related to the import and movement of aquatic plants;
> (c) prevent the spread of regulated aquatic plants as pests in the ornamental and other trade sectors, using appropriate phytosanitary measures, with support from other national organizations positioned to enforce such measures;

[16] Available at: https://assets.ippc.int/static/media/files/publication/en/2021/04/ISPM_List_En_2021-03-17.pdf

(d) ensure that aquatic plants, as potential pests and pathways, become subject to, or included in, pest risk analysis whenever relevant, in particular in cases where aquatic plants are intentionally imported for intended uses as plants for planting, e.g. in aquaculture or other aquatic habitats;
(e) ensure that, in accordance with the outcome of a pest risk analysis, aquatic plants as pathways or pests become subject to official control and that adequate phytosanitary measures such as phytosanitary import requirements, surveillance, eradication, containment etc. are established;
(f) coordinate regional cooperative efforts on pest risk analysis for aquatic plants as pathways or pests.
(g) coordinate communication among NPPOs and other stakeholders to strengthen regional approaches to managing risk and identifying appropriate management options for aquatic plants as pathways or pests.

Again, as with much of the Aquatic Animal Health Code, the Recommendation is non-binding representing best practice for the protection of aquatic plant health rather than strict legal rules.

Nevertheless, the core elements of the IPPC in terms of the appointment of the national plant protection organization, the issuance of phytosanitary certificates, the possibility of imposing non-discriminatory quarantine measures etc. apply equally to aquatic plants.

g) Codex Alimentarius

The Codex Alimentarius Commission (Codex) was established on the basis of a resolution of the governing bodies of the Food and Agriculture Organization of the United Nations (FAO) in 1961 and the World Health Organization (WHO) in 1963. Its primary objectives are to protect consumer health and to ensure fair practices in food trade through the elaboration, harmonization and publication of food standards and other related texts (Vapnek and Spreij 2005).

As noted above, the SPS Agreement recognizes Codex as the source of international standards for food safety, although standards that result in a higher level of sanitary protection may be applied (if there is a scientific justification). The TBT Agreement also recognizes the Codex standards, although indirectly, by referring to "international standards." Among Codex

standards relevant to aquaculture are those that specify the maximum residue limits for veterinary drugs in food produced from aquaculture, including standards relating to antimicrobials (FAO, 2020a).

h) Labour standards

There are currently no specific internationally agreed labour standards for the aquaculture sector. For example, the focus of the Work in Fishing Convention (ILO 188) of the International Labour Organization (ILO) is on capture fishing activities: it applies to "all fishers and all fishing vessels engaged in commercial fishing operations."

Nevertheless, the international community has, over recent years, become increasingly aware of the problem of child labour in fishing and aquaculture. To this end ILO conventions relating to child labour, including the Worst Forms of Child Labour Convention, 1999 (No. 182) and the Minimum Age Convention, 1973 (No. 138) are relevant to the sector. More recently, FAO and ILO jointly published the document Guidance on addressing child labour in fisheries and aquaculture. (FAO/ILO, 2013). Children may work in aquaculture as unpaid family labour or under contract for an employer. In some cases, they are victims of trafficking or forced labour which is turn regulated at the international level through a number of legal instruments adopted under the auspices of ILO including the Forced Labour Convention, 1930 (No. 29), the Abolition of Forced Labour Convention, 1957 (No. 105), and the Protocol of 2014 to the Forced Labour Convention, 1930.

i) Chemicals agreements

Chemicals are used in aquaculture for a number of purposes. These include preventing the fouling of pens, cages and other water-based structures, disinfection, the cleaning of nets and pond maintenance through the use of a range of herbicides, piscicides and pesticides. Chemicals of the wrong sort or used in the wrong quantities are potentially dangerous for human, animal or plant health and potentially harmful to the environment.

A range of international agreements address aspects of the international trade in chemicals and their use in the workplace. These include: (a) the

Rotterdam Convention on the Prior Informed Consent Procedure for certain hazardous chemicals and pesticides in international trade[17] which, among other matters, provide that the export of a banned or severely restricted chemicals included in Annex III to the Convention can only take place with the prior informed consent of the importing Party; (b) the Convention concerning Safety and Health in Agriculture, ILO, 2001;[18] and (c) the Chemicals Convention, 1990,[19] which is concerned with the use of chemicals in the workplace.

Again, none of these agreements specifically refer to aquaculture but they are of relevance in terms of ensuring both that dangerous and inappropriate chemicals are not used in the sector and that appropriate chemicals are used in a safe manner. Mention can also be made of the International Code of Conduct on Pesticide Management (ICCPM)[20] adopted under the auspices of the FAO and WHO which among other matters calls for the regulation of all pesticides together, including chemical and biological pesticides, for agriculture or pest control for plant and livestock use. The ICCPM is implemented through a number of guidelines including the Guidelines for the Registration of Microbial, Botanical and Semiochemical Pest Control Agents for Plant Protection and Public Health Uses (FAO/WHO, 2017) and the Guidelines on Pesticide Legislation (FAO/WHO, 2015). In accordance with the Guidelines, no pesticide should be placed on the market unless it is registered as prescribed. The ICCPM is, as its name implies, a soft law instrument and once again it does not explicitly refer to aquaculture. However, as will be seen in the next part, a number of soft law instruments not only refer to aquaculture but are entirely focused upon the topic.

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17 10 September 1998, 2244, *UNTS* 393.

18 www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C184

19 www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312315:NO

20 www.who.int/publications/i/item/9789240030428

2.2. Soft law instruments and guidelines

Recent years have seen significant growth in so-called "soft law" at the international level, through the adoption at global or regional level of a range of non-binding instruments. In many ways this has led to a transformation of international law. A good example of a soft law instrument is provided by the 17 Sustainable Development Goals (SDGs) adopted by the United Nations General Assembly on 25 September 2015, and which set out a roadmap for future prosperity by addressing key challenges including world poverty, hunger, disease and illiteracy (United Nations, 2015). Although aquaculture is explicitly mentioned only once in the SDGs (in the context of increasing the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources), the sector has a potentially important role to play in terms of achieving a number of the goals, including Goal 2 (to end hunger, achieve food security and improved nutrition and promote sustainable agriculture) and Goal 14 (to conserve and sustainably use the oceans, seas and marine resources for sustainable development).

Precisely because soft law instruments are not legally binding (although they may also reflect already established rules of international law), they are often easier to agree than formal inter-state agreements. Moreover, because they are not formal agreements, their scope of application is not limited to States and international organizations: they can also apply to individual and civil society actors. Indeed, soft law instruments can in many ways be more effective not only in terms of guiding the development of formal normative frameworks at the international and national levels but also in terms of guiding best practice. And it is in the realm of soft law that the first examples of aquaculture-specific instruments appear at the international normative level.

a) Code of Conduct for Responsible Fisheries

In terms of aquaculture the most important soft law instrument is the Code of Conduct for Responsible Fisheries (the "Code of Conduct")[21] which was adopted during the 28th Session of the FAO Conference on 31 October 1995. The Code of Conduct is a voluntary agreement that is addressed not only to States, but also to "fishing entities, sub-regional, regional and global organizations, whether governmental or non-governmental, and all persons concerned with the conservation of fishery resources and management and development of fisheries, such as fishers, those engaged in processing and marketing of fish and fishery products and other users of the aquatic environment in relation to fisheries."

The scope of the Code of Conduct is extremely broad. It encompasses almost all aspects of fisheries and aquaculture management, setting out generally agreed "principles and standards applicable to the conservation, management and development of all fisheries." It also covers the "capture, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management". While the term "fisheries" is expressed to include "aquaculture" the document also contains a number of specific references to the sector.

In particular, Article 6, paragraph 19, entitled "General Principles", calls, for States to "consider aquaculture, including culture-based fisheries, as a means to promote diversification of income and diet. In so doing, States should ensure that resources are used responsibly and adverse impacts on the environment and on local communities are minimized." Subsequently Article 9 on "Aquaculture Development" sets out a number of important principles for the responsible development of aquaculture. Of particular relevance to this study is Article 9.1.1 which provides that:

> States should establish, maintain and develop an appropriate legal and administrative framework which facilitates the development of responsible aquaculture.

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[21] Code of Conduct for Responsible Fisheries adopted on 31 October 1995, Resolution 4/95 FAO Conference.

Other aspects of Article 9 address such issues as the potential impacts of aquaculture on transboundary aquatic ecosystems, the use of aquatic genetic resources for the purposes of aquaculture and responsible aquaculture at the production level.

The Code of Conduct has been followed up with a series of technical guidelines for responsible fisheries that set out in more detail how the code is to be implemented. These include FAO Technical Guidelines for Responsible Fisheries No. 5, Aquaculture Development which has in turn been further developed in a series of supplements (see Box C). In addition, Technical Guidelines on Aquaculture certification were adopted in 2011 (FAO, 2011).

Box C
Supplements to *Aquaculture Development*, FAO Technical Guidelines for Responsible Fisheries No. 5

- Good Aquaculture Feed Manufacturing Practice
- Health Management for Responsible Movement of Live Aquatic Animals
- Genetic Resource Management
- Ecosystem Approach to Aquaculture
- Use of Wild Fish as Feed in Aquaculture
- Use of Wild Fishery Resources for Capture based Aquaculture
- Aquaculture Governance and Sector Development
- Recommendations for Prudent and Responsible Use of Veterinary Medicines in Aquaculture
- Development of Aquatic Genetic Resources: A Framework of Essential Criteria

Relevant provisions in the Code of Conduct and its technical guidelines are referenced in the discussion on national legal frameworks in Chapter Four below. While the Code of Conduct is of global application, soft law instruments in the form of guidelines relating to aquaculture have also been adopted at the regional level.

b) ASEAN Guidelines

The Association of Southeast Asian Nations, or ASEAN, was established on 8 August 1967 in Bangkok, Thailand, with the signing of the ASEAN Declaration (Bangkok Declaration) and its members include some of the largest aquaculture producer nations in the world.[22]

While the aims of ASEAN in terms of promoting economic growth, social progress and cultural development in the region, regional stability etc., evidently go far beyond the aquaculture sector, ASEAN has adopted a series of guidelines relating to aquaculture including *Guidelines on ASEAN Good Aquaculture Practices (ASEAN GAqP) for Food Fish and Guidelines for the Use of Chemicals in Aquaculture and Measures to Eliminate the Use of Harmful Chemicals*.

c) NACA Guidelines

Remaining at the regional level, a number of sets of guidelines and other technical documents have been developed under the auspices of the Network of Aquaculture Centres in Asia and the Pacific (NACA) and its various international partners.

These include the "Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals" developed with the support of FAO; the "International Principles for Responsible Shrimp Farming", 2006 developed with a range of stakeholders including FAO to provide a basis for stakeholder collaboration for more development of shrimp farming; "Guidelines on Aquaculture Society Classification" which seek to enable aquaculture societies to seek group certification from independent third party certification programmes, as well as "better practice guidelines" on a range of topics, guides and technical guidelines relating to the management and cultivation of specific aquaculture animal species. The NACA has also adopted a range of studies, manuals and policy briefs on aquaculture including regarding vulnerability and adaptation to climate change.

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[22] The Member States of ASEAN are Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Viet Nam.

2.3. Aquaculture certification schemes

Some of the most comprehensive international normative frameworks for aquaculture derive not from international organizations but from the private sector in the form of certification schemes that are in turn related to ecolabelling. Ecolabels reflect consumer preferences for more environmentally and socially sustainable products. In order to receive certification, and therefore to benefit from a particular ecolabel, producers are required to comply with various standards. The incentive to comply with those standards derives not from the threat of sanctions but from the benefits of certification which may include obtaining a premium price. Increasingly, certification schemes are also the key to market access as more and more major retailers in importing markets (in particular supermarket chains) respond to increasing consumer concerns about the sustainability of food sources in general, and aquaculture in particular, by requiring certification. The result is that in many cases the standards set by private sector led certification schemes are stricter than those specified in the national legal framework in an exporting jurisdiction.

Two of the most well-known schemes are GlobalG.A.P. and the Aquaculture Stewardship Council

a) GlobalG.A.P.

The GlobalG.A.P. is a farming standard that is applicable to a range of agricultural activities including aquaculture. The Integrated Farm Assurance (IFA) standard for Aquaculture covers finfish, crustaceans, and molluscs for all types of farming systems.[23]

Relevant standards relate to: (a) animal health and welfare (including a requirement for a comprehensive veterinary health plan, the responsible use of anti-biotics, staff training and water quality monitoring); (b) biosecurity (with a requirement for a biosecurity plan for each farm as well as the participation of each farm in an area management plan, appropriate biosecurity practices at farm level and quarantine procedures

[23] See: www.globalgap.org/uk_en/for-producers/globalg.a.p./integrated-farm-assurance-ifa/aquaculture

as needed); (c) traceability (including as regards supplies from certified hatcheries, no use of genetically modified organisms, traceability to origin, the recording of fish movements at all stages of life as well as feeds used, treatments given and post-harvest traceability and certification through to the final consumer, as well as recall procedures and labelling requirements); (d) food safety (to be ensured at all stages from brood stock onwards, feed safety monitoring, the use only of authorized chemical compounds, detailed sampling to analyse residue levels, the use of antibiotics only if an infectious bacterial disease is diagnosed, appropriate on site human waste collection and disposal, compliance with Codex Alimentarius requirements for banned substances, staff training on food safety).

b) Aquaculture Stewardship Council

While the Global GAP is of general application within the broader agricultural sector, the Aquaculture Stewardship Council (ASC) standards are exclusively applicable to aquaculture and in essence aim to instil good practice for aquaculture taking into account environmental and social requirements with a major focus on biosecurity.

Separate standards have been elaborated on the basis of extensive stakeholder consultations for the following species groups: abalone; bivalves (clams, mussels, oyster, scallop); flatfish; freshwater trout; pangasius; salmon; seabass, seabream and meagre; seriola and cobia; shrimp; tilapia; and tropical marine finfish.[24] In addition, a joint standard for seaweed has been developed with the Marine Stewardship Council (a standard setting body for capture fisheries).

Each standard contains seven separate principles. While, the detail varies from species standard to species standard, the first standard is always "comply with all applicable laws and regulation", although all standards prohibit the culture of transgenic fish and provide that anti-biotics may only be used for therapeutic purposes. Similarly, while GMO use in fish feed is permitted, it must be documented. Each standard has very clear requirements relating to the social aspects of aquaculture including as

[24] See: www.asc-aqua.org/what-we-do/our-standards/farm-standards

regards child labour, forced labour, discrimination, health and safety and remuneration. The certification procedure begins with an initial audit, which requires 6–12 months' worth of data, followed by surveillance audits every 12 months for three years followed by a certification audit. Initial certification is undertaken by accredited certification entities, after which there is an annual surveillance audit.

3. National legal frameworks for aquaculture

Having examined the international normative framework for aquaculture, the aim of this chapter is to examine national legal frameworks for aquaculture and the role and evolution of aquaculture legislation within those frameworks.

3.1. Aquaculture legislation

Notwithstanding the growth in the sector, it's economic importance and its contribution to meeting food demand, aquaculture has long been treated as a subsidiary element of the capture fisheries sector.

At the national level aquaculture is typically still the responsibility of an aquaculture department or directorate that is one of a number of departments or directorates within a larger fisheries administration or agency (even if, as often happens, that administration now includes the word "aquaculture" in its formal name).

The same kind of approach holds true as regards "aquaculture legislation," in the sense of laws or acts of parliament (generically referred to in this study as "laws") or provisions in specific laws that have aquaculture as their primary focus. Indeed, while, as will be seen below, a number of jurisdictions have recently adopted specific aquaculture laws, in most countries aquaculture is still addressed in the basic fisheries law (even if it is called a "fisheries and aquaculture" law).[25] Very often, such a law contains a separate chapter on aquaculture. Sometimes, though, a single article or section in the fisheries law simply confers broad powers upon the government or the relevant minister to adopt subordinate legislation (in the form of regulations, rules, decrees, orders etc. depending on the jurisdiction concerned) on aquaculture.

[25] Sometimes the name is the other way around as in the case of Rwanda's Law N°58/2008 of 10/09/2008 Determining the Organization and Management of Aquaculture and Fishing in Rwanda.

There are, of course, entirely logical reasons for addressing aquaculture in a fisheries law. Expertise about fish and other aquatic animals and plants within government is typically found in the fisheries administration. Moreover, there are a number of linkages between captures fisheries and aquaculture. These include the stocking and transport of live fish, the interaction between farmed and wild stocks as regards fish diseases, escapes and interbreeding as well common provisions on the post-harvest handling of food fish. But the question arises whether the approach of addressing aquaculture in a fisheries law is still appropriate, especially given that in an increasing number of countries, aquaculture production now exceeds capture fishery production (FAO, 2022).

From a legal perspective there is, of course, nothing wrong or incorrect in legislating on aquaculture in a fisheries law. Subject only to constitutional constraints and obligations under international law, legislatures are broadly free to adopt laws as they wish. Nevertheless, there are a number of implications that may be worth considering.

A first point concerns the overall legal framework within which aquaculture takes place. A fisheries law is, generally speaking, a somewhat stand-alone text. As a result, fishing in the sense of searching for and catching fish, usually takes place largely in accordance with the provisions of such a law and relevant subordinate legislation (see Box D).

Box D
Gone fishing

In order to undertake commercial fishing at sea an individual fisher usually needs either a personal fishing licence or a licence for the fishing vessel that s/he will use. Such licences are issued in accordance with the fisheries law. The fisheries law may sometimes require the registration of smaller fishing vessels while larger ones will often also need to be registered in accordance with the relevant merchant shipping law. Fishing vessels may also be subject to rules on lighting, navigation, safety requirements etc contained in merchant shipping legislation, and of course laws relating to employment and the commercial aspects of running a fisheries business will also apply. But that, usually, is it. An individual fisher basically fishes in accordance with the terms of the licence and subordinate legislation adopted pursuant to the fisheries law.

While there are increasing linkages between fisheries legislation and environmental legislation, reflected for example in the ecosystem approach to fisheries management (EAFM) (FAO, 2021), and marine spatial planning legislation, the impacts of these linkages is usually manifested in the manner in which the fisheries legislation, is implemented. For example, marine spatial planning legislation or protected area legislation may specify where fishing can and cannot take place, but this is typically reflected in a fisheries management plan and implemented through fisheries legislation in terms of regulations adopted under the fisheries law and the conditions that apply to each fishing licence. An individual fisher does not usually require an environmental licence or a separate permit to use a specific area of marine space.

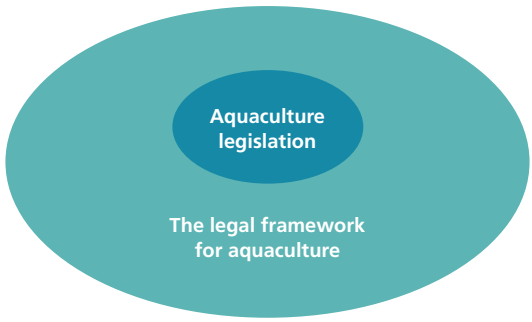
Aquaculture, though, is quite different to capture fishing. First of all, it is a farming rather than a hunting activity. And second, as will be discussed in the next part, aquaculture is subject to a range of different laws that do not have aquaculture as their primary focus.

3.2. The legal framework for aquaculture

In analysing the legal framework for aquaculture, it is important to distinguish between: (1) aquaculture legislation in the sense of laws or elements of laws that specifically address aquaculture; and (2) the broader legal framework within which aquaculture takes place. This broader legal

framework includes aquaculture legislation, of course, but also other legislation that is relevant to aquaculture including legislation on land tenure and water tenure, spatial planning, environmental protection and navigation, as well as laws on animal health, plant health, medicines, chemicals, the veterinarian profession and food safety (see Figure 1).[26]

Figure 1
Aquaculture legislation and the legal framework for aquaculture



The legal framework for aquaculture is complex by any standard.

A good example of this complexity is provided on the *Business Queensland* aquaculture website of the Queensland Government in Australia (see Table 1)[27] which shows: (a) in the third column the range of different laws that relate to the issuance of an aquaculture licence in the cases where land use planning/development consent is not needed; and (b) in the second column, the number and types of approval that are needed. Two additional points to note are that: (1) a separate (similarly sized) table applies with regard to activities that also require planning/development consent; and (2) the website clearly indicates that the table is only for guidance and that other agencies may also be involved in approving aquaculture activities!

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[26] In fact, the situation is even more complex than shown in Figure 1, given that the legal framework for aquaculture is itself implemented within a broader legal framework for business/commercial activity as regards such matters as company formation, the need for specific business licences, tax and accounting rules etc. The focus of this study, however, is limited to the legal framework for aquaculture.

[27] www.business.qld.gov.au/industries/farms-fishing-forestry/fisheries/aquaculture/policies-licenses-fees/licensing-approvals/regulations-non-development, accessed on 6/07/2022.

Table 1
Permits/approvals needed for aquaculture in Queensland

Activity	Approval type	Legislation	Assessing Agency
Access/use of terrestrial land	Tenure	*Land Act 1994*	Department of Natural Resources, Mines and Energy (DNRME)
Access/use of tidal land for aquaculture activities (other than inlet / outlet)	Resource allocation authority (RAA)	*Fisheries Act 1994*	Fisheries Queensland
Access/use of tidal land for aquaculture activities (other than inlet / outlet)	Works in a marine park	*Marine Parks Act 2004*	Access/use of tidal land for aquaculture activities (other than inlet/outlet)
Access/use of tidal land	Permit to occupy	*Land Act 1994*	DNRME
Discharge into the Great Barrier Reef Marine Park for land-based aquaculture adjacent to the Great Barrier Reef	The Australian Government has accredited Queensland laws under these regulations, allowing for a single assessment process	*Great Barrier Reef Marine Park (Aquaculture) Regulations 2000*	No separate assessment by GBRMPA if complies with accreditation details.
Potential impacts to matters of national environmental significance (World Heritage properties, national heritage places, wetlands of international importance [Ramsar wetlands], threatened species and ecological communities, migratory species, and Commonwealth marine areas)	Assessment under *Environmental Protection and Biodiversity Conservation Act 1999*	*Environmental Protection and Biodiversity Conservation Act 1999*	Commonwealth Department of the Environment and Energy

Table 1 *(cont.)*
Permits/approvals needed for aquaculture in Queensland

Activity	Approval type	Legislation	Assessing Agency
Collection of regulated species from the wild	Fishing licence General fisheries permit (GFP)	*Fisheries Act 1994*	Fisheries Queensland
Collection of regulated species from the wild	Permit for take of protected species	*Environmental Protection and Biodiversity Conservation Act 1999*	Commonwealth Department of the Environment and Energy
Collection of regulated species from the wild	Permit for take of protected species	*Great Barrier Reef Marine Park Act 1975*	GBRMPA
Translocation of aquatic animals into Queensland from other states	Translocation approval	*Fisheries Act 1994*	Fisheries Queensland
Importation of aquatic animals from outside Australia	Import permit	*Quarantine Act 1908*	Commonwealth Department of Agriculture
Food safety (if product is for human consumption)	Compliance with Food Safety Program	*Food Act 2006, Food Production (Safety) Act 2000*	Safe Food Queensland Queensland Health
Stocking of public dams and impoundments	General fisheries permit (GFP)	*Fisheries Act 1994*	Fisheries Queensland

Source: www.business.qld.gov.au/industries/farms-fishing-forestry/fisheries/aquaculture/policies-licences-fees/licensing-approvals/regulatory-framework

But the case of Queensland is by no means unusual and in fact it only shows part of the picture as it is mainly concerned with the planning and approval process rather than the operation of aquaculture facilities.

Analysis of the legal frameworks for aquaculture in Indonesia, Malaysia, Thailand and Viet Nam undertaken during the preparation of this study

showed in each case an extremely long list of laws and subordinate legislation. See, for example, Box E which sets out the laws (i.e. not including subordinate legislation) relevant to aquaculture in Thailand.

Box E
The legal framework for aquaculture in Thailand

1. The Act on the Promotion of Marine and Coastal Resources Management, B.E. 2558 (2015)
2. The Agricultural Commodity Standards Act, B.E. 2551 (2008)
3. The Agricultural Land Consolidation Act, B.E. 2558 (2015)
4. The Agricultural Land Reform Act, B.E. 2518 (1975)
5. The Animal Epidemics Act, B.E. 2558 (2015)
6. The Animal Feed Control Act, B.E. 2558 (2015)
7. The Civil and Commercial Code, B.E. 2468 (1925)
8. The Contract Farming Promotion and Development Act, B.E. 2560 (2017)
9. The Cooperatives Act, B.E. 2542 (1999)
10. The Cooperatives Act (No. 2), B.E. 2553 (2010)
11. The Cruelty Prevention and Welfare of Animal Act, B.E. 2557 (2014)
12. The Drugs Act, B.E. 2510 (1967)
13. The Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992)
14. The Food Act, B.E. 2522 (1979)
15. The Groundwater Act, B.E. 2520 (1977)
16. The Hazardous Substance Act, B.E. 2535 (1992)
17. The Land Code Act, B.E. 2497 (1954)
18. The Land Lease for Agriculture Act, B.E. 2524 (1981)
19. The Plant Quarantine Act, B.E. 2507 (1964)
20. The Public-Private Partnership Act, B.E. 2562 (2019)
21. The Royal Ordinance on Fisheries, B.E. 2558 (2015)
22. The Royal Ordinance on Fisheries (No. 2), B.E. 2560 (2017)
23. The State Administration Act, B.E. 2534 (1991)
24. The State Irrigation Act, B.E. 2485 (1942)
25. The Town Planning Act, B.E. 2562 (2019)
26. The Water Resources Act, B.E. 2561 (2018)

At the level of implementation, the situation can be further complicated by decentralization policies or programmes that devolve decision making and regulatory powers relating to aquaculture to local governments, thereby adding another layer of legislation and another set of actors.

The complexity of the legal framework for aquaculture has a number of important implications. First of all, simply understanding the legal framework for aquaculture can be a challenge even for those who are responsible for its implementation. As noted in Chapter One, because the topic is complex in the first place and because different agencies are involved in implementing different laws, administrators and their legal advisers often work in "siloes", expert on the legislation for which they are responsible but not so familiar with the other aspects of the legal framework for aquaculture.

Second, given that aquaculture legislation is only one part of the legal framework for aquaculture it is clear that analysing and, as necessary, improving aquaculture legislation on its own will not be sufficient. It is instead necessary to take a holistic approach in order to analyse and understand the entire legal framework for aquaculture. It follows, too, that adopting a modern, comprehensive and notionally "perfect" aquaculture law may not be sufficient by itself unless that law makes clear and appropriate legal linkages to the other elements of the legal framework for aquaculture.

Third, the complexity of the legal framework can be problematic for investors and actually hinder the growth the of the sector. In particular the need to obtain different approvals from different agencies in accordance with the different laws that make up the legal framework for aquaculture, as well as the need to coordinate decisions and approvals, can be costly and time consuming. European Union studies have found, for example, that licensing systems within the European Union's Members States can be lengthy and costly, that the legislation and administration are complex and overlapping and that outcomes are consequentially uncertain (European Commission, 2021).

The truth is that increasingly complex legal and regulatory frameworks are simply a fact of modern life. Indeed, many elements of the legal framework for aquaculture are also relevant to other types of business seeking to set up activities that use freshwater resources or which are located in coastal or nearshore areas.[28] There are also important differences, not least the fact that while aquaculture is a potential source of environmental harm, the sector itself can only function sustainably within a healthy environment. A robust and effective legal framework for environmental management is therefore also necessary for sustainable aquaculture. At the same time, ensuring the health of aquatic animals and plants used in aquaculture and the health of aquaculture products is not some kind of optional "extra" for the sector but rather lies at the heart of its economic sustainability.

Fully de-regulating the sector through a notional "bonfire of regulations" is simply neither a viable, nor a desirable, option. The different elements of the legal framework for aquaculture exist for very sound reasons (the allocation of land and water, spatial planning, environmental protection, animal and plant health and so on). At the same time, another recent paper found that in Africa, where there is a need for aquaculture development due to falling per capita fish supplies, the lack of an enabling policy environment is one of the main constraints to sector growth (Troell *et al.*, 2014).

In short, relatively complex legal frameworks are necessary for the sustainable development of a complex sector. What aquaculture laws can do is to create clear linkages between the different elements of the legal framework for aquaculture so as to enable, as far as possible, a logical and coherent set of rules and procedures for the sector. However, here too a challenge arises mainly due to the manner in which aquaculture legislation has typically developed in different countries around the world.

[28] A marina, a commercial port, a boatyard, a resort, a desalination plant would all likely be subject to many of the same laws in terms of spatial planning, environmental protection, navigation, land tenure the use of public land under water and in the nearshore.

3.3. The (typical) evolution of aquaculture legislation

As noted above, in a majority of countries aquaculture is addressed in the basic fisheries law. For example, in Malaysia aquaculture legislation at Federal level is contained in the Fisheries Act 1985. The Fisheries Act contains definitions of "aquaculture" and "culture system" in its Section 2, while aquaculture is the topic of Part VIII, one of 11 parts of the act. However, Part VIII contains only two sections. Section 39 imposes a duty on the Director General appointed under the Fisheries Act to promote the development of aquaculture (in consultation with the relevant State Authority as regards freshwater aquaculture). Section 40 of the act establishes a permitting regime for the import and export of live fish the movement of live fish across state/territory boundaries within Malaysia which is obviously of relevance to aquaculture (but also of relevance to stocking activities). And finally, Section 61 confers power upon the minster to adopt subordinate legislation to "promote and regulate aquaculture in maritime waters", to provide for and improve the collection of statistics and to require any person engaged in aquaculture, as well as fishing, marketing and processing to supply such information as may be required.

Given that it contains 62 sections in total, the Fisheries Act clearly does not create a very elaborate legal framework for aquaculture. Yet this kind of approach, sometimes with a little more detail, is quite common: a chapter in a fisheries law followed up with a series of more detailed items of subordinate legislation devoted solely to aquaculture. Again, there is nothing unusual in this: the extensive use of detailed subordinate legislation to address the technical aspects of fisheries management as well as fishing activities themselves is a common feature of fisheries legislation. However, this approach has important implications for the aquaculture sector.

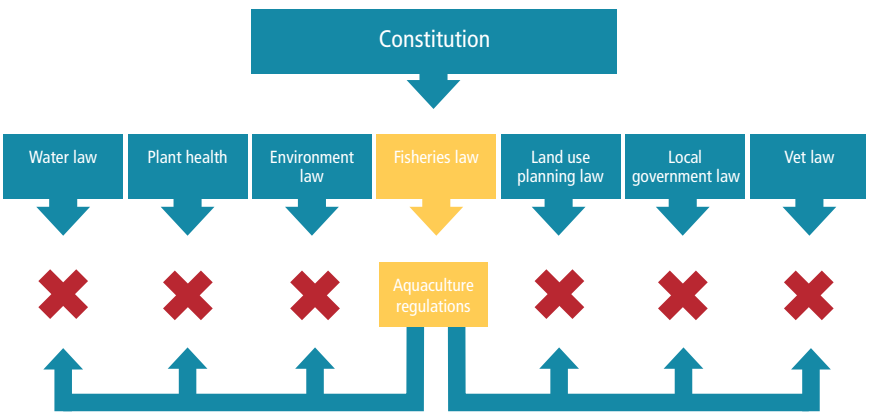
a) Linkages to the legal framework for aquaculture

Given that aquaculture takes place within a far more complex legal framework than capture fisheries (as briefly described in Box D above), a key function for aquaculture legislation should be to create linkages with the other elements of the framework. And here a particular challenge can arise, one that highlights the basic difference between fishing, which

takes place almost exclusively within the legal framework for fisheries (in the sense of the law, subordinate legislation and licensing regime) of the fisheries law itself, and aquaculture which takes place within a broader legal framework.

The key point here is that it is legally difficult, if not impossible, to use subordinate legislation adopted pursuant to an aquaculture law to make the necessary linkages with the laws that comprise the other elements of the legal framework for aquaculture. And it is equally impossible to alter such laws using such subordinate legislation. The notion of the hierarchy of laws, found in all legal systems, typically places the constitution as the apex law that over-rides all other types of laws. Next comes primary legislation in the form of laws adopted or approved by the legislature. Below that comes subordinate legislation in the form of regulations, decrees, orders, rules etc. In accordance with the notion of the hierarchy of laws subordinate legislation cannot be used to modify a law (seed Figure 2).

Figure 2
Subordinative legislation adopted pursuant to aquaculture legislation cannot be used to modify laws that comprise the other elements of the legal framework for aquaculture



Moreover, even if in legal theory a lawfully adopted item of subordinate legislation is legally binding in the sense that it has the force of law, in practice in many countries government officials have a habit, rightly or wrongly, of focusing on the primary and subordinate legislation that is implemented by the ministry that they work for and disregarding the regulations of other ministries (even if they are aware of their existence).

In short, using regulations adopted pursuant to an aquaculture law to coordinate activities with other elements of the legal framework for aquaculture does not create a very robust legal framework and is not likely to be successful. And using regulations adopted pursuant to an aquaculture law to change provisions in other laws, is simply not possible. In order to create effective linkages between aquaculture legislation and the other elements of the legal framework for aquaculture, primary legislation is necessary.

b) Licensing

The extensive use of regulations is not the only feature of capture fisheries legislation that has been copied over to aquaculture.

The other feature is that licensing[29] has emerged as the main regulatory tool for the aquaculture sector. At a conceptual level this may seem unusual. After all, fishing is a hunting activity to be licensed while aquaculture is a farming activity that involves the private property of the farmer. Aquaculture farmers typically purchase fry and brood stock just as terrestrial livestock farmers buys calves or lambs. Yet while terrestrial farmers may be required to register their activities, particularly when they farm products that will be used for food, they are seldom if ever licensed as farmers, in the manner of, say, a "licensed sheep farmer" or a "licensed cabbage farmer".

And so, a first question is whether or not a licensing approach is appropriate or necessary for farming in water when it is not used for farming on

[29] In this paper the term licence is used to refer to any legal document that authorizes a given activity irrespective of the name used (e.g. permit, permission, consent, authorization etc.) and the term licensing is used to refer to the procedure for issuing such a document. A licence, in this sense, is usually personal to the holder although it may be capable of being transfer to a third party with the approval of the body that issued it.

land? Indeed, is licensing the only legal tool that can be used to regulate aquaculture? In order to answer this question, it is useful to examine the other regulatory tools that are notionally available to legislators.

Box F
The legal framework for aquaculture in the European Union

Neither an association of States nor an international organization, the European Union is a unique body. It's 27 Member States,[30] which remain independent and sovereign, have transferred legislative competences in a number of specific areas to the European Union in, accordance with the European Union's Treaties in order to gain greater collective strength and influence in areas best addressed through cooperation. Consequently, the European Union is able to adopt legislation to give effect to policies adopted at the European level. Two types of legislation are relevant to aquaculture: "directives" and "regulations". Regulations are of a binding nature and directly effective, while Directives set out the basic objectives to be achieved while leaving it to each Member State to adopt its own national legislation to give effect to those objectives.

The European Union legal framework for aquaculture is extensive and complex, comprising two main areas. The first concerns environment and includes: the Water Framework Directive (Directive 2000/60/EC); the Marine Strategy Framework Directive (Directive 2008/56/EC); the Decision on Good Environmental Status (Decision 2017/848/EC); the River Basin Management Plans; the Birds and Habitats Directives (Directive 2009/147/EC and Directive 92/43/EEC); the Industrial Emissions Directive (Directive 2010/75/EU); the Regulation concerning the use of alien and locally absent species in aquaculture (Regulation (EC) No. 708/2007) and the Regulation on invasive species (Regulation (EU) 1143/2014); the Environmental Assessment Directive (Directive 2011/92/EU); and the Strategic Impact Assessment Directive (Directive 2001/42/EC) and the Maritime Spatial Planning Directive. In addition, specific legislation for organic production promotes, through certification and labelling, organic aquaculture that complies with stricter production requirements on environmental impact and animal welfare, as

[30] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, France, Germany, Finland, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Kingdom of the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

Box F *(cont).*

well as limited and regulated use of external inputs (Council Regulation (EC) No. 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control). The second main area primarily concerns animal health and includes Regulation (EU) 2016/429 on transmissible animal diseases ("Animal Health Law"), applicable from 21 April 2021; Council Directive 90/167/EEC of 26 March 1990 laying down the conditions governing the preparation, placing on the market and use of medicated feeding stuffs in the Community; Regulation (EU) 2019/6 of the European Parliament and of the Council of 11 December 2018 on veterinary medicinal products and repealing Directive 2001/82/EC; Regulation (EU) 2019/4 of the European Parliament and of the Council of 11 December 2018 on the manufacture, placing on the market and use of medicated feed. Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed; Council Regulation (EC) No. 834/2007 on organic aquaculture animal and seaweed production.

Because aquaculture is a competence that is shared between the European Union and the Member States, European Union aquaculture legislation, as such, is rather limited, comprising a single chapter, Chapter VII, in the "Basic Regulation" which sets out the EU's common fisheries policy (Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy). Chapter VII in turn contains a single article that requires the European Commission to prepare non-binding Union strategic guidelines on common priorities and targets for the development of sustainable aquaculture activities that must aim at: (a) improving the competitiveness of the aquaculture industry and supporting its development and innovation; (b) reducing the administrative burden and making the implementation of Union law more efficient and responsive to the needs of stakeholders; (c) encouraging economic activity; (d) diversification and improvement of the quality of life in coastal and inland areas; (e) integrating aquaculture activities into maritime, coastal and inland spatial planning. The European Union Member States must also prepare multi annual national strategic plan for the development of aquaculture activities.

c) ... and other legal regulatory tools

Other regulatory tools are actually or potentially relevant for aquaculture legislation include:

Environmental impact assessment

Environmental impact assessment (EIA) is a decision-making support tool that is usually used to ensure that the potential environmental impacts of a planned project are taken into account during the authorization process and, as necessary, to identify potential mitigation measures. EIA legislation typically provides that a full EIA is only necessary for larger more environmentally harmful projects and usually sets out screening processes accordingly. As will be seen below, depending on the scale of a proposed project, EIA certainly can be relevant to the aquaculture sector particularly in terms of siting decisions. However, while an individual EIA can identify the potential negative environmental impacts of a proposed project and appropriate measures to prevent or mitigate such impacts, to be capable of application and enforcement such measures need to be translated into legally binding rules relating to the proposed project. There are two basic options for creating legally binding rules: subordinate legislation or the inclusion of conditions in a licence. Moreover, because each EIA is undertaken for a particular project and place, measures to prevent or mitigate negative environmental impacts will typically be specific to that project and place meaning they are best translated into specific licence conditions. In other words, EIA by itself cannot be used to control the routine operation of an aquaculture facility in order to prevent or mitigate negative environmental impacts.

A similar type of approach, sometimes called a strategic environmental assessment (SEA), can be used to evaluate the potential environmental impacts of new plans, policies and programmes including aquaculture development policies and spatial planning tools.

Liability regimes

While ordinary civil liability regimes provide the basis for imposing responsibility for wrongful or accidental damage to a person's health,

business or property, usually through the payment of damages (financial compensation), environmental liability regimes seek to impose financial liability upon those who cause harm to the environment and/or natural resources through, for example, causing pollution. The amount or quantum of financial damages that must be paid in this case is usually calculated by reference to the costs of remedying the environmental harm.

Specific liability regimes have been developed in a number of countries, particularly in respect of more environmentally harmful activities or those using hazardous substances. Such regimes can include the imposition of strict liability (under which it is not necessary to prove fault), relaxed rules on proving causation and the development of statutory funds to cover any eventual "clean up" costs, for example through requiring operators to provide bonds or other financial guarantees.

In the case of aquaculture, the ordinary rules of civil liability would theoretically apply if an aquaculture facility caused wrongful damage to a person's health, business or property, although in practice it may be difficult to see how such a claim could arise. Evidently, aquaculture could cause environmental damage in terms of pollution or as a result of the escape of non-native, invasive species and in theory an aquaculture farmer could be held liable for the clean-up or remediation costs. In practice, though, particularly as regards invasive species, remediation may be extremely difficult (if not impossible) and the ex-post facto risk of civil liability may not be sufficient to ensure environmentally responsible aquaculture. In short, relying on a liability regime alone is not likely to be sufficient. Nevertheless, as will be seen below, liability regimes have a potential role to play in ensuring effective environmental management of aquaculture facilities.

Market-based mechanisms

Market-based mechanisms use economic incentives to promote more efficient and more effective regulation of the activities impacting the environment and natural resources. In the context of capture fisheries management, the discussion of market-based mechanisms has tended to focus on the notion of individual transferable catch quotas, but these have little relevance to aquaculture where aquatic animals and plants being

cultivated are privately owned. It is also difficult to see how other types of market-based mechanism such as deposit-refund schemes, extended producer responsibility and charging mechanisms to reduce waste or consumption, could be of much relevance to aquaculture.

Public participation and co-management

The importance of involving the public in decision making through consultation procedures is increasingly understood in all-natural resource and environment sectors and there is no reason why this principle should not be extended to aquaculture. On the other hand, though, public participation has its limits: participation in what? In practice participation is usually in decisions relating to applications for licences and permits.

Under co-management approaches, stakeholders are involved in making decisions relating to the management of fisheries and other natural resources. However, a key point to note is that these are public resources whereas the most important aquaculture resources, aquatic animals and plants, are privately owned. There are, as will be seen below, examples of joint management of aquaculture areas that can play a role in aquaculture management, but these are quite different to traditional co-management approaches.

Voluntary approaches

Voluntary approaches are a feature of the management of many natural resource and environment sectors and include industry sponsored codes of conduct, certification schemes and eco-labelling schemes. Indeed, because of their voluntary and private nature it can be argued that these are not regulatory tools at all. In the case of aquaculture, though, as already seen, certification and ecolabelling schemes already play a significant role in the sector. However, as also seen, the first standard of the ASC certification scheme is to required compliance with the requirements of "all applicable laws and regulations". In other words, while voluntary approaches clearly have an ongoing role to play in the aquaculture sector, it is not realistic to suppose that they could ever supplant the need for formal regulation.

Information systems and data access rights

Data is essential for the management of any sector that uses natural resources sector, including aquaculture where key elements are privately owned. Similarly, information systems, starting from basic data about the sector and how it is managed, through to the legal rules under which members of the public can access relevant data, can play a hugely important role in promoting effective and transparent management. Again though, information systems and rights to access data, are clearly not sufficient in themselves to effectively regulate the sector.

...and back to licensing and regulation

In conclusion while most of the other regulatory tools have some role to play in creating legal frameworks for sustainable aquaculture, the very nature of aquaculture is such that regulation is necessary. This is mainly because, unlike land-based agriculture, the same water that is the medium of production is also the potential medium of escape. Of course, livestock can escape from a terrestrial farm, but they are much more likely to be recovered while the chances of environmental harm from the discharge or pollution of aquaculture facilities or the escape of diseased or non-native species are far greater. In other words, in terms of environmental and biosecurity impacts, a rational case can be made for the need for the regulation of aquaculture facilities.

In this regard the most effective tool is the licence or permit which can not only be used to determine whether or not aquaculture can be undertaken at a given place but also, through the inclusion of detailed provisions in the licence or permit, to determine how aquaculture is to be undertaken (as regards, say, the type of species that may be farmed, the concentration of animals within a given facility and measures to prevent escapes). However, as will be discussed in more detail below, while the issuance of licences or permits is usually feasible as regards larger-scale aquaculture facilities, licensing small scale facilities may be a significant challenge in developing countries in particular meaning that greater use must be made of generally application subordinate legislation in terms of setting and enforcing standards.

d) The reactive evolution of aquaculture legislation

Another issue to be considered in analysing the substantive content of aquaculture legislation is the dynamism and evolution of the sector. One result is that aquaculture legislation often plays the role of catching up with the sector rather than leading its development.

In many countries, for example, environmental considerations have been reflected in (revised) aquaculture legislation as a result of negative environmental impacts and resulting public criticism of the sector. In the same way aquaculture legislation has often been reformed (strengthened) to address biosecurity in a more serious manner, only after devasting disease outbreaks. In Chile, for example, the infectious salmon anaemia crisis in 2007 was a turning point that triggered revision of the aquaculture legislation to place a much greater emphasis on animal health and the environmental impacts of the sector (see Box G) (Fuentes Olmos and Engler, 2016).

In a sense this is not surprising. Legislative time is valuable, and politics is typically responsive to problems. It follows, that in a jurisdiction where there is little in the way of aquaculture activity it may be hard to argue for the adoption of comprehensive aquaculture legislation unless that is part of a clear government policy to promote the growth of the sector. It is also the case that the particular focus of aquaculture legislation may depend on both the type of aquaculture undertaken and the socio-economic development of the country concerned, particularly in terms of civil society activism as regards the protection of the environment.

Box G
The evolution of aquaculture legislation in Chile

During an early phase, the regulatory framework focused on promotion of the aquaculture industry, allowing only minimal government intervention (a view consistent with the liberal economic vision enshrined in the Chilean Constitution). This regulatory context soon became a challenge for a mature industry. Social conflict, environmental degradation and sanitary emergencies made the need for reform evident, in some cases, dramatically so. A first dedicated legal framework for aquaculture was set up under the General Fisheries and Aquaculture Act in 1991 which included innovative provisions regarding (1) coastal zone use, (2) environmental measures for aquaculture and (3) measures to prevent, control and eradicate high risk diseases and plagues while maintaining the earlier aquaculture licensing regime alongside a marine leasing regime under the Ministry of Defence for the use of marine areas. It also introduced a planning regime that set out "areas suitable for aquaculture" (ASA) and conferred broad regulation making powers on the minister responsible for aquaculture. However, while environmental regulations and animal health regulations were adopted, implementation and enforcement were challenging for a number of reasons including resource constraints and legal and institutional difficulties with the result that the regulatory framework was not able to deter unsustainable aquaculture practices. In 2007 an infectious salmon anaemia (ISA) outbreak was detected which rapidly turned into a crisis for the sector. The Aquaculture Reform Act of 2010 amended the General Fisheries and Aquaculture Act by, among other matters: giving clear legal recognition to regional coastal zone plans and by requiring the harmonization of these plans with the ASAs; establishing minimum mandatory distances between aquaculture facilities/ introducing a five-year moratorium on new leases; reducing the duration of leases to 25 years and making renewal conditional on good environmental performance; strengthening provisions on escapes including by introducing a presumption of environmental damage and strengthening provisions on environmental reporting; introducing the concept of "aquaculture neighbourhoods" and zones as the basis for managing aquatic animal health, within which operators: (a) must coordinate the management of their facilities; and (b) can by majority decision adopt binding rules for the neighbourhood; conferring power on the aquaculture administration to set facility and stock densities by reference to biosecurity "scores"; stronger provisions on sanctions for non-compliance.

In short, in terms of legislative reform, aquaculture is a relatively dynamic sector. And in examining national practice around the world, there is a clear trend towards the adoption of separate aquaculture laws.

e) Towards the adoption of separate aquaculture laws?

As set out in Table 2, separate aquaculture laws have been adopted in some 20 countries. Most of these laws are relatively recent, adopted since the turn of the century. In Morocco, India and Sri Lanka the focus of such legislation is on a specific institution in the form of an aquaculture development agency. In the other cases listed in Table 2, the aquaculture legislation sets out a relatively complete framework for the aquaculture sector, albeit one that has very clear links to the other elements of the broader legal framework for aquaculture.

Table 2
Separate aquaculture laws

Australia	South Australia, Aquaculture Act 2001 Tasmania, Marine Farming Planning Act 1995
Canada	Newfoundland, Aquaculture Act, 1987 c15 s1 New Brunswick, Aquaculture Act, 2011 Quebec, Law on Commercial Aquaculture, 1 January 2003
Croatia	Law on Aquaculture, 15 December 2017
Cyprus	Aquaculture Law of 2000, No. 117 of 2000
Greece	Law No. 4282 on Aquaculture Development
Guinea	Law No. 2015/28 on the Aquaculture Code
Iceland	Aquaculture Act, No. 71/2008
India	Coastal Aquaculture Authority Act, 2005 Andhra Pradesh, Andhra Pradesh Aquaculture Seed (Quality Control) Act, 2006 Tamil Nadu, Tamil Nadu Aquaculture (Regulation) Act, 1995

Table 2 *(cont.)*	
Japan	Sustainable Aquaculture Production Assurance Act (Act No. 51 of May 21, 1999)
Madagascar	Law nº 2001-020 on the responsible and sustainable development of prawn aquaculture
Morocco	Law No. 52-09 establishing the National Aquaculture Development Agency
Myanmar	Law on Aquaculture, 1989
Namibia	Aquaculture Act, 18 of 2002
Norway	Act No. 79 on Aquaculture, 2005
Peru	Legislative Decree No. 1195 of 2015 approving the General Law on Aquaculture
Portugal	Decree-Law No. 40/2017 of April 4
Sri Lanka	Aquaculture Development Authority of Sri Lanka Act
Tonga	Aquaculture Management Act, No. 15 of 2003
Ukraine	Law No. 5293-VI "On Aquaculture"
United States of America	National Aquaculture Act of 1980 Marianas, "Commonwealth Aquaculture Development Act of 2006."

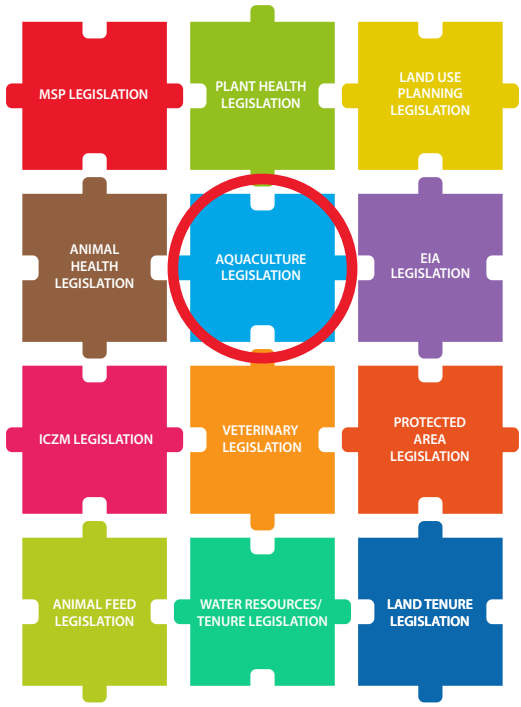
At the time of writing, Canada is preparing a specific federal aquaculture law to take account of the fact that aquaculture is subject to "a complicated regulatory system with inconsistent requirements across the country" and that the basic Federal aquaculture legislation, the Fisheries Act, "was designed for wild capture fisheries and does not reflect the distinct needs of aquaculture" (Fisheries and Oceans, Canada, 2020).

In determining whether or not separate aquaculture legislation should be adopted, there will typically be a number of factors to take into consideration.

First, there is the relative size of the aquaculture sector. If the sector is very small compared to the capture fisheries sector, then in simple political terms, given that the adoption of legislation has a political cost, separate legislation may simply not be a viable option. On the other hand, if aquaculture has become, or is starting to become, an important sector in its own right then separate legislation may be justified, not least because future growth in capture fisheries is likely to be limited whereas aquaculture often still has growth potential. Indeed, separate aquaculture legislation in the form of an aquaculture law can play an important role in promoting future growth by demonstrating clear political support for the aquaculture sector as well as setting out a clear path for its development and management.

The purpose of a separate aquaculture law evidently cannot be to replace the other elements of the legal framework for aquaculture. However, such a law can be used to ensure that the legal framework for aquaculture is appropriate for the development of the sector in particular through creating the necessary linkages with the other elements and as necessary ensuring that such legislation takes into account the specificities of the sector.

Figure 3
The puzzle – linking aquaculture legislation to the other elements of the legal framework for aquaculture



Of course, more detailed provisions on aquaculture could be included in a longer chapter on aquaculture in a fisheries law. One result of such an approach could be a rather lengthy text: as a general trend, fisheries laws are becoming longer as more detail is added as to how fisheries should be managed, including as regards the implementation of the EAFM, and more emphasis is placed on enforcement not least as part of the ongoing struggle against illegal, unregulated and unauthorized (IUU) fishing.

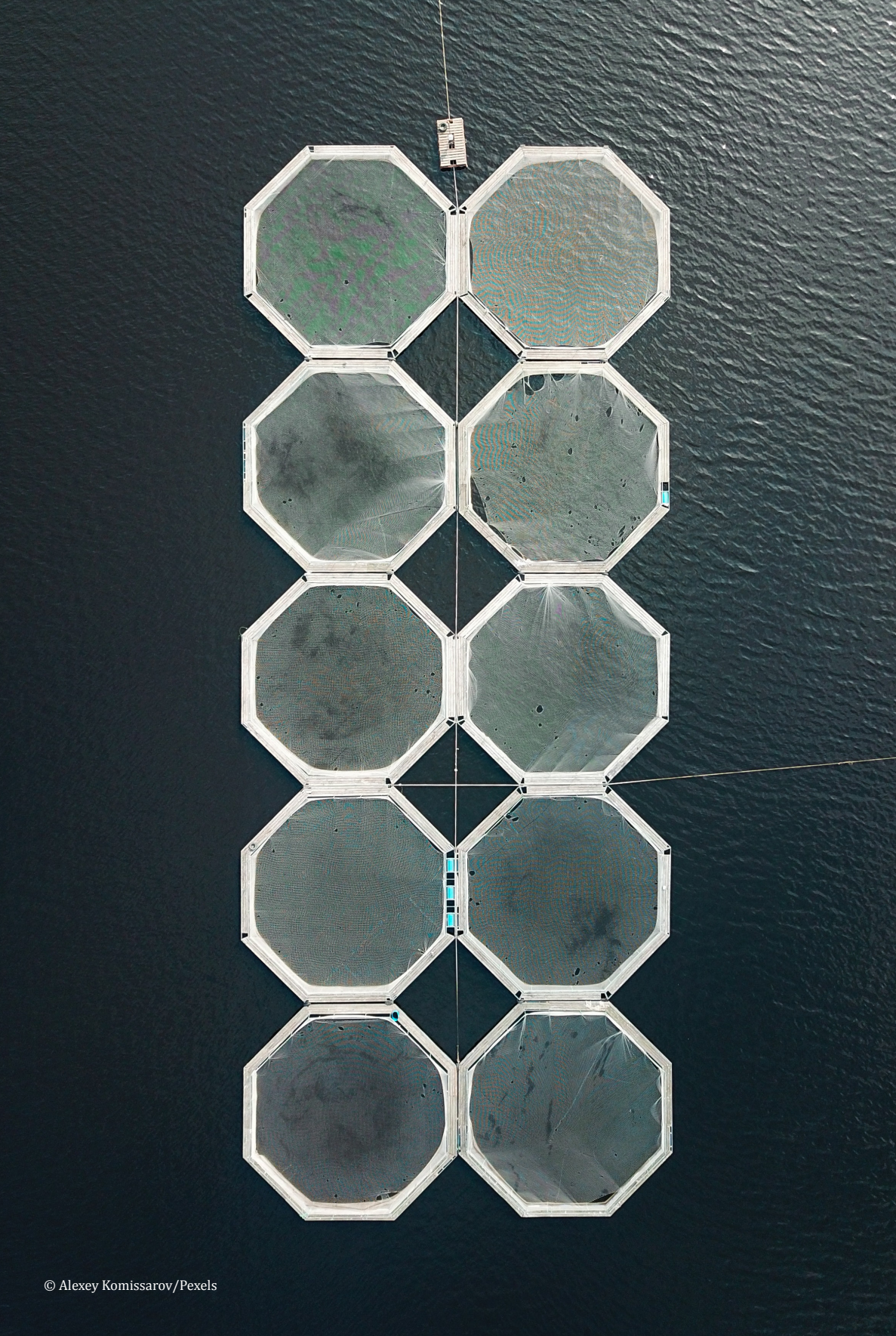
At a theoretical level the case for separate legislation seems quite strong given the fundamental differences between captures fisheries and aquaculture. On the other hand, though, elements of fisheries legislation may also be relevant to aquaculture (including as regards the transport of

live animals and post-harvest requirements) and the extensive provisions on inspection and enforcement typically found in fisheries laws will also be necessary in an aquaculture law.[31]

Ultimately it is for each jurisdiction to determine which approach to take. What is interesting, though, about the countries that have adopted specific aquaculture laws, is the fact that the need to better coordinate both the sector and the legislation with other sectors is typically described either as an objective of the law itself or in other government documents as a key reason why such laws have been adopted. For example, Section 3 of the Newfoundland Aquaculture Act, 1987 includes minimizing "conflicts with competing interests and uses" and "helping in consultative and co-operative decision making within the province and between the government of the province and the Government of Canada" among the purposes of the act. And, as will be seen below, a key feature of several of the laws is to reduce the administrative burden through "one stop shop" procedures to coordinate the issuance of the licences and permits necessary for aquaculture development.

Irrespective of whether or not a jurisdiction decides to adopt a separate aquaculture law, it is nevertheless possible on the basis of national legislative practice to identify the necessary elements of a legal framework for sustainable aquaculture including the issues that should be addressed in aquaculture legislation. This is the topic of the next chapter of this study.

[31] There is, in fact, a counter example in the case of New Zealand where the Marine Farming Act, 1971 was repealed by the Aquaculture Reform (Repeals and Transitional Provisions) Act 2004, which was in turn further amended in 2011 with the overall objective of bringing the regulation of aquaculture within the overall framework for natural resources management contained in the Resources Management Act, 1991. In fact, New Zealand is a rather special case given the uniquely comprehensive scope of the Resources Management Act, a legislative approach that few if any other countries have followed. At the same time New Zealand also has in place a comprehensive Biosecurity Act.



4. Key elements of a legal framework for sustainable aquaculture

As seen in Chapter Two, Article 9.1.1 of the Code of Conduct calls on States to "establish, maintain and develop an appropriate legal and administrative framework" to facilitate responsible aquaculture development.

The aim of this chapter is to identify and describe the key elements of an appropriate legal framework for responsible aquaculture development, one that promotes environmentally, socially, and commercially sustainable aquaculture. In other words, it seeks to identify: (1) issues that should be addressed in an aquaculture law; and (2) issues that should be addressed elsewhere in the legal framework for aquaculture. Depending on the jurisdiction concerned, these issues may be contained in an environmental law, a natural resources law, a water resources laws, land tenure laws, land use planning laws, a marine spatial planning law, a coastal zone management law, a maritime zone law, a navigation law, a specific biosecurity law, a specific biosafety law, a food law, a medicine law, an animal health law, a public health law, a plant health law, a veterinary law, a chemicals laws, a pesticides law and so on. A key point to note is that there is no consistency of approach in terms of which law is used to address which issue. For example, the same issue may be addressed in one country in a biosecurity law, in another country in an animal health law and in a third country in a veterinary law or a public health law and so on.

The term "aquaculture law", or "aquaculture legislation", is used to mean the principal law or act of parliament that contains specific provisions on aquaculture (such as an aquaculture law or fisheries and aquaculture act).[32] The term "aquaculture regulations" is used to mean subordinate legislation adopted on the basis of an aquaculture law. Where possible, legislation

[32] In other words, an 'aquaculture act' adopted in a common law jurisdiction is described as an aquaculture law. However, respecting the practices of the different legal traditions, reference is made to 'sections' or 'articles' depending on the context.

on other aspects of the legal framework for aquaculture is referred to generically, in terms for example an "environmental law" or a "navigation law". In cases where particular issues may be addressed in one of a number of different laws, a reference is made simply to the "relevant legislation".

Because this study is written in support of the aquaculture sector, it's primary target or audience in government is the ministry, department or agency responsible for aquaculture (the "aquaculture administration"). While issues that can be addressed in aquaculture legislation are obviously identified, this chapter also addresses substantive and implementation issues relating to other elements of the legal framework for aquaculture while recognizing that in practice addressing such issues may well be beyond the mandate of the aquaculture administration. In such cases, references are again made to the "relevant legislation" and the limited actions an aquaculture administration may be able to take by itself to revise that legislation.

This chapter is intended to be read alongside the ALART and therefore follows the structure of the ALART. More specifically, each question in the ALART corresponds to a specific numbered section in this chapter. For example, question 1 of the ALART is concerned with the definition of aquaculture which is the subject matter of section 1 below.

Again following the order of the ALART, this chapter is set out thematically in nine parts in the following order: (4.1) core policy issues; (4.2) institutional arrangements; (4.3) tenure arrangements; (4.4) planning and approval/authorization; (4.5) production – inputs; (4.6) production – facility management; (4.7) disease prevention and control; (4.8) post-production; and (4.9) inspection and enforcement.

Examples are taken from both of the main legal traditions (namely the common law tradition and the civil law tradition) as well as from countries with socialist legal systems, and from developed and developing countries around the world. But these examples are just that, examples. They are not necessarily recommendations: the purpose of the study is to identify the key elements of a legal framework for sustainable aquaculture rather than to propose actual wording. Finally, notwithstanding the enormous

diversity of the aquaculture sector in terms of production systems, the species cultivated and the location of aquaculture facilities (in freshwater, brackish water and marine waters) this chapter, like the ALART, is intended to be of general application although in cases where issues relate to a particular type of aquaculture (e.g. freshwater aquaculture) this is indicated in the text.

4.1. Policy issues

At the outset, several basic policy issues relevant to all types of aquaculture activity need to be addressed, usually in the aquaculture legislation. These kinds of policy issue are relevant to all jurisdictions irrespective of the type of aquaculture undertaken.

1. Aquaculture definition

Aquaculture legislation typically contains a definition or description of aquaculture. In part this is because the word "aquaculture" is a technical term that may be unfamiliar to the broader public: the expression "fish farming" is more commonly used in everyday language. But it also serves the purpose of defining the scope of the legislation in order to exclude, for example, the breeding in captivity of mammals and reptiles (which is not usually addressed in aquaculture legislation) or private aquaria. Consequently, any such definition may be legally important. If, for example, a licence is required for "aquaculture" then precisely which activities amount to aquaculture?

Because, as already seen, aquaculture is a relatively fast developing sector it is important to ensure that the definition used is broad enough to include all relevant types of aquaculture in the jurisdiction concerned, including the cultivation of aquatic plants and ornamental fish, as well as new and emerging technologies such as RAS, aquaponic systems, offshore ranching activities using fixed or floating cages. Nevertheless, there are some "grey areas" that may require a clear policy decision. For example, while the cultivation of micro-algae and macro-algae is usually regulated under the heading of aquaculture, what about technical processes that make use of

genetically modified micro-algae in an industrial setting. Should these be regulated as aquaculture or as an industrial process?

And what about "capture-based aquaculture" in which live aquatic animals or plants are caught or collected in the wild before being used in aquaculture? The fattening of wild caught stock in floating cages, such as the case of "tuna-ranching" in the Mediterranean, is usually treated as an aquaculture activity, not least because, provided they are lawfully caught, the fish concerned are owned by the operator of the facility, an important legal consideration discussed in more detail below. The key point is that part of the process is "farming" or "husbandry". For example, Malaysia's aquaculture legislation[33] has the following definition:

> "aquaculture" means the propagation of fish seed or the raising of fish through husbandry during the whole or part of its life cycle;

Stocking, in the sense of releasing fish, usually fry or juveniles, into a water body to improve the fish stock and the fishery, using material obtained from aquaculture is not usually treated as aquaculture (although the aquaculture element of the process at the hatchery stage usually is).

More complex, though, is the case of culture-based fisheries. Culture-based fisheries usually consist of two phases. The first part of the lifecycle of the aquatic animals concerned takes place in captivity while the second part takes place in the wild. Whether or not this should be classified simply as the stocking of fish or as aquaculture will depend on the context. For example, Article 2(3) of the aquaculture law[34] of Chile which, as already seen in Box G is a country with extensive salmon aquaculture operations, contains the following definition of aquaculture:

> 3) Aquaculture: activity aimed at the production of hydrobiological resources organized by man.

Article 2 then goes on to provide as follows:

> Open culture: aquaculture activity in which the production of hydrobiological resources is carried out by taking advantage of the biological cycle of species,

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33 Section 2, Fisheries Act, 1985.

34 General Fisheries and Aquaculture Law, 1991.

> such as anadromous and catadromous, which allows one or more of the cultivation phases to be carried out in unconfined areas.
>
> Anadromous species will be understood as those hydrobiological species whose life cycle begins in terrestrial waters and later migrate to the sea, where they grow and develop until they reach sexual maturity, a stage in which they return to their courses of origin completing their cycle with the reproductive process, and in some cases after it has occurred, they die.
>
> Catadromous species will be understood as those hydrobiological species whose life cycle begins in the sea, from where they migrate to fresh water courses, where they grow and develop until they return to the source waters when they have reached sexual maturity, where they complete the reproductive process.

Specific provisions on "open culture" occur later on in the text and prohibit the capture of anadromous and catadromous species throughout their lifecycle otherwise than in accordance with specific regulations.

Conversely, Norway's aquaculture law[35] does not specifically define the notion of aquaculture but instead states, in Article 2, that it applies to "the production of aquatic organisms (aquaculture)". The law goes on to state that "(a)quatic organisms are defined as animals and plants that live in, on, or near water. Any measures to influence the weight, size, number, characteristics or quality of living aquatic organisms are regarded as production".

The law was subsequently amended to indicate that it also "applies to plants intended for aquaculture, including plants without aquatic organisms". However, it goes on to provide that, "production of anadromous salmonids and fresh-water fish for cultivation purposes is regulated by the Act of 15 May 1992 No. 47 relating to salmonids and fresh-water fish etc". In other words, it does not apply to the "open culture" of such fish.

Otherwise, there is of course no "perfect" or "model" definition of aquaculture. The Malaysian definition mentioned above makes use of the drafting technique, also found in other jurisdictions, of defining "fish" to

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35 Aquaculture Act, 2005.

include plants:

> "fish" means any aquatic animal or plant life, sedentary or not, and includes all species of finfish, crustacea, mollusca, aquatic mammals, or their eggs or spawn, fry, fingerling, spat or young, but does not include any species of otters, turtles or their eggs;

This approach may work perfectly well if aquaculture involving aquatic animals is regulated in exactly the same manner as aquaculture involving aquatic plants but may become problematic if and when it becomes necessary to distinguish between them.

South Australia's aquaculture legislation[36] has a relatively concise definition of "aquaculture":

> aquaculture means farming of aquatic organisms for the purposes of trade or business or research, but does not include an activity declared by regulation not to be aquaculture;

Two points to note here are, first, that aquaculture is defined by reference to the purpose for which it is undertaken (trade, business or research) and also the fact that the scope of "aquaculture," and therefore the scope of application of the law, can be further clarified through subordinate legislation. This approach, of conferring power on the minister to disapply, if necessary, part of the law is also found in Norway's aquaculture legislation.

Remaining with South Australia's law, while the definition of aquaculture itself is rather concise, the text also goes on to define "aquatic organism" (as an "aquatic organism of any species, and includes the reproductive products and body parts of an aquatic organism") and "farming of aquatic organisms" (as "an organised rearing process involving propagation or regular stocking or feeding of the organisms or protection of the organisms from predators or other similar intervention in the organisms" natural life cycles").

In terms of definitions, some jurisdictions go further in terms of complexity. For example, Mexico's aquaculture legislation distinguishes between "Commercial aquaculture" (defined as being undertaken for economic

[36] Aquaculture Act, 2001.

benefits), "Promotion aquaculture" (the purpose of which is the study, scientific research and experimentation in bodies of water under federal jurisdiction, aimed at the development of biotechnologies or the incorporation of some type of technological innovation, as well as the adoption or transfer of technology, at some stage of the cultivation of species of flora and fauna, whose total or partial means of life is water), "Didactic aquaculture" (carried out with the purpose of training and teaching purposes), "Industrial aquaculture" (defined as a large-scale production system for aquatic organisms, with a high level of business and technological development and a large investment of capital of public or private origin; and "Rural aquaculture" (defined as involving a small-scale aquatic organism production system, carried out in a family way or in small rural groups for self-consumption or partial sale of the surplus from the harvest). The advantage of this approach, and the last two definitions added to the relevant article subsequent to its initial enactment, is presumably to more easily apply a specific set of rules or procedural requirements to a particular type of aquaculture activity.

2. Consistent use of aquaculture related terms

Given that aspects of aquaculture may be addressed or referred to in laws other than the aquaculture legislation, it is also important to ensure that the term "aquaculture," and any related definition, is used consistently across the various elements of the legal framework for aquaculture or at least in a manner that does not cause conflict.

For example, at European Union level, a narrower definition of aquaculture that is focused entirely on aquatic animals, is used in the European Union's Animal Health law[37] compared to the broader definition used in the Basic

[37] Article 4(6) 'aquaculture' means the keeping of aquatic animals where the animals remain the property of one or more natural or legal persons throughout the rearing or culture stages, up to and including harvesting, excluding the harvesting or catching for the purposes of human consumption of wild aquatic animals which are subsequently temporarily kept while awaiting slaughter without being fed;

Regulation.[38] However, this does not cause any conflict given the specific focus of the first instrument (i.e. animal health).

3. The place where aquaculture is undertaken

Next it is also advisable to clearly define in the aquaculture legislation the place where aquaculture takes place given that it will be a primary focus of regulation. This is a potentially challenging issue because, as described in Chapter One of this study, aquaculture may be undertaken in a wide range of places ranging from paddy fields and irrigation ditches in the case of rice-fish culture, to tanks and land based self-contained RAS (which may be indoors or outdoors), to raceways, public and privately-owned ponds, to pens, structures attached the river or seabed or on the seabed itself, tethered cages and rafts in reservoirs, rivers, or coastal areas, to floating cages towed far out to sea. Apart from the last example, they are all at least fixed places. But how to create a definition that can capture this diversity while at the same time respecting the language being used?

Malawi's aquaculture legislation uses the term "aquaculture establishment":

> "aquaculture establishment" means any area, enclosure, impoundment, premise or structure set up or used on or in land or water for the cultivation of freshwater fish, and includes any cage or raft or other structure used for the cultivation of fish;

But is a pond or a cage really an "establishment"? Ethiopia's aquaculture law[39] contains a simpler definition, which also, by excluding personal aquaria, has the effect of limiting the scope of aquaculture:

> "aquaculture facility" means any place, area or structure constructed for the purpose of aquaculture or where aquaculture is, or could be, undertaken but does not include a personal aquarium.

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[38] Article 4(25) 'aquaculture' means the rearing or cultivation of aquatic organisms using techniques designed to increase the production of the organisms in question beyond the natural capacity of the environment, where the organisms remain the property of a natural or legal person throughout the rearing and culture stage, up to and including harvesting;

[39] Fisheries Development and Utilization Proclamation, No. 31 of 2002.

The South Australia aquaculture legislation uses the term "farming structures" which are defined to mean, "structures used for the farming of aquatic organisms and includes sea cages and racks, longlines and submerged lines used for aquaculture, together with their associated baskets, barrels, lanterns and other culture units." Including examples of certain types of structure at the very least provides a degree of legal certainty.

4. Private ownership of aquaculture products

As mentioned in the introduction, a key legal difference between aquaculture and capture fishing is the fact that aquatic animals and plants used in aquaculture are owned by the aquaculture farmer. For the purpose of legal certainty and in order to protect the interests of aquaculture farmers, it is important to ensure that the aquaculture legislation recognises the private ownership of aquaculture products within aquaculture facilities

There are a number of ways to this. One way is through the definition of aquaculture itself as done in Article 4 the European Union's Animal Health Law:[40]

> "aquaculture" means the keeping of aquatic animals where the animals remain the property of one or more natural or legal persons throughout the rearing or culture stages, up to and including harvesting, excluding the harvesting or catching for the purposes of human consumption of wild aquatic animals which are subsequently temporarily kept while awaiting slaughter without being fed;

Another way is to include specific statement to that effect in the aquaculture legislation. For example, Section 22 of the New Brunswick (Canada) aquaculture law[41] states:

> All aquacultural produce of the species and strains specified in an aquaculture licence, while contained within the boundaries of the aquaculture site, are the exclusive personal property of the licensee until sold, traded, transferred or otherwise disposed of by the licensee.

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[40] Regulation (EU) 2016/429 of the European Parliament and of the Council of 9 March 2016 on transmissible animal diseases and amending and repealing certain acts in the area of animal health ('Animal Health Law') (OJ L 84, 31.3.2016, p. 1).

[41] Aquaculture Act, 2011.

Linking the issue of private ownership of the species and strains specified in the aquaculture licence emphasizes the important role of the licence while also providing certainty as to the scope of ownership.

Another technique is to create a specific offence of stealing or unlawfully removing aquaculture products from an aquaculture facility, as done in Section 47 of the South Australia aquaculture law which creates an offence of unlawful interference with stock or equipment:

> (1) A person must not, without lawful excuse —
>
> (a) take or interfere with aquaculture stock within a marked-off area of an aquaculture lease; or
>
> (b) interfere with equipment used to mark-off or indicate the boundaries of the marked-off area of an aquaculture lease; or
>
> (c) interfere with aquaculture equipment within a marked-off area of an aquaculture lease.
>
> (2) Maximum penalty: Imprisonment for 2 years.
>
> A person must not enter a marked-off area of an aquaculture lease intending to commit an offence against subsection (1) in the area.
>
> Maximum penalty: Imprisonment for 1 year.
>
> (3) A court convicting a person of an offence against subsection (1) may, whether or not a penalty is imposed, order the person to pay to any person affected by the commission of the offence such compensation as the court considers proper for loss or damage suffered by that person as a result of the commission of the offence.

In contrast in Viet Nam, the issue of the ownership of aquatic animals used in aquaculture is in fact addressed not in the aquaculture law but in Article 244 of the Civil Code [42] which states:

> ***Article 244* - Establishment of ownership rights to raised aquatic animals**
> When a person's raised aquatic animal moves naturally into the field, pond or lake of another person, it shall belong to the person having such field, pond or lake. Where an aquatic animal has specific marks which make it possible to determine that it does not belong to him/her, the person having such field, pond or lake must make a public announcement for the owner to be aware

[42] Civil Code of Viet Nam, No. 91/2015/QH13, dated 24th November, 2015.

> thereof and reclaim it. If after one month from the date of public announcement no one comes to reclaim the raised aquatic animal, it shall belong to the person having such field, pond or lake.

5. Policy principles for the aquaculture sector

The inclusion of policy principles in legislation is ultimately a question of drafting style and legislative practice. Nevertheless, fisheries legislation typically sets out principles for the sustainable development and management of fisheries. Principles do not, of course, create legal rules. However, they can help guide decision makers in terms of the implementation of the law. Given that aquaculture, as a farming activity, is quite different to fishing, it can be useful to set out clear policy principles for the sector that are adapted to its specific features and challenges.

For example, Ukraine's aquaculture law[43] contains a specific acknowledgement of the importance of the sector as a pillar of food security and nutrition as well as a source of high protein food before going on to set out, in its Article 4, a number of principles including sustainability, the ecosystem approach, genetic diversity, food and nutritional security, health, quality and safety, animal health including product quality and traceability, research, citizen participation and inclusion in terms of the generation of economic opportunities. In this regard it is to be noted that achieving gender equality and women's empowerment is integral to each of the SDGs.

In a similar manner, Article 3 of Peru's aquaculture law[44] sets out a detailed series of principles as follows:

> The development of aquaculture is governed by the following principles:
>
> 3.1 Sustainability - The State promotes the sustainable development of aquaculture, in harmony with the conservation of resources and the environment, considering the satisfaction of the social and economic needs of the population through the promotion of a profitable and competitive aquaculture activity.
>
> 3.2 Ecosystem Approach - The aquaculture activity adapts and respects the ecosystem approach, considering the environmental, social and institutional

[43] Law of Ukraine on Aquaculture, 2012.

[44] Legislative Decree No. 1195 Approving the General Aquaculture Law

> dimensions, guaranteeing participation, equity in the distribution of benefits and respect for the integrity and functionality of the ecosystems, guaranteeing the resilience of interconnected socio-ecological systems.
>
> 3.3 Genetic Diversity - Genetic diversity represents the biological raw material of both aquaculture and other users and its preservation is decisive for ecological balance. The genetic diversity of natural or hatchery populations is therefore managed responsibly based on the best available scientific evidence, analyzing the ecological risks of anthropic disturbances and also taking into account traditional knowledge.
>
> 3.4 Food and nutritional security - The State recognizes that aquaculture is an important pillar of the population's food and nutritional security since it represents a source of food with high protein value.
>
> 3.5 Health, Quality and Safety - Aquaculture activities are carried out in culture environments that promote the health of the species that are raised there.
>
> 3.6 Ensuring animal health, quality and safety of aquaculture products with traceability systems implemented throughout the entire production chain.
>
> 3.7 Research, Technological Development and Innovation- The State promotes and strengthens research, technological development and innovation, seeking productive diversification, competitiveness and optimization of the aquaculture production chain.
>
> 3.8 Transparency and information - The State promotes and facilitates the registration and access to updated information related to aquaculture activity, in accordance with the corresponding regulations, coordinating with the public and private sectors.
>
> 3.9 Citizen participation - The State, through the Ministry of Production, as well as the Regional Governments and Local Governments, promotes actions that strengthen trust and credibility among the actors involved with aquaculture activity, through the establishment of participatory processes free and informed, that favor the prevention and management of conflicts, to ensure the sustainability of aquaculture activity and the development of coastal and continental communities.
>
> 3.10 Inclusion- Aquaculture, as a productive activity, should contribute to the generation and diversification of economic opportunities, to the development of productive capacities and of entrepreneurship in the rural areas where it is developed; as well as food and nutritional security associated with the increase in the availability of good quality protein.

As can be seen, both of these examples explicitly refer to the ecosystem approach to aquaculture (EAA) which is discussed in more detail in Supplement 4 to the FAO Technical Guidelines for Responsible Fisheries No. 5 Aquaculture Development - Ecosystem Approach to Aquaculture, Supplement 4 (FAO, 2010).

Supplement 4 provides that the EAA "is a strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity and resilience of interlinked social-ecological systems." The importance of the EEA is that it clearly recognizes not only the impacts of aquaculture on the wider environment but also the impacts of that environment on aquaculture.

As a strategic approach, the EAA focuses not on "what" should be done, but rather on "how" the sector should be developed in a manner that is ecologically, economically and socially sustainable so as to ensure both human and ecological well-being. Having identified stakeholders at different spatial and temporal scales, stakeholder involvement is a key element of EAA coupled with the development of a strategy based around three main interlinked principles as follows: (1) aquaculture development and management should take account of the full range of ecosystem functions and services, and should not threaten the sustained delivery of these to society; (2) aquaculture should improve human well-being and equity for all relevant stakeholders; and (3) aquaculture should be developed in the context of other sectors, policies and goals.

6. Requirement for a formal aquaculture policy

An explicit requirement in legislation is not strictly necessary for the adoption at the highest political level (government or cabinet) of a formal aquaculture policy, either as a stand-alone policy or as part of a broader fisheries and aquaculture policy.

However, an explicit reference to an aquaculture policy in an aquaculture law, in terms of requiring the adoption and periodical revision of such a policy, not only makes it more likely that such a document will be prepared (and periodically reviewed) but also makes it possible to link the content of the policy, which evidently may evolve over time, to decision making pursuant to the aquaculture law. For example, Article 3(1) of Japan's aquaculture law[45] provides that "(t)he Minister of Agriculture, Forestry and Fisheries shall establish the Basic Policy for assuring sustainable aquaculture production (hereinafter referred to as the "Basic Policy")".

[45] Sustainable Aquaculture Production Assurance Act (Act No. 51 of May 21, 1999).

7. Content of aquaculture policy

The issues to be addressed in a country's aquaculture policy will depend on a range of matters including the scale and relative development of its aquaculture sector as well as new and emerging threats to the sector. One important issue, in this connection, is the threat to the health of aquatic animals and plants, and the measures needed to address this. This topic is the main focus of Article 3(2) of Japan's aquaculture law which provides that the Basic Policy must address:

> (i) Matters concerning the improvement goals for aquaculture areas
>
> (ii) Matters concerning measures for improving aquaculture areas and for preventing the spread of specified diseases, and concerning the organization of aquaculture facilities
>
> (iii) Matters concerning the organization of a system for improving aquaculture areas and for preventing the spread of specified diseases
>
> (iv) Other important matters concerning the improvement of aquaculture areas and prevention of the spread of specified diseases.

Other important issues that could be usefully be included in a formal aquaculture policy are: (a) the environment in terms both of the impacts of aquaculture on the environment and the negative impacts of a degraded environment, particularly as regards water quality, on aquaculture; (b) the need to reduce the administrative burden faced by investors in the sector and the streamlining and coordination of licensing and permit procedures (an issue returned to below); (c) the promotion of opportunities for women, youth and men and disadvantaged communities; and (d) the short term and long term threats to the sector as a result of climate change. Short term threats include reduced freshwater availability for inland aquaculture accompanied by an increased risk of floods, droughts and storm surges in the low-lying places where aquaculture is typically undertaken. In this regard it may be important to link aquaculture policies with more general climate change adaptation policies and plans.[46]

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[46] Discussed further in footnote 76 below.

8. Aquaculture sector development strategies and plans

Strategic planning and investment are fundamental to the sustainable development of all farming sectors and aquaculture is no exception. To this end the Code of Conduct provides, at paragraph 9.1.3, that "States should produce and regularly update aquaculture development strategies and plans, as required, to ensure that aquaculture development is ecologically sustainable and to allow the rational use of resources shared by aquaculture and other activities".

Tonga's aquaculture law[47] provides, for example, in Section 4 that, "(t)he Minister shall prepare and keep under regular review a plan for the management and development of aquaculture which shall be published in the Gazette".

In a similar vein, Article 55 of Togo's aquaculture legislation[48] law provides:

> Aquaculture activities are the subject of a national development and management plan drawn up, implemented by the ministry responsible for aquaculture, in accordance with the texts in force and providing in particular that:
>
> a. any form of commercial aquaculture activity is subject to prior authorization issued by the ministry responsible for fisheries and aquaculture under conditions determined in accordance with the regulations in force;
>
> b. aquaculture activities are carried out in compliance with hygiene and public health measures and rules relating to water quality and the preservation of marine and continental ecosystems.

Mention can also be made of the relatively detailed provisions on master planning contained in the aquaculture legislation of the Republic of Korea.[49] Article 6(1) requires the Minister of Oceans and Fisheries to prepare an aquaculture industry development master plan (master plan) every five years based on a series of fact-finding surveys. Each master plan must, in

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47 Aquaculture Management Act, 2003.

48 Law No. 2016-026 of 11/10/2016 on the regulation of fisheries and aquaculture in Togo.

49 Aquaculture Industry Development Act, 2020.

accordance with Article 6(2), contain the following elements:

1. Basic direction and objectives of the development of the aquaculture industry;
2. Current status and prospect of the aquaculture industry;
3. Matters concerning research and technological development of the aquaculture industry;
4. Matters concerning training of aquaculture workforce and their entry into foreign markets;
5. Matters concerning examination and evaluation for continuous development of the aquaculture industry;
6. Matters concerning acceleration of consumption of aquaculture products and stimulation of export thereof;
7. Matters concerning the promotion of the aquaculture industry, such as the creation of aquaculture complexes;
8. Matters concerning securing funds and providing the assistance necessary for developing the aquaculture industry;
9. Other matters deemed by the Minister of Oceans and Fisheries to be necessary for the development of the aquaculture industry.

Article 6(3) provides that in preparing a new master plan, the minster must consult the heads of relevant central administrative agencies, mayors, governors and local government leaders as well as the Central Fisheries and Fishing Village Policy Review Committee established pursuant to Article 8 of the Framework Act on Fisheries and Fishing Villages Development. Moreover, in accordance with Article 7, mayors and governors must formulate an annual regional action plan for the development of the aquaculture industry in the regions for which they are responsible.

Finally, in accordance with the Basic Regulation[50] each Member State of the European Union is required to prepare a multi-annual national strategic plan for the development of aquaculture activities. Such plans must aim at: (a) administrative simplification, in particular regarding evaluations and impact studies and licences; (b) reasonable certainty for aquaculture

[50] Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No. 1954/2003 and (EC) No. 1224/2009 and repealing Council Regulations (EC) No. 2371/2002 and (EC) No. 639/2004 and Council Decision 2004/585/EC (OJ L 354, 28.12.2013, p. 22).

operators in relation to access to waters and space; (c) indicators for environmental, economic and social sustainability; (d) assessment of other possible cross-border effects, especially on marine biological resources and marine ecosystems in neighbouring Member States; (e) the creation of synergies between national research programmes and collaboration between the industry and the scientific community; (f) the promotion of the competitive advantage of sustainable, high quality food; (g) the promotion of aquaculture practices and research with a view to enhancing positive effects on the environment and on the fish resources, and to reducing negative impacts, including reducing pressure on fish stocks used for feed production, and increasing resource efficiency. Each plan must set out the objectives of the Member State concerned as well as the measures and the timetables necessary to achieve them.

9. Data and information

As already discussed, data and information are essential for the development and sustainable management of any sector that involves the use of natural resources and aquaculture is no exception. The important role of data and information is clearly recognized in Article 9.2.4 of the Code of Conduct which provides:

> States should establish appropriate mechanisms, such as databases and information networks to collect, share and disseminate data related to their aquaculture activities to facilitate cooperation on planning for aquaculture development at the national, sub-regional, regional and global level.

This provision is further developed in Supplement 7 to Technical Guidelines No. 5 on *Aquaculture Development - Aquaculture governance and sector development* (FAO, 2017) which states that "(a)ccurate and reliable statistics are critical for effective policy-making: reliable and credible information enables the competent authority to design policies and strategies and evaluate their likely impacts".

It follows that aquaculture legislation should address data and information relating to aquaculture even if sector specific provisions on data and information relevant to the sector (such as environment or health issues) are addressed in other elements of the legal framework for aquaculture.

Data must not only be gathered and managed but must also be available for inspection and use.

Returning to the aquaculture legislation of the Republic of Korea, Article 8 provides that:

> 1. The Minister of Oceans and Fisheries may conduct fact-finding surveys on the aquaculture industry in Korea and foreign countries in order to efficiently establish and promote policies, etc. for the promotion and development of the aquaculture industry.
>
> 2. For the continuous and efficient use of fish farms, the Minister of Oceans and Fisheries and Mayors/Do Governors shall conduct fact-finding surveys on the management of fish farms.
>
> 3. Where necessary for conducting fact-finding surveys on the management of fish farms under paragraph (2), the Minister of Oceans and Fisheries or Mayors/Do Governors may have affiliated public officials or persons designated by the Minister of Oceans and Fisheries enter the land, fish farms, etc. of aquaculture businesspersons and conduct surveys.
>
> 4. The public officials or persons designated by the Minister of Oceans and Fisheries who enter other persons' land, fish farms, etc. pursuant to paragraph (3) shall carry a certificate and show it to interested parties.
>
> 5. Matters necessary for the scope and methods of fact-finding survey conducted under paragraphs (1) and (2) shall be prescribed by Presidential Decree.

While the scope of the power conferred by Article 8 of the Republic of Korea's legislation is rather broad, Scotland's aquaculture legislation[51] confers powers upon the relevant ministers to require the provision of information on a very specific topic namely the prevention, control and reduction of parasites (a) on fish farms and (b) on shellfish farms.

These are but two examples of explicit provisions on data and information in aquaculture legislation. Other examples of the importance of data and information are flagged as they appear below.

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[51] Aquaculture and Fisheries (Scotland) Act 2007.

4.2. Institutional arrangements

Given the number of different laws that typically make up the legal framework for aquaculture, it is important to ensure that, as far as possible, key institutional arrangements and linkages are clearly set out, and as far as possible identified in the aquaculture legislation. Again, these kinds of institutional question are relevant to all jurisdictions irrespective of the type of aquaculture undertaken.

10. Minister and "aquaculture administration"

In terms of institutional arrangements, a key task of aquaculture legislation is to clearly identify the ministry, department or agency responsible for aquaculture. To this end, the FAO Technical Guidance on Aquaculture Development (FAO, 1997) provides as follows:

> Designated authority. States should designate or establish an authority or authorities competent, empowered and capable to effectively promote, support and regulate aquaculture and culture-based fisheries.

Aquaculture legislation will typically need not only to identify which minister is responsible for aquaculture but also the aquaculture administration (in other words the ministry, department or agency) which is responsible for the implementation of that legislation.

In some countries, different agencies (i.e. different aquaculture administrations) are responsible for the implementation of freshwater aquaculture and marine aquaculture. In Portugal, Article 4 of the aquaculture law[52] provides that:

> 1 – the Directorate-General for Natural Resources, Security and Maritime Services is the coordinating entity for the installation and exploitation procedures for aquaculture establishments in marine waters, including transitional waters, and their related establishments.
>
> 2 – the Institute for the Conservation of Nature and Forests is the coordinating entity for the installation and exploitation of aquaculture establishments in inland waters and respective related establishments.

[52] Decree-Law No. 40/2017 of April 4.

Having identified the minister, it is also necessary to confer broad regulation-making power either upon him/her, or depending on practice in the legislation concerned, upon on the government on the proposal of the minister. Such is the complexity of aquaculture that regulations will inevitably be necessary to ensure the sustainable development of the sector particularly with regard to aquaculture activities that are not subject to a licence (see section 61 below). Such regulations should be used to address technical matters of detail. As described above it is difficult, indeed often not possible, to use regulations to coordinate actions with the laws that make up other elements in the legal framework for aquaculture or the agencies that implement those laws.

An example of particularly broad and detailed regulation making powers is contained in the legislation of the Canadian province of Newfoundland:

> Regulations
>
> 11.2 The minister may make regulations
>
> (a) respecting optimal resource utilization and sustainable development, and related prohibitions;
>
> (b) respecting matters related to health, including the health of aquatic plants or animals, safety and the protection of the environment, and related prohibitions;
>
> (c) respecting terms and conditions to which an approval to introduce, transfer or transport aquatic plants or animals may be subject or under which such approval may be issued;
>
> (d) respecting, subject to the Plant Protection Act, the introduction into and the transfer and transport of aquatic plants in the province and from place to place within the province, including the conducting of assessments in relation to that introduction, transfer or transport;
>
> (e) respecting, subject to the Plant Protection Act, the isolation, quarantine, detention, treatment, disposal or destruction of aquatic plants, the disposal or destruction of feed, the disinfection, quarantine, detention or prohibition of movement or transport of related gear, equipment, tanks, ponds and other facilities and vehicles, and other measures to mitigate the development of pathogenic agents or prevent the spread of pathogenic agents;
>
> (f) respecting the introduction into and the transfer and transport of aquatic animals in the province and from place to place within the province, including the conducting of assessments in relation to that introduction, transfer or transport;
>
> (g) respecting the isolation, quarantine, detention, treatment, disposal or destruction of aquatic animals, the disposal or destruction of feed, the

disinfection, quarantine, detention or prohibition of movement or transport of related gear, equipment, tanks, ponds and other facilities and vehicles, and other measures to mitigate the development of pathogenic agents or prevent the spread of pathogenic agents;

(h) respecting the use, or prohibiting the use, of chemicals, fertilizers, vaccines, drugs, feed, and other substances in the conduct of aquaculture;

(i) respecting the isolation, quarantine, detention, treatment, disposal or destruction of aquatic plants or animals, the disposal or destruction of feed, the quarantine, disinfection, detention or prohibition of movement or transport of aquaculture gear, vehicles, tanks, ponds and other facilities, and other measures related to the use of chemicals, fertilizers, vaccines, drugs, feed and other substances in the conduct of aquaculture;

(j) prescribing the marking of aquaculture gear, of the boundaries of a site and any other markings or identification;

(k) prescribing the information to be provided and the procedures to be followed in applying for

(i) an aquaculture licence,

(ii) an approval to introduce, transfer or transport aquatic plants or animals, and

(iii) another licence, permission or approval required by this Act or the regulations;

(l) prescribing the use, content and enforcement of development plans for sites;

(m) prescribing performance standards for aquaculture facilities;

(n) prescribing maximum sizes for aquaculture facilities;

(o) respecting the rent payable for an aquaculture licence;

(p) prescribing standards relating to the construction, layout, equipping and operation of an aquaculture facility;

(q) respecting methods of handling, buying, selling, holding in possession, offering or advertising for sale, processing and maintaining the quality of aquatic plants or animals;

(r) respecting information and documents to be provided to the minister by a licensee concerning the use, productivity, investment and obligations of the licensee in respect of an aquaculture facility and other matters pertinent to the conduct of aquaculture and the marketing and sale of aquaculture produce by the licensee;

(s) respecting the provision of financial or other security for the purpose of this Act;

(t) prescribing procedures by which the neighbouring land owners, municipalities, other affected or interested persons and the general public may participate in helping the minister in his or her decision whether

> to grant an aquaculture licence, and if so on what terms or conditions, including the manner in which the applicant, the minister or a designate or others are to meet with, provide information to and record the opinions, concerns and questions of those participating;
>
> (u) respecting the duties of, and the records and documents to be kept by the Registrar of Aquaculture and other matters pertaining to the proper conduct and operation of a registry of aquaculture records; and
>
> (v) prescribing rules, procedures, composition, functions and powers of committees created under this Act.

It can also be very useful to provide in the aquaculture legislation for a formal mechanism to provide technical advice about aquaculture to the minister. An example of such a mechanism is provided by Tonga's aquaculture law, Section 11 of which provides for the establishment of an Aquaculture Advisory Committee as follows:

> Aquaculture Advisory Committee
>
> (1) There shall be established an Aquaculture Advisory Committee to advise the Minister in relation to —
>
> (a) any matter on which the Minister or the Secretary is required to consult the Advisory Committee under this Act;
>
> (b) policy, planning and guidelines for the regulation, management and development of aquaculture;
>
> (c) the elaboration or review of the aquaculture plan referred to in section 4 and codes of practices referred to in section 10;
>
> (d) the approval of plans for collaboration on aquaculture management with other foreign or local institutions;
>
> (e) co-operation on the management and development of aquaculture among relevant government agencies and local communities;
>
> (f) appropriate public awareness programmes on the need for proper management and development of aquaculture;
>
> (g) the establishment of aquaculture areas and buffer zones;
>
> (h) any matter relating to aquaculture which the Minister refers to the Advisory Committee for investigation, deliberation and advice.
>
> (2) The Advisory Committee shall comprise the following members:
>
> (a) the Secretary who shall be Chairman;
>
> (b) an officer of the Department of the Environment;

> (c) an officer of the Ministry of Labour, Commerce and Industries;
>
> (d) an officer of the Ministry of Marine and Ports; and
>
> (e) three representatives of the aquaculture industry appointed by the Secretary in consultation with fish farmers associations and organizations involved in aquaculture affairs.
>
> (3) The Advisory Committee may co-opt any person with particular expert knowledge or skill but such co-opted person shall not be entitled to vote.
>
> (4) The Advisory Committee shall determine its procedures.

In a similar manner, Article 8(9) of Croatia's aquaculture law provides for the establishment of an "advisory council" which is described as an "an independent body that provides expert opinion on topics of importance for aquaculture and participates in the preparation and drafting of draft regulations in the field of aquaculture" as well as a specific advisory committee to advise on the use of alien species in aquaculture (in Article 8(6)).

11. Federal jurisdictions

In federal jurisdictions, the question whether aquaculture is a federal or a state subject is a matter of constitutional law. Indeed, in several countries (including Canada and India), the courts have been asked to determine which level of government which is competent to legislate on the topic. See further Doelle and Saunders, 2016.

Typically, freshwater aquaculture is a state subject while the federal level of government has competence to adopt legislation on aquaculture undertaken in marine waters beyond a certain distance from the baseline. However, the issue may not be restricted to aquaculture legislation but also include the use of the seabed. For example, in the United States of America, the federal Submerged Lands Act of 1953 granted each coastal state jurisdiction over submerged lands and related natural resources extending three geographical miles from its coast. Within this three-mile zone the state holds title to the submerged lands and may manage and administer the lands and their natural resources through leasing and development, including for aquaculture.[53]

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[53] United States Ann Powers and Patrick Carroll

In reviewing and revising the legal framework for aquaculture there is not much that can be done about the issue of legislative competence: it is a constitutional given. Nevertheless, in the case of a federal jurisdiction, it is important to ensure that the aquaculture legislation recognizes and provides for clear and robust functional linkages between the federal government and states or provinces in terms of their respective responsibilities for the implementation of different elements of the legal framework for aquaculture in terms of coordination, the chain of command and the overall consistency of approach.

For example, even if aquaculture is a state competence, it is quite likely that animal and plant health, at least as far as imports are concerned, will be a federal responsibility, particularly as regards border control. The same may or may not apply to environmental protection. In Australia, for example, marine biosecurity, agriculture and veterinary chemicals, water quality standards and environmental protection and biodiversity conservation are all subject to Commonwealth (federal) legislation, legislation with which aquaculture legislation adopted by the States and Territories must be coordinated.

And even if the federal government has a residual competence as regards say, offshore, aquaculture then it may still be necessary to ensure that the necessary linkages can be established. For example, Quebec's aquaculture law[54] clearly provides that the state minister can communicate with the responsible federal minister about aspects of aquaculture as well as other elements of the legal framework for aquaculture such as risks to public health or safety, the environment or wildlife etc.

Similarly, Mexico's federal aquaculture legislation,[55] explicitly recognizes the fact that different levels of government will exercise different powers under the law (in Article 6) while also clearly identifying the body that will exercise federal powers, the federal "aquaculture administration" in the sense used in this study (Article 7).

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54 Law on Commercial Aquaculture, 2016.

55 General Law on Sustainable Fishing and Aquaculture, 2007.

12. Formal linkages with local governments

As mentioned above, as a result of decentralization policies and programmes local governments often play an important role in the implementation of the legal framework for aquaculture. For example, local governments often play a particularly important role in terms of land use planning. Moreover, in practice it is primarily at the local government level that aquaculture farmers interact with the legal framework for aquaculture.

Depending on the jurisdiction concerned, a question can arise as to the functional mandate of officials responsible for aquaculture at the local government level and their reporting responsibilities as regards both local government and the aquaculture administration. Sometimes the aquaculture administration is the technical lead and the local government is concerned with all other aspects. Consequently, it is important to ensure that the rights and responsibilities of the aquaculture administration and local government are clearly set out in the aquaculture legislation. To this end, for example, Article 11 of Ukraine's aquaculture law sets out the responsibilities of local governments in some detail. Similarly, Viet Nam's aquaculture law[56] clearly describes the functions of different levels of government as regards aquaculture management.

In practice, though, problems can arise in cases where the full scope of activities relating to aquaculture, such as aquatic animal and plant health, are not clearly described in either the local government legislation or the aquaculture legislation, not only as regards the scope of actual legal competences but also with respect to budget allocation for specific activities. Legislation concerning the roles and powers of local governments may not, for example, specifically refer to aquaculture with the result that their responsibilities are unclear. For example, is aquaculture to be understand as being included under the heading of fisheries or agriculture? And even if local government competence over aquaculture and (terrestrial) animal health is clearly set out, does that extend to aquatic animal health? As a result, it is important to ensure that the role of the local government as regards the implementation of the legal framework for aquaculture is

[56] Law on Fisheries, 2017.

clearly described in the aquaculture legislation, even if this means directly or indirectly referring to other laws that form part of that framework. Moreover, as will be seen below, it is equally important to ensure that legal mechanisms are put in place to facilitate reporting and information flows.

13. The "competent authority"

Apart from the aquaculture administration, it is also necessary to identify, within the legal framework for aquaculture, the identity of the "competent authority" for the purposes of aquatic animal health in accordance with the Aquatic Animal Health Code. As described in Chapter Two of this study, the Aquatic Animal Health Code confers upon WOAH Headquarters the right to communicate directly with the competent authority.

The term "competent authority" is defined in the Aquatic Animal Health Code to mean "the Veterinary Authority or other Governmental Authority of a Member Country having the responsibility and competence for ensuring or supervising the implementation of aquatic animal health and welfare measures, international health certification and other standards and recommendations in the Aquatic Code in the whole territory". The competent authority may or may not be located within the same ministry as the aquaculture administration. In practice, this is more likely to be the case if the aquaculture administration is located within with the ministry that is also responsible for agriculture and food. This is currently the case in Thailand where the Ministry of Agriculture and Cooperatives is also responsible for aquaculture.

14. Plant protection organization

As regards the health of aquatic plants, it is also necessary to identify, somewhere within the legal framework for aquaculture, the identity of the "plant protection organization" for the purpose of implementing the IPPC. This issue will usually be addressed in a plant health law although, in practice, it will also be necessary to verify that such a law actually applies to aquatic plants.

15. Explicit recognition of the role of other agencies in the aquaculture legislation

Given the number of different agencies involved in the implementation of the legal framework for aquaculture, it is important to ensure that the aquaculture legislation directly or indirectly refers to them. To this end, the FAO Technical Guidance on Aquaculture Development (FAO, 1997), provides as follows:

> Appropriate institutional linkages with other authorities such as those concerned with agriculture, rural development, water resources, environment, health, education and training and many others, should also be established. These linkages may have to be expressed in legislative form.

A key point to note in this statement is the phrase "may have to be expressed in legislative form". The fact is that in practice it can often be difficult for government departments to easily collaborate across ministerial lines. Depending on national drafting practice, the creation of linkages expressed in legislative form can be achieved by explicitly referring to the names of the relevant agencies concerned (e.g. "the animal health agency") or by reference to their functions ("the agency responsible for animal health").

16. Formal coordination and information exchange mechanisms

Given the number of different actors involved in the sector it can be useful to establish specific mechanisms for inter-agency coordination and information exchange in the aquaculture legislation.

For example, Article 10 of Peru's aquaculture law provides for the establishment of the "National Aquaculture System" (*El Sistema Nacional de Acuicultura* in Spanish, hereafter *SiNACUi*) as a formal inter-agency mechanism composed both of central government and regional government bodies. It describes the members of the SiNACUi as follows:

> The following are part of the SiNACUi: 10.1 the Ministry of Production PRODUCe 10.2 Ministry of the Environment MiNAM; 10.3 Ministry of Defense, through the General Directorate of Captaincies and Coast Guard DiCAPi of the Peruvian Navy; 10.4 National Service of Natural Areas Protected SeRNANP of the Ministry of the Environment; 10.5 Organism of evaluation

> and Environmental Control OeFA of the Ministry of the Environment; 10.6 ANA National Water Authority of the Ministry of Agriculture; 10.7 Peruvian Promotion Commission for Export and Tourism PROMPeRÚ of the Ministry of Foreign Trade and Tourism; 10.8 Technological Institute of Production iTP of the Ministry of Production; 10.9 Research Institute of the Peruvian Amazon iiAP of the Ministry of the Environment; 10.10 National Fisheries Health Agency SANiPeS of the Ministry of Production; 10.11 Instituto del Mar del Perú iMARPe of the Ministry of Production; 10.12 National Fund for Fisheries Development FONDePeS of the Ministry of Production; 10.13 The entities and bodies that carry out the administration activities of the aquaculture activity of the Regional Governments;

In Spain, a country with a highly devolved system of administration, the equivalent body is the "National Advisory Board of Marine Aquaculture" which is explicitly empowered to coordinate the activities of the regional "Autonomous Communities" and the central government in Madrid. Article 27 of the (marine) aquaculture law[57] provides as follows:

> In order to facilitate the coordination of the activities of the different Autonomous Communities, and to monitor the national plans, a National Advisory Board of Marine Aquaculture will be constituted in the General Secretariat of Maritime Fisheries, in which all the Departments of Fishing and the Marine Farming sector will be represented. The specific objectives, the composition and operation of said Board will be developed in a Regulation that, with the approval of the Autonomous Communities, will be sanctioned and published by the Ministry of Agriculture, Fishing and Food.

Another approach to ensuring inter-agency coordination, contained in article A5 of the Quebec aquaculture law, is to explicitly provide for information exchange between different concerned ministers. Article 25 provides as follows:

> The Minister or the person designated by the Minister in his or her department shall transmit to the Minister of Sustainable Development, Environment and Parks, the Minister of Natural Resources and Wildlife, and the Minister of Health and Social Services, and shall receive from them, any confidential industrial, financial, commercial, scientific or technical information held by the Minister or furnished by a third person and necessary for the application

[57] Law 23/1984, of June 25, on marine farming.

> of this Act and the regulations or for the prevention of a risk to public health or safety, the environment or wildlife, and for their protection.

4.3. Tenure arrangements

Tenure arrangements determine how people, communities and organizations access and use natural resources including land and water. Secure land and water tenure arrangements are necessary for sustainable aquaculture. Who, after all, would invest in the sector on the basis of weak or insecure tenure? However, as will be seen, the nature and relative importance of both land tenure and water tenure arrangements may be quite different depending on where aquaculture is undertaken.

While Article 2 of Portugal's aquaculture law is primarily concerned with the scope of application of that law it also gives a flavour of the complexity of land and water tenure issues:

> This Decree-Law applies to the establishment of aquaculture facilities in marine waters and inland waters and, in particular establishments, located on private property, the private domain of the State and the public domain of the State and local authorities, including the hydraulic domain of the state.

Moreover, land is still land even if it is covered by water. Section 3 of Ireland's aquaculture law[58] makes this clear:

> "land" includes land covered by water and the water covering that land;

While an aquaculture pen or a floating cage makes use of the water that flows through it, it still needs to be attached the lake, river or seabed, which is a use of land.

Finally, while it is useful for the purpose of analysis to make a clear distinction between tenure arrangements for aquaculture (which are concerned with the right to use land and water resources) and aquaculture licensing (which authorizes the undertaking of aquaculture), and while this distinction is commonly made in aquaculture legislation, in reality

[58] Fisheries (Amendment) Act 1997.

the relationship between tenure arrangements and authorization is a little more complex.

First, as will be seen below, in some jurisdictions such as Spain and the Australian State of Tasmania, the instruments that create tenure rights also function as the authorization to undertake aquaculture. In other words, they also act as an aquaculture licence.

Second, the grant of tenure rights is also closely linked to the issue of aquaculture planning, which is discussed in more detail in part 4.4 below. Particularly in cases where private land is concerned, an investor may typically first acquire the land for an aquaculture facility before applying for a licence. At the same time siting decisions are of fundamental importance for aquaculture not only in terms of addressing the potential impacts of aquaculture on the environment and other activities but also in terms of ensuring that aquaculture facilities are themselves situated in an appropriate area, particularly as regards the quality of the water that is used. In cases where private or public land is to be acquired for aquaculture, planning mechanisms can play an important role in ensuring that such acquisitions take place in an appropriate area.

a) Land tenure

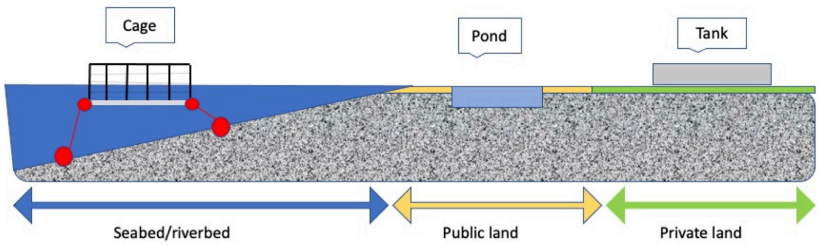
Land, in one form or another, is necessary for all types of aquaculture.[59] A key point to note at the outset is that different land tenure regimes may apply depending on the location of an aquaculture facility. For example, aquaculture involving the construction of a pond or the installation of a tank may be undertaken on private land on the basis of ownership rights or lease rights. In such cases the right to own or use the land is the same as for any other activity such as, for example, agriculture, and there is little that aquaculture legislation can usefully add to the issue.

However, private land ownership is not provided for in all jurisdictions. In Viet Nam, for example, land belongs to the people as represented by the

[59] Even floating cages towed out to sea, need some kind of land base for the purpose of storage or unloading.

State and the State may allocate lease or use rights. Land for aquaculture use has the same status as land for agriculture and the allocation of land takes place in accordance with land use master plans.[60]

Figure 4
Different land tenure regimes including specific regimes applicable to the land of the riverbed/seabed which is usually classed as public land



And even in jurisdictions where the private ownership of land is foreseen, large areas of land suitable for aquaculture may be in public ownership. Moreover, land in particular areas is also typically classified as public land. This includes: (a) riverbank or riverbed land; and (b) land in coastal and maritime areas. As a result, different land tenure regimes may apply depending on whether an aquaculture facility is located on private land, public land or the seabed or riverbed (see Figure 4). To complicate matters further, different applicable land tenure regimes may be set out in different laws.

17. Public land

In cases where aquaculture takes place on public land that is not temporarily or permanently covered with water (see Box H), it is important to ensure that the relevant legislation provides: (a) a clear legal basis for the use of

[60] Chapter V, Land Law 2013.

such land for aquaculture; (b) that the land can be used for a sufficiently long period to enable a return on investment.[61]

Box H
Public land

The term "public land" is used in this study to include all land owned by the state or by local government. It generally includes the underwater land of rivers, lagoons and estuaries as well as the seabed. In some civil law jurisdictions, such land is part of what is described as the "domain of the state" (along with the associated waters). Typically, land in the domain of the state is divided into two categories: private domain land which can be used by private actors or even in some circumstances sold to them and public domain land that cannot.

If the relevant legislation (which may be general land tenure legislation, or specific legislation on public land or the public domain of the state) does not address the issue, then it may be appropriate to consider revising the aquaculture legislation to provide for the granting of leases or concessions for the use of public land for aquaculture. Again, such leases or concessions should be of sufficiently long duration to enable an investor to make a return on an investment in aquaculture.

On the basis of practise, this usually implies a range of between 1–25 years. In some countries this is an issue that is addressed specifically in aquaculture legislation. For example, Article 57 of Togo's aquaculture law provides that:

> The operator of an aquaculture establishment or development in the public domain of the State must obtain a concession in accordance with the rules of occupation and management of the public domain The procedure for submitting requests, examining and issuing concessions is set in accordance with the regulations in force.

[61] It will be recalled that, as described in section 9 above, the multi annual national strategic plans prepared by EU Member States must aim at 'reasonable certainty for aquaculture operators in relation to access to waters and space'.

Similarly, Section 38 of Sri Lanka's aquaculture law provides:

> Subject to the provisions of the Crown Lands Ordinance there shall be leased, such portions of State land or the Sri Lanka Waters as the Minister may consider necessary in the interest of the national economy, for the purpose of aquaculture.

18. Riverbank/riverbed land

The use of public land adjacent to or beneath freshwater bodies (rivers, reservoirs, lakes) for aquaculture (as well as other purposes) is usually addressed in a water resources law[62] by requiring such use to take place on the basis of a specific legal instrument in the form of a water use permit, authorization, concession or lease (hereafter a "water use permit").

Again, it is important to ensure that the relevant legislation provides a clear legal basis for the use of such land for aquaculture on the basis of a water use permit of sufficiently long duration to enable a return on investment. Such a permit should also explicitly or implicitly authorize the use of the water that flows through the cage or structure as a "non-consumptive" use.

It can also be useful for the aquaculture legislation to cross refer to the relevant water legislation and any water use permit requirements, as provided for in Article 19 of the Quebec aquaculture legislation:

> The holder of an aquaculture licence for an aquaculture site in the waters in the domain of the State must hold a lease for aquaculture purposes issued under the Watercourses Act (chapter R-13), 2003, c. 23, s. 19.

19. Use of the public land in coastal and maritime areas

Under this heading are included public coastal land as well as submerged or semi-submerged land used for brackish water or marine aquaculture including lagoons, estuaries and the seabed. Again, it is important to ensure that the relevant legislation provides: (a) a clear legal basis for the use of

[62] In some jurisdictions the land adjacent to and beneath small streams and rivers is also in private ownership meaning that the private land tenure rules apply. The land under ponds on private land, though, is usually considered to be in private ownership.

such land for aquaculture; (b) that such land can be used for a sufficiently long period to enable a return on investment.

In many jurisdictions the use of public land in coastal and maritime areas is subject to specific legislation relating to maritime zones. In the case of China, for example, this is the Law of the People's Republic of China on the Administration of the Use of Sea Areas, 2002. In Ireland, the right to occupy or use the seashore and seabed from the high-watermark to the outer limit of the territorial sea needs the approval of the relevant minister in the form of either a "foreshore licence" or a "foreshore lease" granted in accordance with the Foreshore Acts 1933-2014. Foreshore leases and licences are considered "companion" licences to aquaculture licences. To that end, Section 82 of the aquaculture legislation[63] provides that when the minister is considering an application for a foreshore lease or licence which is sought in connection with an aquaculture licence s/he must "have regard to any decision of the licensing authority in relation to the aquaculture licence".

In a number of jurisdictions, the right to use the seabed for the purpose of aquaculture is set out in the aquaculture law itself. For example, South Australia's aquaculture law provides for the grant by the minister of "production leases" within State Waters (which extend up to 12 nm from the baseline). The law goes on to set out relatively detailed rules regarding the procedure for the allocation of production leases, including a general call for applications and the creation of an "Aquaculture Tenure Allocation Board" to advise the minister including as regards the standard conditions applicable to each lease. The legislation also provides for the grant of short term "Pilot leases" to trial aquaculture development in new areas and goes on to provide that an aquaculture licence may not be issued in the absence of a production lease except in the case of aquaculture undertaken on moving vessels or in towed structures. In other words, a lease is usually a pre-requisite for a licence. In a similar manner, in Tasmania an aquaculture lease issued pursuant to the Marine Farm Planning Act, is a pre-requisite for the issuance of a marine farming licence pursuant to the Living Marine Resources Management Act 1995.

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63 Fisheries (Amendment) Act 1997.

However, in some jurisdictions, as already mentioned, the document that creates tenure rights, such as a lease or a concession contract, also functions as the aquaculture licence. For example, the Spanish marine aquaculture law clearly distinguishes in Article 4 between a "concession" which grants a right "to the exclusive and temporary use and enjoyment by natural or legal persons of Spanish nationality on public domain land, for the installation of establishments for the investigation or exploitation of mariculture" and an "authorization" to undertake mariculture for the purposes of research or exploitation. However, it is to be noted that when an aquaculture concession involves the use of fixed structures within the sea (as will often be the case), a separate concession will also be required from the competent agency for ports and coasts, in accordance with Article 10.3 of Law 28/1969, on Coasts.

A key issue concerns the duration of the land tenure rights granted over the seabed. Again, it is important to ensure that the tenure right granted is of sufficient duration to enable an investor to make a return on investment. In Viet Nam, a use right may last only for five years although it can be renewed. In South Australia a production lease may last for up to 20 years following which it may be renewed. Similarly, a concession granted under the Spanish marine aquaculture law has an initial duration of 10 years but may subsequently be extended up to 50 years in total.

However, if a lease or concession is excessively long, this may cause its own problems in terms of tying up marine space. To this end in Chile, one of the reforms contained in the 2010 Aquaculture Reform Act was to limit the duration of aquaculture concessions to 25 years and to provide that they may only be extended thereafter on the basis of positive environmental reports. A related issue concerns the right to transfer or assign leases or concessions. This matter is discussed in more detail below in section 57.

20. Requirement for proof of title

Before a public agency authorizes a particular activity on a particular area of land, it is normal to require the applicant to provide evidence that s/he has the right to use that land not least so as to avoid the situation in which an implied land tenure right is created. For that reason, aquaculture legislation should require evidence of title, in other words a legal right to use the land

relating to the proposed aquaculture facility, in support of an application for an aquaculture licence. This is particularly important in cases where public land is to be used.

For example, Article 9 of the Croatian aquaculture law provides that an aquaculture licence may only be issued if, among other matters, the applicant holds a concession "for the economic use of a maritime property for the purpose of performing aquaculture activity" or if s/he has "obtained the appropriate acts for the right to use the agricultural land owned by the Republic of Croatia for the performance of aquaculture activities in accordance with a special regulation on agricultural land, in the case of farming on agricultural land owned by the Republic of Croatia".

21. Recognition of customary land tenure arrangements

In many countries, customary land tenure law is the dominant type of land tenure arrangement outside urban areas. Customary land tenure arrangements are therefore based on their own specific normative systems and typically rely on oral agreements and the consent of the relevant community rather than formal title documents. In such circumstances it will be necessary for aquaculture legislation to take account of those specific requirements in terms of requiring proof of title (i.e. the legal right to use the land in question).

The Newfoundland aquaculture law,[64] for example, contains specific provisions on the use of land subject to the rights of indigenous Inuit people.

> **Labrador Inuit rights**
> 3.1 (1) This Act and regulations made under this Act shall be read and applied in conjunction with the Labrador Inuit Land Claims Agreement Act and, where a provision of this Act or regulations made under this Act is inconsistent or conflicts with a provision, term or condition of the Labrador Inuit Land Claims Agreement Act, the provision, term or condition of the Labrador Inuit Land Claims Agreement Act shall have precedence over the provision of this Act or a regulation made under this Act.

[64] Aquaculture Act, 1991.

(2) Where, under this Act, the minister issues an aquaculture licence he or she may add to that licence terms and conditions that the licensee must comply with in order to ensure compliance with the terms and conditions of the Labrador Inuit Land Claims Agreement Act.

a) Water tenure

Successful aquaculture is highly dependent on access to sufficient, good quality water (Lebel *et al.*, 2019). The use of poor-quality water contributes to fish stress, increased risks of fish disease, increased use of chemicals, and ultimately, higher food safety risks for humans. Secure water tenure in the form of legal rights to abstract and/or use an adequate quantity of clean water are necessary for sustainable freshwater aquaculture. In contrast, few jurisdictions regulate the abstraction and/or use of seawater.

22. Permit for abstraction and use of freshwater

In most, but not all, jurisdictions, the abstraction and use of freshwater is regulated on the basis of a water resources law. Such laws typically require any person who wishes to abstract and use water for aquaculture to obtain a long-term water use permit (which may also be described as a licence, an authorization or a concession). Many countries have recently adopted revised water resources legislation in order to implement integrated water resources management (IWRM) by 2030 as required by SDG Target 6.5 on Clean Water and Sanitation (United Nations, 2015) or are in the process of doing so.

The basic objective of such a permitting regime is to provide a clear legal basis for the allocation and use of water resources among different water users and different water use sectors, including aquaculture. At the same time, a water use permit confers security of water tenure upon the holder, in that the water legislation typically requires the rights of existing water use permit holders to be taken into account and respected before new water use permits are issued and/or uses are authorized including uses that may negatively impact water quality.

The first question as regards water tenure, therefore, is whether or not the applicable water resources legislation requires a water use permit for

the abstraction and/or use of freshwater for aquaculture? This is an issue that can really only be properly addressed in a water resources law. If it is not adequately addressed, then it will be necessary to revise the water resources law accordingly. An aquaculture law can do little more than to cross refer to the relevant legislation. For example, Article 101 of the Mexican aquaculture law cross-refers to the Mexican water law:

> The exploitation or use of domestic water resources for aquaculture, can be granted to individuals or companies by the Water Authority under the terms of the National Water Act, this Act and its regulations.[65]

As seen in section 18 above, the use of riverbed land for the purpose of attaching a cage or other aquaculture structure is usually also subject to a permit requirement which also explicitly or implicitly authorizes the use of that water flows through the cage of structure.

23. Protection of existing water tenure arrangements

It is important to ensure that water legislation contains provisions that requires the interests of existing permit holders (including permits relating to aquaculture) to be respected when applications for new permits for the use of water resources are determined. This is just as true for consumptive uses of water, such as the abstraction of water for use in a pond, as it is for non-consumptive uses, such as the use of water in a cage or other structure, in terms of: (a) ensuring that there is sufficient water to enable such uses; and (b) ensuring that the water to be used is of appropriate quality. In this connection it is important to note that temperature is usually an important issue as regards the quality of water used in aquaculture. The release of cold de-oxygenated water from hydropower dams, for example, can cause serious harm to downstream aquaculture facilities.

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65 *'La explotación, uso o aprovechamiento de las aguas nacionales en la acuacultura, se podrá realizar por personas físicas o morales previa la concesión respectiva otorgada por la Autoridad del Agua, en los términos de la Ley de Aguas Nacionales, la presente Ley y sus reglamentos.'*

24. Water legislation implementation

Growing pressure on freshwater resources as a result of population growth and increased economic activity poses an increasingly serious challenge to the sustainability of freshwater aquaculture in terms of water availability. Although, as mentioned above, many countries have recently adopted revised water resources legislation to give effect to IWRM, the reality is that IWRM is both costly and challenging to implement, with the result that implementation often lags far behind. In this connection, it follows that the weak or inadequate implementation or enforcement of water resources legislation also poses a potentially serious challenge to the sustainability of freshwater aquaculture in terms of the quantitative management of water resources.

Again, there is little that an aquaculture administration can do by itself to address this issue, other than to monitor the situation and to lobby for increased funding by pointing out the potentially adverse effects on the aquaculture sector in terms of rural incomes, food security etc. The freshwater aquaculture sector in general and the aquaculture administration in particular are key stakeholders as regards the implementation of water resources legislation.

25. Water quality standards

For freshwater aquaculture the quality of the water is used is as important as the quantity. Put another way, water tenure arrangements that confer a right to use a specific quantity of water provide little tenure security if the quality of the water is so poor as to make it unfit for use in aquaculture. Particularly, but not exclusively, in developing countries, there is a growing water quality crisis which in turn poses a major threat to the freshwater aquaculture sector (e.g. Damania *et al.*, 2019). In terms of addressing this issue, the first question is whether or not the water resources legislation (or in some countries the environmental legislation) provides for the setting of ambient water quality standards, discharge standards and the issuance of wastewater discharge permits?

Ambient water standards specify binding quality objectives for river reaches or water bodies by reference to the purposes for which such

waters may be abstracted and/or used, while discharge standards typically specify the concentration of pollutants that may be discharged from a fixed point. Wastewater discharge permits regulate the discharge of wastewater (effluent) by setting legally binding conditions relating to the treatment of wastewater and the discharge standards to be achieved in order to ensure compliance with ambient water quality standards.

If such standards/permit conditions are not provided for in the existing water resources/environmental legislation the first priority has to be to address that gap through the reform of the applicable legislation.

26. Water quality standards implementation

As with the quantitative management of water resources, even if appropriate legislation on water quality standards/permitting is in place, it is important to assess the extent to which it is implemented/enforced. Again, there is little that an aquaculture administration can, by itself, do to alter this kind of situation, other than to monitor the situation and having identified it as a threat to the sector, to lobby for remedial action.

4.4. Planning and approval

Depending on the jurisdiction concerned and the type of aquaculture to be undertaken, a range of different approvals based on different laws and planning mechanisms may be required for aquaculture in addition to a licence issued pursuant to the aquaculture legislation (see Figure 5). For example, aquaculture in Scotland requires between five and seven approvals, depending on whether an environmental impact assessment is needed, from different bodies. As already seen in Chapter Three of this study a similar number of approvals may be necessary for aquaculture in Queensland, Australia.

Many of these approvals relate to the siting of aquaculture facilities. Siting decisions are of fundamental importance not only in terms of addressing the potential impacts of aquaculture on the environment and other activities but also in terms of ensuring that aquaculture facilities are themselves situated in an appropriate place as regards, in particular, water quality.

Once an aquaculture facility has been authorized/constructed it is usually very difficult (if not impossible) to change the quality of the water that will be used there, even if the water resources/environmental legislation is fully implemented.

Box I
Permits needed for aquaculture in Scotland

The five to seven consents which may be required, depending on whether an environmental impact assessment is involved, are as follows:

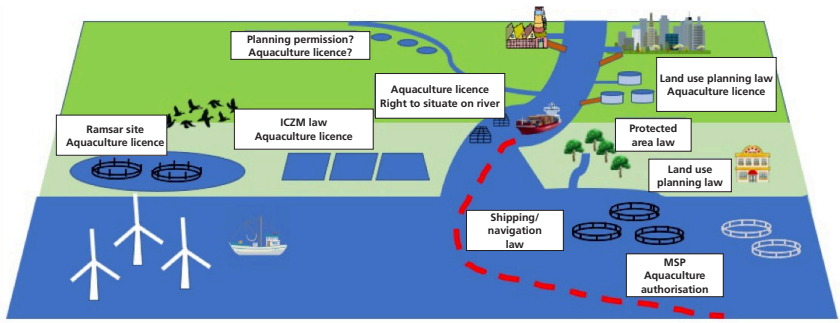
1. Seabed/Foreshore Lease issued by The Crown Estate/ Crown Estate Scotland (the body that is responsible for managing marine public land), which confers land tenure rights to use the seabed/foreshore area.
2. Planning Permission granted at local government level.
3. Environmental Impact Assessment (EIA), if required, assessed by local government.
4. Marine Licence issued by Marine Scotland Licensing Operations Team.
5. Authorization to operate an Aquaculture Production Business issued by Marine Scotland Science Fish Health Inspectorate.
6. Controlled Activity Regulations (CAR) issued by Scottish Environmental Protection Agency, SEPA to regulate potential water quality impacts from aquaculture.
7. Habitats Regulation Appraisal (HRA), which may be required if the proposed facility may have negative impacts on protected or protected species, issued by any of the following: local government, Marine Scotland Licensing Operation Team, The Crown Estate/Crown Estate Scotland, Marine Scotland, Science Fish Health Inspectorate.

Source: Nimmo, F, McLaren, K, Miller, J & Cappell, R. 2016. *Independent Review of the Consenting Regime for Scottish Aquaculture*. Edinburgh, Scottish Government.

Moreover, as the sector grows pressure on suitable space increases along with the risk of conflict with other users of land and the sea. A recent European Union strategy document (European Commission, 2021) found that the main challenge to enhancing production in Europe is now the lack of available space in inshore sheltered areas followed by the administrative

complexity cause by the number of different consents/approvals needed from different agencies.

Figure 5
Different spatial planning/authorization regimes potentially relevant to aquaculture



a) Land use planning

Land use planning (sometimes describes as spatial planning) legislation is potentially applicable to all types of aquaculture, except for towed cages out at sea (and, as already mentioned, the operation of towed cages will also require some kind of base on land).

27. Application of land use planning legislation to aquaculture

Depending on the type of aquaculture and the legislation of the jurisdiction concerned, aquaculture may be classified as a "development" activity meaning that the development of a new aquaculture facility needs a land use planning/development approval (hereafter "development consent"). In Iceland, for example, land-based aquaculture requires a development consent while water-based aquaculture does not. On the other hand, in Norway, the Planning and Building Act applies to the entire country including river systems and extends 1 nm into the territorial sea. A development consent from the land use planning authority is required for "development" which is defined that law to mean "the carrying out of

building, engineering, mining or other operations in, on, over or under land, or the making of any material change in the use of any buildings or other land or the operation of a fish farm…".

Similarly, in Scotland the land use planning legislation applies up to 3 nm from the baseline meaning that a development consent is needed not only for a new marine aquaculture facility but also for a change of use within an existing facility (such as, for example, changing a shellfish farm to a finfish farm) or for changes of the species being farmed as well as for alterations to an existing authorized facility (Slater, 2016). On the other hand, although Malaysia's National Land Code 1965 and Town and Country Planning Act 1986 require a development consent for most kinds of development, aquaculture is classified as an "agricultural" activity of a kind which is generally exempt from land use planning restrictions or the need for a development consent.

A first question, therefore, is whether or not aquaculture is subject to land use planning legislation? If so, the implication is that each new aquaculture project will require a development consent. Land use planning legislation usually provides that applications for a development consent are subject to public consultation procedures which may include the holding of public meetings and the notification of those who may potentially be affected by a proposed development. If not, the implication is that spatial planning aspects of aquaculture development will need to be addressed largely or entirely in accordance with the aquaculture legislation including as regards provision for public consultation.

28. Identification in spatial development plans of areas where aquaculture may take place

If land use planning legislation applies to aquaculture, the next question is whether or not spatial development plans identify areas in which new aquaculture developments may or may not take place. Given the technical specificity of aquaculture this is an issue in respect of which input from the aquaculture administration will usually be necessary. In Croatia, for example, zones where aquaculture may take place are identified in the spatial plans adopted at county level in accordance with the Law on

Spatial Planning, 2013, as supplemented by a specific item of subordinate legislation, namely the Ordinance on criteria for determining areas for aquaculture on the maritime domain NN1067/2018 (30.11.2018).

It is important, however, to note that this ordinance was adopted pursuant to Article 14 of the aquaculture law by the minister responsible for aquaculture in consultation with the ministers responsible for the environment and spatial planning. In other words, this is an example of an aquaculture law being used to modify, and enrich, another element of Croatia's legal framework for aquaculture so to better integrate aquaculture into spatial planning (or to use the language used in Chapter Three above, to create a stronger linkage between aquaculture legislation and planning legislation).

If land use planning legislation does not identify areas where aquaculture may or may not take place, the implication is that applications for development consent will be determined on a case-by-case basis, which may lead to unpredictability for investors. Moreover, if land use plans do not identify areas in which aquaculture may or may not take place, the need for specific aquaculture spatial planning in accordance with aquaculture legislation becomes more important (see section 47 below).

29. Facilities requiring development consent

If the relevant legislation provides that only large-scale aquaculture development, however so defined, requires a development consent there may be a risk of uncontrolled/uncoordinated development of small-scale aquaculture. In this situation, too, consideration should be given to the development of provisions on spatial planning in aquaculture legislation.

30. Reference to land use planning in aquaculture legislation

If land use planning legislation applies to aquaculture it is important to ensure that the aquaculture legislation: (a) cross refers to the need for development consent (if necessary) before applications for aquaculture licences are considered; and (b) provides for coordinated decision making with the relevant land use planning authorities; or (c) establishes a "one-

stop shop" for the joint determination of applications for planning consent and aquaculture licences.

For example, Articles 8 and 15 of the Norwegian aquaculture law explicitly address this interlinkage as follows:

> § 8 Coordination of matters related to the establishment of aquaculture
>
> The authorities pursuant to this Act, the acts listed in Section 6, first paragraph, letter d, and the municipality, as the planning and building authority here, are obligated to undertake an efficient and coordinated processing of applications.
>
> The Ministry may prescribe, by regulations, detailed provisions relating to the coordination of application processing, including the stipulation of time limits for the processing of applications.
>
> …
>
> § 15 Relationship to land use plans and conservation measures
>
> Aquaculture licences may not be granted in contravention of:
>
> a) adopted land use plans pursuant to the Planning and Building Act of 14 June 1985 no. 77,
>
> b) adopted conservation measures pursuant to the Act of 19 June 1970 no. 63 relating to nature conservation, or
>
> c) adopted conservation measures pursuant to the Act of 9 June 1978 no. 50 relating to cultural heritage.
>
> An aquaculture licence may nevertheless be granted if the relevant planning or conservation authority gives its consent.

The issue of the one stop shop is considered in section 53 below.

b) Marine legislation

A number of items of marine legislation are potentially relevant to aquaculture undertaken in marine waters.

31. Marine spatial planning legislation

As a result of greater awareness of growing pressure on marine space, over recent years an increasing number of jurisdictions have adopted legislation on marine spatial planning (MSP). The aim of MSP is to balance

competing claims between different economic sectors, such as navigation, fisheries, energy generation and aquaculture, for marine space while at the same time protecting the marine environment. For example, the European Union Maritime Spatial Planning Directive[66] requires European Union Member States to prepare "maritime spatial plans" to "identify the spatial and temporal distribution of relevant existing and future activities and uses in their marine waters". On the other hand, in Viet Nam MSP is undertaken on the basis of Article 21 of the Law on Master Planning[67] as completed by Article 44 of the aquaculture legislation.[68]

If there is no MSP legislation in place, it may be appropriate to consider addressing other claims for marine space in development of aquaculture spatial plans developed on the basis of aquaculture legislation, as discussed in more detail in part 4.4. f) below.

32. Identification of zones where aquaculture may/may not be undertaken

If MSP legislation is in place, the next question is whether the resulting marine spatial plans identify zones where aquaculture may or may not be undertaken. In practice, this should usually be the case. For example, Article 8(2) of the European Union directive mentioned above sets out an indicative list of maritime activities that must be taken into consideration in the development of maritime spatial plans. This list begins with "aquaculture areas", followed by "fishing areas", and a range of other activities including "maritime transport routes and traffic flows" and "nature and species conservation sites and protected areas".

33. Cross reference to MSP legislation in aquaculture legislation

If MSP legislation is in place, then it is obviously important to ensure that the aquaculture legislation cross refers to it in terms both of aquaculture planning and authorization.

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66 Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning (OJ L 257, 28.8.2014, p. 135).

67 Law on Master Planning, 2017.

68 Law on Fisheries, 2017.

34. Approvals under navigation legislation

Aquaculture facilities in marine waters are a potential hazard to navigation. In some jurisdictions it is necessary to obtain prior approval from the ministry, department or agency responsible for navigation as regards the siting of aquaculture facilities. Such approval may be granted on the basis of conditions regarding the lighting or other marking of aquaculture facilities in order to prevent collisions.

If this is the case, then it may be appropriate to cross refer to the navigation legislation in the aquaculture legislation. For example, Article 6 of Norway's aquaculture law specifically refers to licences issued on the basis of "Act of 8 June 1984 No. 51 relating to harbours, fairways, etc". Indeed, the issue of coordination may go beyond aquaculture licensing but also include the issuance of land tenure rights (such as leases or concessions) granted on the basis of the aquaculture legislation. To this end, Section 20 of the South Australia aquaculture legislation provides:

> **20—Concurrence under Harbors and Navigation Act**
>
> (1) The power of the Minister to grant an aquaculture lease in respect of an area to which this Part applies is subject to the requirement under section 15 of the Harbors and Navigation Act 1993 for the concurrence of the Minister responsible for the administration of that Act.
>
> (2) However, the concurrence of the Minister is not required—
>
> (a) for the substitution of an aquaculture lease following the division of lease areas into separate lease areas, or the amalgamation of lease areas, in accordance with the regulations; or
>
> (b) for the grant of an emergency lease over an area that is not within a port or harbor within the meaning of the Harbors and Navigation Act 1993.

In a similar manner, Article 9 of Spain's marine aquaculture legislation cross-refers to navigation legislation in connection with the issuance of aquaculture concessions.

c) Floods, droughts and storm surges

As a result of climate change, the risks to aquaculture facilities from floods, droughts and storm surges are likely only to increase. NACA in

particular has published a number of technical studies on his topic.[69] Apart from the risks to the economic sustainability of aquaculture, the destruction of aquaculture facilities as a result of floods and storm surges can cause environmental harm as a result, for example, of the escape of aquatic animals.

Some of these issues may be taken into consideration in relevant sector laws, including land use planning legislation. But if they are not, and particularly if aquaculture is not subject to land use planning legislation, then it may well be appropriate to address them in aquaculture legislation.

35. Inland flood risks

Wetlands and low-lying areas adjacent to rivers are often particularly suitable places for the construction of aquaculture facilities but at the same time may be particularly vulnerable to flooding. Water resources laws, linked with land use planning legislation, increasingly seek to identify areas at greater risk from flooding. For example, the European Union Flood Risks Directive[70] requires the Member States to identify areas in respect of which potential significant flood risks exist or might be considered likely to occur and to prepare "flood hazard maps" and "flood risk maps" as well as flood risk management plans (Article 7).

If such measures exist, aquaculture legislation should require them to be taken into account in the determination of applications for aquaculture licences. If they are not provided for then flood risk should be a further issue to be taken into consideration in the development of spatial plans for aquaculture development.

36. Water priority for aquaculture

Water shortages as a result of climate change may pose an increasing risk to freshwater aquaculture (European Commission, 2021). As described

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69 See: https://enaca.org/?id=9

70 Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (OJ L 288, 6.11.2007, p. 27).

above, a water use permit will typically be required for the abstraction of freshwater for aquaculture ponds, tanks and raceways. Water use permitting regimes usually provide for the temporary restriction or reduction in the volumes that can be abstracted in times of drought or low flow, often in accordance with a system of priorities. Use for basic household (drinking water) and ecological needs will usually have the highest priority, as set out in the water resources legislation itself or relevant river basin management plans. From the perspective of the aquaculture sector, it is important to ensure that aquaculture, as a vital food source, is given a high priority, analogous to other types of farming activity.

This issue cannot be addressed in aquaculture legislation but should be reflected in terms of the priorities for water use set out in water resources legislation or in relevant river basin management plans as appropriate.

37. Identification of coastal land and sea areas at risk from extreme weather events

Aquaculture facilities located in the coastal zone and in sea areas may also be at risk from a range of extreme weather events such as storm surges. Flooding may not only destroy such facilities but may also lead to the escape of the aquatic animals being farmed there. To the extent that such risks are identified and managed on the basis of other legislation, such as legislation on land use planning, water resources management, coastal zone management or specific legislation on flooding or climate change in the context of climate change adaptation measures,[71] then it is important that the aquaculture legislation cross refers to this. If it is not (yet) addressed in other legislation it will be increasingly important to address the management of risks of extreme weather events in aquaculture legislation itself.

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[71] In particular, Article 7 of the Paris Agreement, adopted by the Conference of the Parties to the United Nations Framework Convention on Climate Change, requires each party to engage in adaptation, including by formulating and implementing National Adaptation Plans that should be submitted and periodically updated through an adaptation communication describing priorities, needs, plans and actions.

d) Coastal zone management

Apart from their vulnerability to storm surges, highly populated low-lying coastal areas, including mangroves, provide a range of livelihood and vital ecosystem functions. The intensive development of large-scale commercial shrimp aquaculture in vulnerable habitats in the coastal zone is one of the main environmental criticisms made of the sector.

38. Coastal zone management plans

To reduce conflict and to promote the sustainable use of the coastal zone, many countries have adopted coastal zone management legislation that requires the development of coastal zone management plans as part of a process known as integrated coastal zone management (ICZM).

If such legislation is in place, it is important first to verify that the issue of aquaculture is addressed in the legislation itself and in coastal zone management plans in terms of identifying areas in which aquaculture may or may not take place. It is also important to ensure that aquaculture legislation cross refers to such provisions and requires them to be taken into account in the determination of applications to authorize aquaculture development in the coastal zone.

If there is no coastal zone management legislation in place, consideration should be given to revising the aquaculture legislation to require consideration of vulnerable habitats and other uses of land within the coastal zone in aquaculture development spatial plans (as discussed in more detail in part 4.4 f) below).

e) Environmental legislation

With the possible exception of RAS,[72] environmental legislation is relevant to all types of aquaculture. As described in Chapter One, the negative environmental impacts of aquaculture are potentially significant. They can include: (a) water pollution as a result of waste from aquatic animals;

[72] And even RAS produce some waste that has to be disposed of.

(b) adverse impacts on habitats due to land-use change; (c) negative effects of chemicals/medicines used in aquaculture on water quality; (d) damage to vulnerable habitats and ecosystems; (e) the release of diseased organisms and carriers; (f) the escape of genetically changed and/or invasive non-native species, causing direct/indirect impacts to biodiversity and fisheries; (g) negative cultural effects (landscape; demography); and (h) indirect negative impacts associated with inputs (e.g. food, fertilizer etc.) on the wider environment.

As regards the potential environmental impacts of aquaculture, paragraph 9.1.2 of the Code of Conduct provides that "States should promote responsible development and management of aquaculture, including an advance evaluation of the effects of aquaculture development on genetic diversity and ecosystem integrity, based on the best available scientific information".

39. Application of EIA legislation to aquaculture

As described in Chapter Three above, EIA procedures seek to identify the potential negative impacts of development projects as well as measures to prevent or mitigate such impacts. In many jurisdictions the EIA legislation requires the person responsible for determining whether or not to authorize a project to take into account the potential environmental impacts in reaching a decision. However, in other jurisdictions, the EIA procedure is managed by the agency responsible for environmental protection and results in the issuance by that agency of an environmental permit that confers an environmental clearance or approval for the project while also setting out permit conditions intended to prevent or mitigate negative environmental impacts.

As regards aquaculture, paragraph 9.1.5 of the Code of Conduct specifically states that:

> States should establish effective procedures specific to aquaculture to undertake appropriate environmental assessment and monitoring with the aim of minimizing adverse ecological changes and related economic and social consequences resulting from water extraction, land use, discharge of effluents, use of drugs and chemicals, and other aquaculture activities.

A first question, therefore, is whether or not aquaculture development, in the sense of constructing/establishing new aquaculture facilities, is potentially subject to EIA. If aquaculture is not subject to EIA, because for example it is simply not mentioned in the EIA legislation, then the implication is that the potential environmental impacts of a new aquaculture facility may be largely or wholly considered only in the aquaculture legislation itself.

40. Aquaculture projects subject to EIA

In many jurisdictions only major or large-scale aquaculture developments are subject to EIA. For example, the relevant European Union legislation provides that EIA is required only for "intensive fish farming" projects that are likely to have "significant effects on the environment".[73]

In practice the European Union Member States have applied thresholds for EIA based on a range of different criteria including the size of the aquaculture facility (e.g. requiring an EIA if size of the proposed aquaculture facility exceeds five hectares), the total fish production output (e.g. annual production greater than 100 tonnes), fish production output per hectare (e.g. carp ponds with a fish production output higher than four tonnes per hectare of the pond area) or feed consumption (e.g. more than 2 000 kg of dry feed consumed per year) (European Commission, 2015). Additionally, European Union legislation concerning the protection of habitats and species, provides that projects (including aquaculture projects) that may have a significant effect on certain types of protected area are also to be subject to an "appropriate assessment".[74]

In Viet Nam an EIA is required only for projects to build aquaculture facilities with a water surface area of 10 hectares or more and for extensive farming projects on 50 hectares or more.[75]

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[73] Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (OJ L 26, 28.1.2012, p. 1).

[74] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7).

[75] Decree No. 18/2015/NĐ-CP dated 14/2/2015 of the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plans.

The implication is that if smaller scale aquaculture facilities are not subject to EIA, consideration should be given to revising the aquaculture legislation to require potential environmental impacts to be taken in terms of sector planning and the licensing of aquaculture facilities. A further challenge, as will be seen below, arises in cases where small-scale aquaculture is not also subject to licensing.

41. Issuance of an environmental permit

As already mentioned, in some countries EIA is a stand-alone procedure that results in an EIA report that identifies the potential environmental impacts of a proposed project which must be taken into account by the relevant decision maker in determining whether or not to authorize the project. So, for example, in Scotland the EIA is taken into account by the relevant local government in determining whether or not to issue a development consent for a proposed aquaculture project in accordance with the land use planning legislation.

In other countries, such as Chile, the preparation of an EIA for a proposed aquaculture facility is the first step towards the issuance of an environmental permit (Fuentes Olmos and Engler, 2016). If the EIA is approved, then this is translated into an environmental permit which in turn contains conditions to prevent or mitigate potential environmental harm identified in the EIA. If environmental management mitigation measures will be addressed in the environmental permit, it may be necessary to ensure that coordination/information exchange mechanisms are in place between the environment agency and the aquaculture administration.

If an environmental permit is not issued as the outcome of the EIA procedure, this will likely mean that a licence issued in accordance with the aquaculture legislation will be the main mechanism to prevent or mitigate the negative environmental impacts from aquaculture facilities (subject to the discussion on water quality in section 44 below).

42. Reference to EIA requirements in aquaculture legislation

If an EIA is required for a new aquaculture project, it is important to ensure a coherent approach to the authorization process and to consider revising the aquaculture legislation to specifically cross refer to the requirements of the EIA legislation.

43. Strategic environmental assessment

In a growing number of countries official plans and programmes, such as aquaculture development plans, are subject to a "strategic environmental assessment" to identify potential negative environmental impacts and to propose measures to prevent or mitigate these.

If this is the case, then the environmental impacts that may arise from an aquaculture development plan will be identified in the SEA process. If it is not the case, it may be appropriate to consider revising the aquaculture legislation to require the environmental impacts of aquaculture development to be addressed, along with appropriate mitigation measures, in the aquaculture development plan itself.

44. Water quality issues

The quality and quantity of waste generated from aquaculture depend mainly on the characteristics of the type of cultivation system used, the species that are cultivated, feed quality and the management of aquaculture facilities. Organic matter and nutrients, largely derived from fish feed, faeces and urine, are among the most important types of pollutant, and may cause algal blooms in receiving waters. Chemicals including medicinal products including antibiotics, disinfectants and pesticides may also cause water quality problems (Lebel *et al.*, 2019).

In principle, the discharge of effluent from an aquaculture pond, tank or raceway should take place, like any other wastewater discharge, in accordance with a wastewater discharge permit (as discussed in section 26 above). In the case of aquaculture in a cage or pen there is no discrete discharge that can be regulated making the process of controlling the

impacts of aquaculture on water quality a more challenging process. So how can it be done? There are two basic approaches to this issue.

Under the first approach, the issue of water quality from aquaculture is regulated on the basis of environmental protection legislation. For example, in Scotland, aquaculture, including cage culture, is one of a number of potentially polluting activities addressed in the Controlled Activity Regulations (CAR) on the basis of a licensing regime.[76] A CAR licence sets site-specific limits on the number of fish that can be held in cages and the type and the quantity of medicines and chemicals that can be used. CAR licences are a requirement only for finfish facilities. A similar approach, in other words the regulation of pollution from aquaculture in environmental legislation, is found in the United States of America where aquaculture in certain waterbodies may be subject to the Federal Clean Water Act.

The other approach is to address the potentially polluting impacts of aquaculture in aquaculture legislation itself. In Ireland, specific regulations[77] adopted pursuant to the aquaculture law, address the use of dangerous polluting substances in aquaculture by setting an additional range of tests for the issuance of aquaculture licences. More specifically, they provide that an aquaculture licence may not be issued if:

> (a) the applicant is unable to comply with limits on the quantity and concentration of a dangerous substance that may be discharged,
>
> (b) the applicant is unable to comply with required emission standards,
>
> (c) it is necessary in order to secure compliance with environmental quality objectives or standards,
>
> (d) it is necessary for the protection of human health, plant health, animal health or welfare, or the environment, or
>
> (e) it is necessary, ancillary or supplementary for an act of the institutions of the European Communities (including an act cited in the preamble to these Regulations) to have full effect.

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76 The Water Environment (Controlled Activities) (Scotland) Regulations, 2011.

77 S.I. No. 466 of 2008 European Communities (Control of Dangerous Substances In Aquaculture) Regulations, 2008.

Moreover, aquaculture licences are subject to conditions:

> (a) (i) limiting the discharge of a dangerous substance, and
>
> (ii) establishing, in relation to the licensed activity, emission standards, set in accordance with Article 6 of [relevant European Union water quality legislation],
>
> (b) identifying, by means of a map or otherwise, the boundaries or limits of the place or waters in relation to which discharge of a dangerous substance may take place,
>
> (c) relating to monitoring and inspection of discharges and emission standards,
>
> (d) specifying the amount of feed inputs,
>
> (e) specifying operational practices, including the stock density and fallowing of sites,
>
> (f) relating to the use and storage of chemicals and medicines,
>
> (g) requiring compliance with such protocols, including in relation to monitoring, auditing and any aspect of managing an aquaculture site, as may be published by the Minister, and
>
> (h) requiring the keeping of records relating to a condition to which this Regulation relates.

The regulations go on to provide that discharge standards for each licence are to be set by reference to relevant water quality standards (as described above in section 26).

45. Protected area legislation

While fisheries laws typically defer to protected area legislation as to whether or not fishing may be undertaken within protected areas (leaving the matter to be determined by the relevant protected area authority in accordance with the relevant protected area legislation), the situation as regards aquaculture is a little different not least because some types of aquaculture facility can create specific habitats that make a positive contribution to biodiversity (Francová *et al.*, 2019). This is why the Ramsar Convention definition of wetlands is broad enough to include artificially created wetlands such as aquaculture ponds for fish/shrimp.

Protected areas of potential relevance to aquaculture include inland and coastal zone protected areas as well as marine protected areas. Depending on the applicable legislation, within specified categories of protected area:

a) aquaculture may be totally prohibited;

b) certain types of aquaculture may be undertaken without a specific authorization from the relevant protected area authority; or

c) aquaculture may be undertaken on the basis of a specific authorization issued by the relevant protected area authority.

The key point is that, irrespective of the situation, it is important to ensure that the aquaculture legislation cross refers to the protected area legislation and any specific requirements that it may contain as regards aquaculture.

46. Habitats/protected species legislation

Finally, apart from any EIA requirements it is important to ensure that the aquaculture legislation cross refers to legislation that seeks to protect: (a) endangered or migratory species; and (b) habitats that are critical to the survival of endangered or migratory species.

a) Aquaculture legislation

Having examined the approvals/consents that may be necessary for aquaculture development contained in elements of the legal framework for aquaculture, it is next necessary to turn to the provisions on planning and authorization contained in the aquaculture legislation itself.

47. Spatial development plans

Spatial planning is important for all activities that use natural resources and aquaculture is no exception. Even if land use plans or marine spatial plans identify areas where aquaculture may or may not be undertaken from a spatial planning perspective, in order to guide the rational development of the sector, aquaculture legislation should in most cases provide for

the adoption of national or sub-national (regional) aquaculture spatial development plans.[78]

Tasmania has specific legislation on marine farm planning, the purpose of which is described in Section 4 as being "to achieve well-planned sustainable development of marine farming activities". Section 4 goes on to provide that this purpose is to be fulfilled by having regard to the need to:

> (a) integrate marine farming activities with other marine uses;
> (b) minimise any adverse impact of marine farming activities;
> (c) set aside areas for activities other than for marine farming activities; and
> (d) take account of land uses; and
> (e) take account of the community's right to have an interest in those activities

Such a plan should guide officials charged with determining applications for aquaculture leases/concessions as well aquaculture licences. Tasmania's legislation also provides for the identification of areas in which aquaculture will not be permitted. A similar approach is taken in the South Australia aquaculture legislation.

Section 4 of Tonga's aquaculture law[79] imposes a duty upon the minister "to prepare and keep under regular review a plan for the management and development of aquaculture which shall be published in the Gazette". The minister may also, with the consent of the Cabinet, designate any area to be an "aquaculture area" and declare any area to be a "development buffer zone".[80]

Part VI of Namibia's aquaculture legislation[81] contains the following relatively detailed provisions on aquaculture development zones:

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78 A possible exception could arise in a case like Croatia where comprehensive land use plans are in place, prepared as described above in accordance with subordinate legislation adopted pursuant to the aquaculture legislation and where most of the potential sites for offshore aquaculture facilities have already been identified.

79 Aquaculture Management Act, 2003.

80 Sections 5 and 6.

81 Aquaculture Act, 18 of 2002.

33. (1) The Minister may by notice in the Gazette -

(a) declare any area of Namibia or Namibian water, including sub-aquatic lands, as an aquaculture development zone;

(b) determine the location and extent, and define the physical boundaries of an aquaculture development zone.

(2) Before declaring a place as an aquaculture development zone, the Minister must consult with the advisory council and any Ministry having jurisdiction in the proposed aquaculture development zone and undertake an environmental impact assessment with regard to the aquaculture development zone and establish the development objectives of the aquaculture development zone.

(3) The Minister may, by notice in the Gazette, in order to protect the aquaculture activities undertaken in an aquaculture development zone, specify restrictions and conditions on the conduct of activities and uses in -

(a) the aquaculture development zone;

(b) the waters draining into an aquaculture development zone; and

(c) any land or water area adjacent to an aquaculture development zone.

(4) The Minister may, by notice in the Gazette, abolish an aquaculture development zone or alter its boundaries.

Conduct of aquaculture in aquaculture development zones

34. The Minister may, by notice in the Gazette, specify restrictions and conditions on the conduct of aquaculture in an aquaculture development zone, or part thereof, as the Minister considers necessary, including -

(a) the aquatic species which may be farmed;

(b) the conditions subject to which aquaculture and any related activities may be conducted;

(c) the number and size of the aquaculture facilities that may be established within an aquaculture development zone, and the carrying capacity of the aquaculture zone concerned.

Other Activities

[The word "Activities" in the section heading should not be capitalised.]

35. A person may not, unless authorized in writing to do so by the Minister, conduct any business or undertaking other than aquaculture in aquaculture development zones.

Planning is in a sense even more important in jurisdictions where small scale aquaculture is not licensed in order to prevent uncontrolled development of the sector that does not respect the carrying-capacity of the

local environment. In Thailand, for example, Section 77 of the aquaculture law provides that, "no person shall undertake an aquaculture enterprise under control outside the areas prescribed by the Provincial Fisheries Committee as aquaculture zones". In Thailand most aquaculture is currently undertaken at a small scale and does not require a licence, meaning that the system of aquaculture zones is the principal mechanism for controlling where (unlicensed) aquaculture can take place.[82]

48. Content of aquaculture spatial development plans

Aquaculture spatial development plans should evidently be drawn up by reference to other relevant plans and should address a number of basic issues. One approach is to identify, within an overall plan, specific aquaculture zones that can then be made subject to specific management rules. For example, Article 86 of Mexico's federal aquaculture legislation provides for the creation of Aquaculture Management Units to enable the integrated, orderly and sustainable development of aquaculture. Article 86 goes on to provide that:

> Each aquaculture management unit must have a management plan that will contain:
>
> I. The actions to be carried out in the short, medium and long term, establishing the link with the applicable plans and programs;
>
> II. The carrying capacity of the water bodies from which the aquaculture production units are intended to be fed;
>
> III. The geographical characteristics of the area or region;
>
> IV. The existing infrastructure works and those that are planned to be developed and their program of administration;
>
> V. The form of organization and administration of the management unit, as well as the participation mechanisms of the aquaculturists settled in it;
>
> VI. The description of the physical and biological characteristics of the Aquaculture Management Unit;

[82] However, Section 77 does not entirely close the door to aquaculture outside aquaculture zones. Instead, it cross refers to Section 79 which provides that aquaculture in the public domain of the State may be undertaken on the basis of a licence issued pursuant to the act.

> VII. Actions for the protection and sustainable use of natural resources and a schedule compliance with the applicable legal provisions;
>
> VIII. Aquaculture health, safety and quality actions; IX. Growth and modernization actions;
>
> IX. The program for the prevention and control of contingencies, monitoring and others that are required due to the characteristics of the aquaculture management unit, and
>
> X. Mitigation and adaptation actions to be carried out in the face of current and future vulnerability to climate change, in accordance with the National Risk Atlas.

As will be seen in Section 120 below, the Aquatic Animal Health Code recommends the establishment of zones to separate distinct sub-populations of aquatic animals used in aquaculture as a means of preventing the spread of disease. Such zones can be separated by natural or artificial geographical barriers (Forrest *et al.*, 2009). Building biosecurity considerations into the planning process from the outset has the potential to strengthen the resilience of the sector against animal health problems. Such an approach is taken in the Chilean aquaculture legislation, following the 2012 amendments (see Box G above), which provides for the grouping of concessions within each "area suitable for the exercise of aquaculture" which share epidemiological, oceanographic, operational or geographical characteristics that justify their coordinated sanitary management by reference to the species cultivated. Moreover, within such a grouping, aquaculture farmers can agree stronger animal health practices.

Other issues to be addressed in aquaculture plans should ordinarily include: (a) limits on the number of facilities in each zone based on the environmental carrying capacity of the area concerned in order enable compliance with water quality objectives; (b) the setting of concentration limits (in terms of biomass per square metre) for individual facilities in order to enable compliance with water quality objectives; and (c) measures to mitigate or prevent adverse environmental impacts from aquaculture facilities.

49. Linkage to other area-based management tools

It is also important to ensure that aquaculture spatial development plans take into account other planning tools, particularly as regards area-based fisheries management. To this end, Chile's aquaculture legislation requires the aquaculture administration to have regard to "artisanal extractive fishing activities and their communities, the access and exit channels of ports and coves, the anchoring areas of the national squad and naval exercises, the areas of port development, the aspects of tourist interest and the protected areas"[83] in determining the boundaries of each area suitable for aquaculture.

50. Licensing

As described above, licensing is the principal regulatory tool used in aquaculture legislation. Particularly in countries where aquaculture is undertaken on a larger scale commercial basis, the legislation typically requires all aquaculture to take place on the basis of a licence. In such cases, undertaking aquaculture without a licence is an offence, as made clear by Section 6 of Ireland's aquaculture law:

> 6. (1) A person who, at any place or in any waters, engages in aquaculture except under and in accordance with an aquaculture licence, a trial licence, or an oyster bed licence or an oyster fishery order shall be guilty of an offence.
>
> (2) If an offence under subsection (1) of which a person was convicted is continued after the conviction, the person shall be guilty of a further offence on every day on which the act or omission constituting the offence continues, and for each such further offence the person shall be liable on summary conviction to a fine not exceeding €300 or on conviction on indictment to a fine not exceeding €2,000.

Similarly, Article 4 of Norway's aquaculture law states:

> **§ 4 Aquaculture licence requirement**
>
> The Ministry may grant a licence to engage in aquaculture activities (aquaculture licence) pursuant to Sections 6 and 7. Such licences may also be acquired by transfer pursuant to section 19.

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[83] Article 67.

> No person may engage in aquaculture activities without registration as the holder of an aquaculture licence in the aquaculture register, cf. section 18, first paragraph.

In the Republic of Korea, aquaculture is licensed as a business activity albeit on the basis of the aquaculture legislation. While most countries provide for a single type of "aquaculture license" the Republic of Korea's aquaculture legislation provides for the issuance of different licences depending on the type of aquaculture to be undertaken:

> Article 10 (Aquaculture Business License) (1) A person who intends to run an aquaculture business falling under any of the following shall obtain a license from the head of a Si/Gun/Gu (in the case of the Han River in the jurisdiction of the Seoul Special Metropolitan City, referring to the agency in charge of the management of the Han River; hereinafter the same shall apply): Provided, That in the case of a person who intends to run an offshore aquaculture business, he or she shall obtain a license from a Mayor/Do Governor:
>
> 1. Seaweed aquaculture business: Business of farming seaweed in the aquaculture facilities installed on the seafloor or under the sea in a certain section of the sea after dividing the sea into several sections;
>
> 2. Shellfish aquaculture business: Business of farming shellfish in the aquaculture facilities installed on the seafloor or under the sea in a certain section of the sea after dividing the sea into several sections;
>
> 3. Pisciculture business: Business of farming aquatic animals besides shellfish in aquaculture facilities installed on the seafloor or under the sea in a certain section of the sea after dividing the sea into several sections;
>
> 4. Combined aquaculture business: Business of farming two or more varieties of aquatic products under subparagraphs 1 through 3 in consideration of the characteristics, etc. of a fish farm;
>
> 5. Collaborative aquaculture business: Aquaculture business for which aquaculture businesspersons residing in a certain area conduct aquaculture in collaboration with each other in ways described in subparagraphs 1 through 4 after vertically dividing the water into zones based on certain depth as prescribed by Presidential Decree;
>
> 6. Offshore aquaculture business: Business of cultivating aquatic animals and plants by installing necessary aquaculture facilities underwater or on the surface of the sea in a certain section after dividing the open sea into several sections, or in other ways;

> 7. Inland aquaculture business: Business of cultivating aquatic animals and plants by installing necessary facilities underwater or on the bottom of the water in a certain section of the water after dividing the water into several sections in public waters under subparagraph 2 of Article 2 of the Inland Water Fisheries Act.

This approach presumably makes it easier to attach a standard set of conditions depending on the type of aquaculture being undertaken.

In some countries different agencies may be responsible for aquaculture licensing depending on where the facility is to be situated. The case of Portugal has already been mentioned. In a federal jurisdiction, different legislation may apply to, say, offshore aquaculture and such licences may be issued on the basis of different legislation. In the United States of America for example, offshore aquaculture is licensed beyond 3 nm from the baseline on the basis of federal legislation.[84]

However, as noted above, in a number of countries aquaculture licences are not required for small scale aquaculture for a range of reasons including the costs and impracticality of attempting to licence large numbers of small-scale facilities. In a very real sense, though, the non-use of licences represents a significant regulatory challenge for the sector. Aquatic animal diseases can spread just as easily through small aquaculture facilities as large ones. At the same time one of the key benefits of a licensing regime is that it offers the opportunity to place a limit on the number of aquaculture facilities in a given area (and to set concentration limits within each facility) that can respect the carrying capacity of the environment. The question of how to regulate aquaculture facilities otherwise than through the use of licences is considered in more detail in section 61 below. Nevertheless, while a licensing regime is not in itself a guarantee of sustainable management, if licences are not required this means that the aquaculture administration should keep the growth of the sector under strict review to prevent unsustainable development that exceeds the carrying capacity of the environment.

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[84] Namely the Magnuson- Stevens Act, 16 USC §§ 1801–1891.

51. Experimental/test aquaculture

In some jurisdictions, aquaculture legislation typically provides for the issuance of shorter term experimental/test aquaculture licences to authorize: (a) experimental aquaculture using new techniques; or (b) to test the viability of the farming aquatic animals or plants in a new place. Such licences are usually issued on the basis of a slightly shortened evaluation procedure.

For example, Article 19 of Spain's marine aquaculture law says:

> Article nineteen.
>
> In order to stimulate the initiative in marine cultures, temporary authorizations may be granted to carry out experiments on new marine cultures or improvement of existing ones. Those who carry out such experiences will have preference in the granting of concessions and authorizations in the place where they had been carried out, if the results obtained so advise, in the opinion of the competent Agency in matters of fishing.

In a similar manner, Section 9 of Ireland's aquaculture law provides that the minister may issue a "trial licence":

> (a) to carry on, at a place or in waters specified in the licence, such operations for the purpose of investigating the suitability of the place or waters for aquaculture, or for any activity forming part of an aquaculture operation, or
>
> (b) to carry out such other trials or experiments (including trials in the culture or farming of novel species),
>
> for such period—
>
> (i) in the case of salmon, not exceeding one year, and (ii) in all other cases, not exceeding 3 years,
>
> and subject to such conditions, which may include or relate to all or any of the matters specified in section 7(3), as the Minister thinks fit and specifies in the licence.
>
> (2) Without limiting the generality of subsection (1), a trial licence may specify, by means of a map or otherwise, the boundaries or limits of the place or waters in relation to which the licensee is licensed.
>
> (3) A trial licence is not capable of being renewed.
>
> (4) The Minister may revoke a trial licence where he or she considers that there has been a contravention of or failure to comply with the terms of the licence or of a condition subject to which it was granted.

As can be seen, a trial licence is issued for a relatively short period and cannot be renewed. If the trial is successful a full licence must be obtained in the ordinary manner in order to move to commercial production.

52. Reference to other approvals

Where, as will usually be the case, other approvals are also necessary for aquaculture in addition to an aquaculture licence, it is useful to cross-reference these in the aquaculture legislation. For example, Article 6 of Norway's aquaculture law explicitly refers to the legislation under which the different licences are issued:

> § 6 General conditions for the allocation of aquaculture licences
>
> The Ministry may grant an aquaculture licence by application, if:
>
> a) it is environmentally responsible,
>
> b) the requirements in section 15 concerning land use plans and conservation measures have been met,
>
> c) the land use interests have been weighed in accordance with section 16, and
>
> d) any licences required pursuant to the following acts have been granted:
>
> • Act of 19 December 2003 no. 124 relating to food production, food safety, etc.,
>
> • Act of 13 March 1981 no. 6 relating to protection against pollution and relating to waste,
>
> • Act of 8 June 1984 no. 51 relating to harbours, fairways, etc., and
>
> • Act of 24 November 2000 no. 82 relating to watercourses and ground water.
>
> The Ministry may prescribe, by regulations, detailed provisions relating to the allocation of aquaculture licences, including requirements for applications and criteria for granting applications.

The approach of Spain's marine aquaculture legislation is slightly different. Rather than referring to specific items of legislation, it makes reference to the different bodies from whom consent may be needed:

> Article ten.
>
> In the files of concessions and authorizations in public domain goods that have not been declared of interest for marine crops, public information will be made and the report of the competent Bodies in matters of Defence, Safety of

> Navigation, Tourism and Ports and Costs, as well as the municipalities affected.
>
> The reports of the corresponding Bodies will be binding when it comes to files relating to access to ports, navigable passages, areas of interest for National Defence, Centres or areas declared of tourist interest and those provided for in article 11.6 of Law 28/1969, of April 26, on coasts.

In contrast, Portugal's aquaculture legislation refers to both the legislation and the agency concerned:

> Article 6
>
> Consultations
>
> 1 - In addition to the competent coordinating authority, the following public entities shall issue an oblatory and binding opinion in accordance with the following assignments:
>
> (a) the Portuguese Environment Agency, IP (APA, IP), in any procedure, be it as to the establishment located in marine waters or in full waters, in accordance with Law No. 58/2005, of December 29, amended and republished by Decree-Law No. 130/2012 of 22 June of Decree-Law No. 226-A / 2007, of May 31, amended by Decrees-Laws No. 391-A /2007, of 21 December 9/2008 of June 4, 107/2009, from May 15, 245/2009, of September 22, and 82/2010 of 2 July and by law on 44/2012 of 29 August, and Decree-Law No. 56/2012, of March 12, amended by Decree-Law No. 55/2016, of August 26;
>
> (b) the competent port authority if Establishment is located in the respective area of jurisdiction, in accordance with Decree-Law No. 226-A/2007, of May 31, amended by Decrees-Laws No. 391-A/2007, of December 21, 9/2008 of 4 June, 107/2009, of 15 May 245/2009 of 22 September and 82/2010 of 2 July and by law at 44/2012, of August 29, of Law No. 58/2005, of December 29, altered and republished by Decree-Law No. 130/2012, of June 22, and Decree-Law No. 16/2014 of February 3;
>
> (c) the Portuguese Institute of the Sea and the Atmosphere, IP, if the establishment is located in marine waters, in accordance with Decree-Law No. 68/2012 of March 20, altered by Decree-Law No. 236/2015, October 14;
>
> (d) the national maritime authority if the establishment is located in the area of its jurisdiction or has immaterials in the safety of navigation or maritime mark, in accordance with Decree-Law No. 44/2002, of March 2, amended Decrees-Laws No. 235/2012, of October 31, and 121/2014 of 7 August;
>
> (e) the Directorate-General for Food and Veterinarian (DGAV), in any procedure, be it regarding the connection establishment located in marine waters or in interior waters, in accordance with Regulations (EC) No. 852/2004 and 853/2004, of the European Parliament and of the

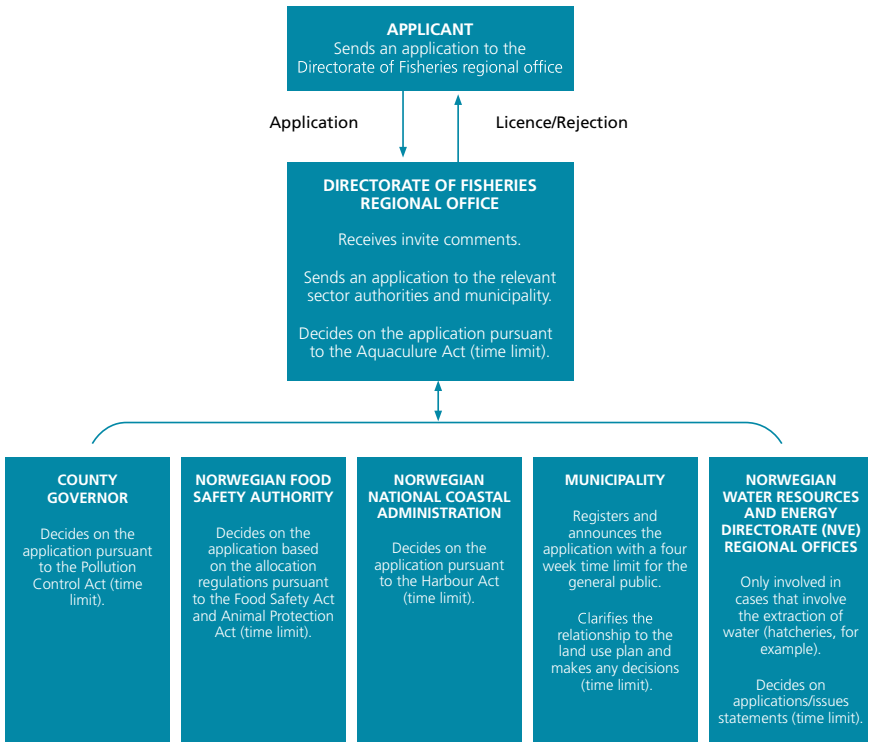
> Council of 29 April 2004 of Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 of Regulation (EU) No. 142/2011 of the Commission, of 25 February 2011, and the concierge at 1421/2006, of December 21;
>
> (f) ICNF, IP, if the establishment is located in classified area, in accordance with Decree-Law No. 142/2008, of July 24, in its current wording, or if species covered by Decree-Law at 316 / 89, of September 12, Decree-Law No. 140/99, of April 24, and Decree-Law No. 565/99, of December 21, all in its current wording;
>
> (g) other entities that should rule on administrative signs or other existing conditions in the area subject to administrative permission.

53. Administrative simplification/"one stop shop"/"single window" procedure

Given the number of different approvals that are typically necessary to set up an aquaculture facility, aquaculture legislation is increasingly concerned with reducing the administrative burden for investors by simplifying and streamlining authorization procedures through a "one stop shop" or "single window" approach. For example, Article 8 of Norway's aquaculture law imposes a clear duty of efficiency and coordination on the authorities concerned in terms of the processing of applications for aquaculture licences:

> § 8 Coordination of matters related to the establishment of aquaculture
>
> The authorities pursuant to this Act, the acts listed in section 6, first paragraph, letter d, and the municipality, as the planning and building authority here, are obligated to undertake an efficient and coordinated processing of applications.
>
> The Ministry may prescribe, by regulations, detailed provisions relating to the coordination of application processing, including the stipulation of time limits for the processing of applications.

Figure 6
The licensing procedure under the Norwegian aquaculture law



In practice this legal duty is given effect by means of the so-called "Trøndelag Model", in which authority has been delegated for routine matters from the County Governor (Pollution Control Act), Norwegian Food Safety Authority (Food Safety Act) and Norwegian National Coastal Administration (Harbour Act) to the Directorate of Fisheries, Trøndelag Regional Office (Norwegian Ministry of Fisheries and Coastal Affairs, 2005). The result is that a single application is made to the aquaculture administration.

Portugal's aquaculture legislation takes a slightly different approach. Under the "single window" approach provided for in Article 3 of the aquaculture law, an individual manager is appointed to act as the single point of contact

for the applicant and to advance the application. The duties of the manager including communicating with the applicant and generally managing the application including by ensuring that all deadlines are complied with. For example, the entities to be consulted in accordance with Article 6 (described in section 54 above) have 15 days to reply to the manager.

54. Determination of licence applications

Apart from requiring that other relevant approvals have been obtained, at the substantive level aquaculture legislation typically also sets out a number of factors to be taken into account in the determination of licence applications. One key element is public consultation. If land use development consent is not necessary, then this may be the only mechanism for public consultation regarding a new aquaculture development (as mentioned in section 27 above).

Supplement 7 to the FAO Technical Guidelines for Responsible Fisheries No. 5, *Aquaculture Development - Aquaculture governance and sector development* (FAO, 2017) states that "Public announcements about licence applications should be scheduled, predictable, and provide an opportunity for the public to object".

Apart from a requirement for public consultation, aquaculture legislation typically also sets out a range of issues to be considered by the decision maker in determining whether or not to issue an aquaculture licence. For example, Section 15 of Tonga's aquaculture legislation contains relatively detailed guidance for the decision maker, in this case the minister, as to how licence applications are to be determined:

> **Issue or refusal**
>
> (1) The Minister shall decide whether to grant or refuse an application for an aquaculture development licence or other authorization within 3 months of submission of the application or 1 month from the last date on which additional information was submitted under section 13(6), whichever is the later date.
>
> (2) In determining the application for an aquaculture development licence or other authorization, the Minister shall consider —

(a) whether the site for which the licence or authorization is applied is located in an aquaculture area;

(b) the impact of aquaculture on the general environment;

(c) the impact on communities, if any, located in the vicinity of the aquaculture area in respect of which an aquaculture development licence or authorization is to be issued and the fishing practices of these communities;

(d) the effect of proposed aquaculture development on fish species located in the area;

(e) any relevant fishery or aquaculture management and development plan;

(f) the advice of the Designated Communities, if any, as referred to in section 8 of this Act responsible for an aquaculture area or part thereof, and

(g) any other appropriate matter.

(3) The Minister shall refuse to issue an aquaculture development licence or authorization under this Act if:

(a) the site where the applicant proposes to undertake aquaculture or a related activity is not available under the law relating to land matters or under this Act or is not suitable for that purpose having regard to other laws, the local environment, the character of the general area and other activities being undertaken in the area;

(b) the application was not made in accordance with this Act or any information furnished or any representation made in the application is false in a material respect;

(c) the applicant is an individual disqualified under section 25(1)(a) from holding an aquaculture development licence or other authorization;

(d) the applicant is a corporation which is disqualified under section 25(1)(b) from holding an aquaculture development licence or any director or manager of the corporation is an individual disqualified under section 25(1)(c) from holding an aquaculture development licence or other authorization;

(e) the issuance of an aquaculture development licence or other authorization under this Act is not consistent with the relevant aquaculture management and development plan; or

(f) the issuance of an aquaculture licence is not consistent with a fisheries plan made under the Fisheries Management Act 2002.

55. Fees

Aquaculture legislation typically provides that the aquaculture administration is entitled to levy: (a) an application fee payable on applications for new licences; and (b) if a licence is issued, an annual fee payable throughout the duration of the licence. For example, Norway's aquaculture law provides:

> § 26 Fee and fee
>
> The Ministry may prescribe regulations relating to fees for the processing of applications and the performance of supervisory work in accordance with the provisions in or pursuant to this Act.
>
> Any fees owed may be recovered by execution proceedings.

Apart from requiring payment of an application fee, South Australia's aquaculture legislation explicitly provides for the payment by licence holders of an annual fee as well as a summary recovery mechanism:

> 53—Annual fees
>
> (1) The holder of an aquaculture licence must, each financial year not later than the date specified by the Minister by written notice to the holder, pay to the Minister a fee of the amount prescribed by regulation.
>
> (2) If the holder of an aquaculture licence fails to pay a fee in accordance with this section, the Minister may, by written notice, require the holder to make good the default and, in addition, to pay to the Minister the amount prescribed by regulation as a penalty for default.

56. Licence duration

The duration of an aquaculture licence is an important issue. A licence should be granted for a long enough term to enable the amortization of investment and encourage long-term planning (FAO, 2017). At the same time it should not be excessively long given the need to align with planning and environmental requirements which may change over time unless the intention is to convert the licence into a form of property right. To this end it is interesting to note that the aquaculture laws of Republic of Korea, South Australia and Tonga all provide for an initial licence term of 10 years. This seems to strike a reasonable period under an ordinary licensing regime.

Norway's approach is somewhat different in that aquaculture licences for most commercial species are issued in perpetuity and become property assets. As a result, they can be mortgaged, bought or sold. Auctions of salmon licences have earned multi-million Euro one-off payments to the Norwegian Government. The commercial value of licences is currently at an all-time high due to scarcity of licences and the current profitability of the sector (Moylan *et al.*, 2017).

57. Renewal /transfer

Aquaculture legislation typically provides that the duration of aquaculture licences can be extended, provided the holder has complied with all of the licence conditions. For example, Section 50A of South Australia's legislation provides:

> (2) An application for renewal of an aquaculture licence—
>
> (a) must be made to the Minister in the manner and form determined by the Minister; and
>
> (b) must be accompanied by a fee of the amount prescribed by regulation.
>
> (3) An applicant for renewal of an aquaculture licence must provide the Minister with any information required by the Minister in connection with the determination of the application, verified, if the Minister so requires, by statutory declaration.
>
> (4) This section has effect subject to the power of the Minister to suspend or cancel an aquaculture licence.

In other words, the Minister can require evidence of compliance.

Aquaculture is a business activity and businesses are bought and sold all of the time. Consequently, aquaculture legislation typically provides that an aquaculture licence may be transferred to a suitably qualified third party subject to the approval of the minister/aquaculture administration. The criteria for refusing approval should be clearly stated (FAO, 2017). For example, Article 19 of Norway's aquaculture law provides:

> **§ 19 Transfer of aquaculture licences**
>
> The aquaculture licences may be transferred.

> The transfer of aquaculture licences is not of any significance to the authorities' use of measures pursuant to this Act.
>
> The leasing of aquaculture licenses is not permitted. In exceptional cases the Ministry may grant exemptions from the ban of leasing.
>
> The Ministry may prescribe, by regulations, detailed provisions relating to the transfer of aquaculture licences.

58. Licence conditions and requirements

To be effective, aquaculture licences should be subject both to general conditions, which may be set out in the aquaculture law itself or in regulations adopted pursuant to that law, and special conditions that address the specific features of the aquaculture facility concerned. A fundamental condition is that a licence holder may cultivate only the type of species specified in the licence, as provided in Article 9(5) of Croatia's aquaculture law.

Section 52 of South Australia's aquaculture legislation provides an example of broad powers conferred on the minister regarding the inclusion of conditions in aquaculture licences:

> 52(1) On the grant of an aquaculture licence, the Minister may impose licence conditions as contemplated by this Act or as the Minister considers necessary or expedient for the purposes of this Act.
>
> (2) Without limiting subsection (1), the licence conditions may—
>
> (a) limit the activities authorized by the licence; and
>
> (b) prohibit or restrict the sale or supply of aquatic organisms farmed under the licence, for example, if the aquaculture is to be carried out for the purposes of research or a business involving tourism; and
>
> (c) regulate the storing, maintaining, repairing or cleaning of farming structures associated with the activity; and
>
> (d) in the case of a corresponding licence—regulate the towing of farming structures containing stock by means of navigable vessel to or from the area of the corresponding licence and the feeding of the stock or the taking of other action in relation to the stock during the movement of the stock.

Even more detail is provided in Section 7(3) of Ireland's aquaculture law which states:

> (3) Without limiting the generality of subsection (1), conditions to which an aquaculture licence may be subject may include or relate to any or all of the following:
>
> (a) a specification, by means of a map or otherwise, of the boundaries or limits of the place or waters in relation to which the licence is granted;
>
> (b) the amount of feed inputs;
>
> (c) annual or seasonal limits on stock inputs, outputs and standing stock on site;
>
> (d) operational practices, including the fallowing of sites;
>
> (e) the reporting of incidences of disease and the presence of parasites;
>
> (f) the disposal of dead fish;
>
> (g) measures for preventing escapes of fish, and arrangements for the reporting of escapes;
>
> (h) monitoring and inspection of the aquaculture carried on pursuant to the licence;
>
> (i) the keeping of records by the licensee;
>
> (j) the protection of the environment (including the man-made environment of heritage value) and the control of discharges;
>
> (k) appropriate environmental, water quality and biological monitoring.

Another common licence condition requires the prompt implementation of the activity authorized by the licence. For example, Article 26 of Portugal's aquaculture law requires the construction of an aquaculture facility to start within 12 months of the issuance of an aquaculture licence and to be completed within two years, although in exceptional cases this period can be extended by one year for objective reasons. Moreover, the exploitation of the facility must begin within one year of the completion of construction.

Other specific licensing conditions are addressed as they arise in subsequent sections of this study. Two particularly important conditions are that licence holders: (a) must remain in compliance with other approvals/authorizations relating to the aquaculture facility; and (b) must file a periodic return relating to the operation of the aquaculture facility. For

example, Article 24 of Croatia's aquaculture law requires the holders of aquaculture licences to "submit to the Ministry within three months of the completion of the reference calendar year accurate statistical data on aquaculture on the prescribed forms".

59. Licence amendment or revocation

It is important that aquaculture legislation provides for the amendment, or even the revocation (cancellation) of aquaculture licences once issued, on precisely specified grounds. For example, Tonga's aquaculture law provides that such licences may be varied for animal health and environmental reasons as well as for unforeseen circumstances:

> 18 Variation of licences
>
> (1) The Minister may by written notice to the holder of an aquaculture development licence or other authorization, vary a condition of an aquaculture development licence or other authorization if the Minister considers that the variation is desirable in order to —
>
> (a) reduce the risk of disease spreading among fish;
>
> (b) to prevent or reduce the risk of damage to the environment; or
>
> (c) to deal with any circumstances which were not foreseen at the time the licence was issued to ensure safe and responsible aquaculture practice.
>
> (2) The holder of an aquaculture development licence or other authorization which is varied may appeal against the variation to the Minister within 30 days of receiving the notice issued under subsection (1).
>
> (3) The holder of an aquaculture development licence or authorization under this Act shall by written notice inform the Minister of any material changes made to the aquaculture premises, including any changes to the information which such licence or authorization may contain.
>
> (4) Following receipt of such notice, the Minister may require the holder of an aquaculture development licence or authorization to provide any additional information which the Minister reasonably considers necessary in relation to the changes.

As regards the revocation of an aquaculture licence, Section 68(1) of Ireland's aquaculture legislation provides:

> 68.—(1) Subject to subsection, the Minister may, in his or her discretion and, subject to subsection (5), without compensation to the licensee, revoke an

aquaculture licence if the Minister—

(a) is satisfied that there has been a breach of any condition specified in the licence,

(b) is satisfied that the aquaculture operation to which the licence relates is not being properly maintained, or

(c) considers that it is in the public interest to do so.

In order to prevent abuse or administrative unfairness, it is important to ensure that a formal procedure is set out for the amendment or revocation of an aquaculture licence. A relatively detailed procedure is set out in Section 68(3) of Ireland's aquaculture legislation:

(3) The following shall apply in relation to the revocation or amendment of an aquaculture licence:

(a) the Minister shall not revoke or amend the licence unless and until he or she has given by post to the licensee not less than 28 days notice in writing stating that the Minister has under consideration the revocation or amendment, as the case may be, of the licence;

(b) the notice shall also state—

(i) where it states that the Minister has under consideration the amendment of the licence, the specified amendment under consideration and the grounds on which it is so under consideration, or

(ii) where it states that the Minister has under consideration the revocation of the licence, the grounds on which the revocation is under consideration;

(c) the Minister shall consider any representations in relation to a proposed revocation or amendment made to the Minister by the licensee before the expiration of the notice.

(4) The application regulations may provide for such procedural matters in relation to the revocation or amendment of licences as the Minister considers necessary or expedient.

(5) Where under subsection (1)(c) or (2) the Minister revokes or amends an aquaculture licence, the licensee shall be entitled to be paid by the Minister compensation for any loss suffered by him or her by reason of the revocation or amendment and, in default of agreement, the amount of compensation shall be determined under and in accordance with the Acquisition of Land (Assessment of Compensation) Act, 1919.

(6) Any expenses incurred by the Minister under this section shall, to such extent as may be sanctioned by the Minister for Finance, be paid out of moneys provided by the Oireachtas.

60. Licence register

As discussed above, information is vital to effective management of the aquaculture sector. To this end it is important that aquaculture legislation provides for the establishment and maintenance of a formal record of aquaculture licences. This can be a paper register or, as is increasingly the case, it may in electronic form as required by Article 10(7) of Croatia's aquaculture legislation. An electronic licence register means that it is possible to provide access through a website hosted by the aquaculture administration, as is the case in Croatia.[85] Similarly, Article 31(2) of Portugal's aquaculture law specifically states that the register is to be maintained on the website of the aquaculture administration.

Section 80 of South Australia's aquaculture legislation contains detailed provisions as to the content of the licence register that must be maintained, and which must also contain details about applications for aquaculture licences. In addition, the register must contain information about the environmental impacts of each facility:

> (1) The Minister must maintain a public register.
>
> (2) The register must contain—
>
> (a) in respect of each application for an aquaculture lease, for the conversion of a pilot lease to a production lease or for an aquaculture licence—
>
> (5) the name of the applicant; and
>
> (ii) a description of the class of lease or licence sought; and
>
> (iii) in the case of a lease, a description of the lease area or proposed lease area; and
>
> (iv) in the case of a licence authorising aquaculture, a description of—
>
> (A) the proposed licence area; and
>
> (B) the species of aquatic organisms proposed to be farmed; and
>
> (C) the farming system proposed to be used; and
>
> (3) the terms and conditions of each aquaculture lease and aquaculture licence issued under this Act; and
>
> the names of the lessees and licensees; and

[85] https://ribarstvo.mps.hr/default.aspx?id=415

> (4) an accurate description of the area of the lease or licence; and
>
> (5) a summary of each environmental monitoring report furnished to the Minister in accordance with the regulations or the conditions of the licences; and

It is also important to ensure public access to such registers. Quebec's aquaculture law simply provides that:

> The information contained in the register is public information.

If a licence register cannot be accessed over the internet it is necessary to specify how access is to take place. Ireland's aquaculture legislation provides in Section 78(2) that the "register of licences shall be kept at the offices of the Minister and shall be made available for inspection by any person free of charge during normal office hours". A copy of an entry in the register of licences, must be provided on request and "on the payment by the person to the Minister of such fee, if any, as may be fixed, not exceeding the reasonable cost of making the copy". The relevant section goes on to describe how evidence of a register entry is to be provided in legal proceedings and also states that the "Minister may keep the register of licences otherwise than in legible form but so that the register is capable of being used to make a legible copy or reproduction (in this section referred to as a "copy record") of any entry in the register".

61. Alternatives to licensing

As described above, in many countries licensing all aquaculture facilities, particularly small-scale aquaculture facilities may not be feasible. If aquaculture licences are not universally required for aquaculture facilities, then an alternative mechanism for regulating the sector is needed.

The most common approach is to require the registration of each individual aquaculture facility or aquaculture farmer. Common binding conditions depending on the type of aquaculture being undertaken can then be imposed through the use of subordinate legislation and such small-scale aquaculture will also be subject to rules contained in other elements of the legal framework for aquaculture. But, just as importantly, registration

provides a source of data about the scale and scope of aquaculture being undertaken.

For example, Article 61(5) of Indonesia's aquaculture legislation[86] requires all "small fish breeders", the term used for persons engaging in small-scale aquaculture, "to register themselves, their businesses and activities to the local fishery institution".

Another approach is to regulate small scale aquaculture at the group level by, for example, requiring compulsory membership in a local aquaculture association that can then be licensed. In reality cooperatives are quite active in the sector and moreover the idea compulsory membership in a cooperative is somewhat antithetical to the philosophy of that of organizational form, which is based on voluntary membership. A work-around, as practised in Indonesia, is to encourage cooperative membership by providing technical support and assistance exclusively through cooperatives. Aquaculture cooperatives, however, must have aquaculture licences. In this way, small scale aquaculture is brought within a licensing regime.

Another approach is taken by Article 11 of the Republic of Korea's aquaculture legislation, which sets out relatively detailed provisions on "group licensing":

> Article 11 (Exceptions to License for Fishing Village Neighbourhood Associations) (1) Where the water for which a license is sought falls under any of the following, the head of a Si/Gun/Gu shall grant a license only to a fishing village neighbourhood association under Article 15 of the Fisheries Cooperatives Act (hereinafter referred to as "fishing village neighbourhood association"), a fisheries partnership under Article 16 of the Act on Fostering and Supporting Agricultural and Fisheries Business Entities (hereinafter referred to as "fisheries partnership") or a district fisheries cooperative under Article 13 of the Fisheries Cooperatives Act (hereinafter referred to as "district fisheries cooperative"), which is near the water, in the case of seaweed aquaculture business and pisciculture business performed in the water and shellfish aquaculture business performed on the water floor:

[86] Law No. 31/2004 on Fisheries.

> 1. Where the water is located in the fishing ground of a community fishery under Article 8 (1) 6 of the Fisheries Act;
>
> 2. Where the water is within 500 meters (1000 meters in the case of the west coast) of the seashore at high tide, and the fisheries mediation committee established in the relevant Special Self-Governing Province, Si/Gun/Gu pursuant to Article 88 of the Fisheries Act deems necessary for the coordination of fisheries.
>
> (2) The head of a Si/Gun/Gu shall grant a license only to a fishing village neighbourhood association, a fisheries partnership, or a district fisheries cooperative located near the water for which a license for collaborative aquaculture business is sought by aquaculture businesspersons residing in a certain area for their common interest.
>
> (3) Where any of the following is applicable, a licensing authority may preferentially grant a license to a fishing village neighbourhood association, a fisheries partnership, a district fisheries cooperative, a fisheries cooperative by business category under Article 104 of the Fisheries Cooperatives Act, a fisheries company under Article 19 of the Act on Fostering and Supporting Agricultural and Fisheries Business Entities (hereinafter referred to as "fisheries company"), or an inland fisheries association under Article 15 of the Inland Water Fisheries Act:
>
> 1. Where deemed necessary for the common interest of aquaculture business persons;
>
> 2. Where deemed necessary for the development and use of fish farms in a certain area;
>
> 3. Other cases as prescribed by Presidential Decree.

In a number of countries small scale farmers collaborate with larger scale farmers through out-grower schemes, sometimes with inputs being provided by the larger scale farmer. In such types of case, to prevent the creation of a regulatory loophole, it may be advisable to address this issue in the licence of the large-scale farmer.

62. Register requirements

In cases where a person is required to register his/her aquaculture operation it is important to ensure that there are clear legal/administrative mechanisms to ensure that: (a) the relevant registers are periodically updated; (b) in cases where registration takes place at local government

level, there is an effective mechanism to ensure cooperation between the aquaculture administration and local government; and (c) information contained in registers, or necessary for registers, flows to one or more central and accessible points at the level of the aquaculture administration.

63. Numbering

For purposes of inspection and data management it is important to ensure that each individual aquaculture facility/farmer is assigned a unique number. This is usually the licence number or the registration number of each aquaculture farmer.

Aquaculture legislation usually also provides for the relevant number to be displayed at the aquaculture facility. For example, Section 19 of the New Brunswick aquaculture law provides:

> Display of aquaculture licence number
>
> 19 The Registrar may require that a licensee display the licensee's aquaculture licence number at all times at the site specified under subsection 18(1) in the licensee's aquaculture licence in accordance with the regulations.

In the case of sea cages, the South Australia aquaculture regulations admits no discretion: all sea cages must be marked. Regulation 25 states clearly:

> 25—Farming structures
>
> (a) each sea cage must be marked with the licence number, or a unique identifier for which the licensee has obtained the Minister's written approval, in text that—
>
> (i) is at least 70 millimetres in height; and
>
> (ii) is clearly visible above the water line;
>
> ...

64. Clean-up/restoration

It is also important to provide in the legislation for the clean-up/restoration of an aquaculture facility when the relevant aquaculture licence ends or alternatively for the payment of a bond or guarantee to ensure that clean-up/restoration takes place. For example, Article 13 of Norway's

aquaculture law states:

> § 13 Restoration and recapture obligations
>
> Any person who engages in aquaculture activities shall restore the site and adjoining areas if the production is discontinued in full or in part, including the removal of organisms, installations, equipment, etc.

More detailed provisions are contained in Article 56 of the Republic of Korea's aquaculture law which states:

> **Article 56 (Removal of Aquaculture Facilities)**
>
> (1) An aquaculture business right holder or permitted aquaculture businessperson shall remove facilities installed in a fish farm or waters (hereafter referred to as "aquaculture facilities" in this Article) or aquaculture products within the period prescribed by Ordinance of the Ministry of Oceans and Fisheries when the validity of aquaculture business right or permission expires or the farming period ends: Provided, That where removal of the aquaculture facilities or aquaculture products is impossible, or it is deemed that there is no need for removal, the Mayor or Do Governor may, in the case of offshore aquaculture business, exempt the responsibility thereof at the request of the person who is obligated to remove the aquaculture facilities or aquaculture products, and in all other cases the head of a Si/Gun/Gu shall have the same authority.
>
> (2) Where a person is exempted from the responsibility of removal of aquaculture facilities or aquaculture products pursuant to the proviso of paragraph (1), he or she shall be deemed to have surrendered ownership over the aquaculture facilities or aquaculture products.
>
> (3) Where a person who is obligated to remove aquaculture facilities or aquaculture products pursuant to paragraph (1) fails to remove the aquaculture facilities or aquaculture products even after the period during which he or she is obligated to remove the aquaculture facilities or aquaculture products expires, the administrative office may remove the aquaculture facilities or aquaculture products as prescribed by the Administrative Vicarious Execution Act.
>
> (4) Paragraphs (1) through (3) shall apply mutatis mutandis to aquaculture facilities installed by a person who has not obtained a license or permission or to the aquaculture products that such person has cultivated.
>
> ...

Regulations adopted pursuant to South Australia's aquaculture law, confer power upon the minister to require financial or other security to ensure the satisfactory implementation of an aquaculture licence, including the removal of equipment and aquatic animals or plants when the licence comes to an end:

> 4.2 (1) The minister may require financial or other security, which in the opinion of the minister covers the operations of a proposed licensee or a licensee, to the satisfaction of and in an amount and a form required by the minister.
>
> (2) The operations of a proposed licensee or licensee include removal of aquaculture gear and aquatic plants or animals and restoration of a site upon cancellation of an aquaculture licence or where an aquaculture licence is not renewed.

In contrast Article 22 of Portugal's aquaculture law requires the provision of a security deposit on the issuance or transfer of an aquaculture licence so as to ensure that when the licence ends, the site is left in a good environmental state and "works and structures" are removed. Such a deposit may be provided through a bank deposit, a bank guarantee, a financial guarantee or an equivalent financial instrument.

65. Appeals

Finally good administrative practice calls for the provision of an appeals procedure regarding decisions relating to aquaculture licences, including decisions to reject a licence application or to amend or revoke a licence. In some jurisdictions the appeal lies to the minister responsible for the sector. Elsewhere, more elaborate procedures are provided for. For example, appeals relating to aquaculture licences in Ireland lie to an independent seven-person Aquaculture Licences Appeals Board established in accordance with the aquaculture legislation.

The members of the board are appointees from a range of sectors including aquaculture, wild fisheries, planning and development, protection and preservation of the environment and amenities, economic development and community development. The function of the board is to provide an independent authority for the determination of appeals against decisions

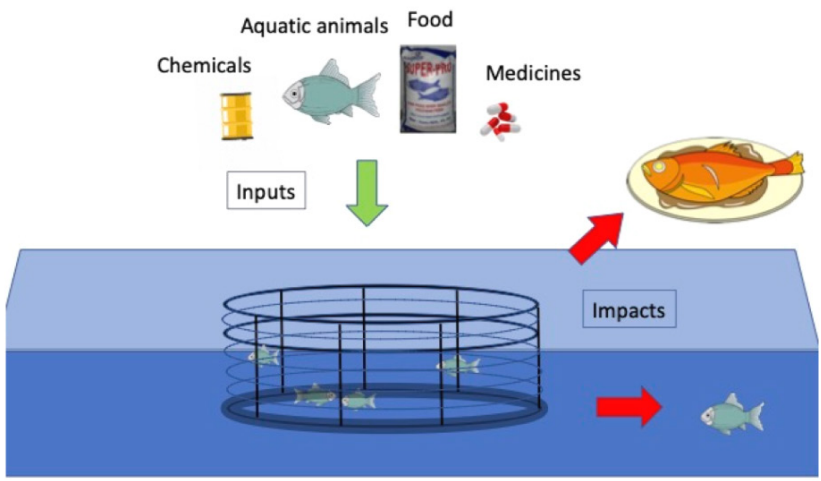
of the minister on aquaculture licence applications. It may also decide to alter the terms or conditions of a licence decision granted by the minister by issuing its own licence with additional or altered terms and conditions. Apart from describing it's function, the aquaculture legislation specifies the membership of the board, the tenure of office of the chairperson and members of the board, their remuneration, the duty of the chairperson to ensure the efficient performance by the board of its functions, deputy chairperson, meetings and procedures of the board, the board's quorum, vacancies, non-disclosure of confidential information, prohibition on communications relation to appeals, the secretary of the board, declaration and disclosure of interests, employees and advisers, payments, accounts, audits, annual reporting as well as detailed provisions on how appeals are to be dealt with.

4.5. Production – inputs

Like any other farming activity, aquaculture needs inputs in the form of the aquatic animals or plants to be cultivated, as well as feed and medicines and chemicals/pesticides used to treat aquatic animals and plants and/or to protect aquaculture facilities.

The quantity and nature of aquaculture inputs varies significantly depending on the type of species cultivated and the aquaculture technology used. Aquatic plants and molluscs, for example, typically do not require feed as they gather their nutrients from the water. On the other hand, the inputs for aquaculture involving other species, such as finfish, are more similar to those for land animals in terms of feed and medicines. Such inputs can, of course, have an impact on the aquatic animals/plants being farmed (and therefore the quality of the aquaculture products) but equally in most types of aquaculture activity they may impact the wider environment including wild stocks of the species being cultivated (see Figure 7).

Figure 7
Potential impacts from aquaculture inputs on the environment and aquaculture products



It follows that it is important to regulate the inputs into aquaculture facilities in terms of the health of aquatic animals and plants, the environment and in the case of aquaculture products used for food, human health. Inputs can be sourced at the national level in which case it is possible to regulate how they are produced, harvested or gathered. But as already seen an important feature of the aquaculture sector is the extent to which aquaculture inputs and products are the subject of international trade.

a) Aquatic animals

Because the aquatic animals that are used in aquaculture are the private property of the aquaculture farmer, the latter naturally has an interest in ensuring that s/he uses only good quality specimens of fast-growing species that will, when harvested, provide a profit. At the same time, aquatic animal disease is one of the most serious constraints to the expansion and development of sustainable aquaculture. Globally, a trend in aquaculture is that a previously unreported pathogen that causes a new and unknown

disease will emerge, spread rapidly, including across national borders, and cause major production losses approximately every three to five years (FAO, Committee on Fisheries, 2019).

The public interest in regulating aquatic animals as an input is therefore threefold. First of all, in terms of reducing the risk of disease to farmed stocks because this remains an important constraint to the economic sustainability of the sector. Second, there is a public health angle in terms of ensuring the safety of aquaculture food products. And finally, to prevent negative impacts on wild stocks not only as regards the risk of disease but also in terms of the introduction of harmful or invasive non-native species including genetically modified stocks. To this end Article 9.3.1 of the Code of Conduct provides:

> States should conserve genetic diversity and maintain integrity of aquatic communities and ecosystems by appropriate management. In particular, efforts should be undertaken to minimize the harmful effects of introducing non-native species or genetically altered stocks used for aquaculture including culture-based fisheries into waters, especially where there is a significant potential for the spread of such non-native species or genetically altered stocks into waters under the jurisdiction of other States as well as waters under the jurisdiction of the State of origin. States should, whenever possible, promote steps to minimize adverse genetic, Disease and other effects of escaped farmed fish on wild stocks.

66. Legislation on the import of aquatic animals for aquaculture

International trade in live aquatic animals, including eggs, powers the continued growth of the aquaculture sector while development at the national level often entails the import of non-native species and novel production systems. Nevertheless, a number of high-profile disease outbreaks as a result of international trade in aquatic animals, such as the introduction of necrotising *hepatopancreatitis* disease and Taura syndrome to North-East Africa through *Penaeus vannamei* brood stock imported from Mexico, and the introduction of Koi herpes virus disease to Indonesia through the import of ornamental *cyprinids* clearly show the risks to the sector if appropriate measures are not put in place (Kahn *et al*., 2012).

A first question that arises, therefore, is whether or not there is appropriate legislation in place that regulates the import of live aquatic animals for aquaculture? In practice, depending on the jurisdiction concerned, the import of live aquatic animals may be governed by veterinary legislation, specific animal disease control legislation, general animal health and/or production legislation, biosecurity legislation or fisheries and aquaculture legislation. Such legislation is referred to generically in this study as animal health legislation.

67. Scope of import rules

The next issue concerns the scope of such legislation. In terms of production, the cultivation of aquarium fish has seen significant growth over recent years. In a number of countries, it forms an important economic sector. While aquarium fish, by their nature are unlikely to pose direct threats to the human food chain, the threats to cultivated and wild fish stocks as a result of importing diseased stock, and the threats to indigenous species from invasive non-native species are identical to those of food fish. It is therefore essential to ensure that the scope of legislation on the import of live fish extends to aquarium fish.

At the same time because animal health legislation is often more focused on land-based animals rather than aquatic animals it is important to ensure that the scope of such legislation is appropriate to the specific life cycle of aquatic animals. To this end it is important to ensure that it applies to aquatic animals at all life stages (seed, fry, spat, genetic material etc.).

68. Import permit

It is next important to ensure that the relevant legislation requires a permit for the import of live aquatic animals. This issue will usually be addressed in the relevant animal health legislation but if it is not, then amendments will be necessary either to that legislation or to the aquaculture legislation. The disadvantage of using aquaculture legislation to regulate imports is that systems will usually already be in place under the animal health legislation regarding coordination with the border control/customs authorities that can be applied to the import of aquatic animals.

Usually, the role of aquaculture legislation in this regard is to cross refer to the relevant animal health legislation as done in Article 16 of Ukraine's aquaculture legislation:

> Article 16. Quarantine requirements and veterinary and sanitary control in aquaculture
>
> 1. Import to Ukraine of live fish, fertilized eggs and other aquatic organisms intended for breeding, keeping and growing in aquaculture conditions, placing them in quarantine fishery isolators, relocation from quarantine fishery isolators to other fisheries aquatic objects (their parts) technological reservoirs and veterinary and sanitary control in the field of aquaculture are carried out in accordance with the Law of Ukraine "On Veterinary Medicine".
>
> 2. Hydrobionts imported from abroad intended for further breeding, keeping and cultivation in aquaculture conditions shall be kept in quarantine fishery isolators for a period specified by law. It is forbidden to place in the conditions of quarantine retention together of hydrobiots of different ages, different species, as well as imported from different countries and at different times.
>
> 3. Hydrobionts imported from abroad are placed in quarantine conditions in accordance with their biological needs and biotechnological characteristics of breeding and / or cultivation.
>
> 4. The quarantine fishery isolators shall keep records of the conditions for keeping the hydrobionts in accordance with the animal health requirements.

69. Import permit requirements

In accordance with the recommendations of Chapter 5 of the Aquatic Animal Health Code, the relevant legislation should require the import of every consignment of live aquatic animals to be accompanied by a valid international health certificate issued by the competent veterinary authority of the exporting country. This is the only practical means of ensuring that healthy live aquatic animals are imported.

In terms of the issuance of an import permit, as described in Chapter Two above, imports may be prohibited or restricted for animal health reasons on the basis of a decision of the competent authority in reliance on its own independent risk assessment or on the basis of international standards. In the case of aquatic animals, the relevant standards are those set by the WOAH and in practice this means the list of diseases maintained by that organization.

70. Specific permitting requirements relating to genetic diversity

As regards the potential threats to biodiversity from the import of live aquatic animals, it is important to ensure that the relevant legislation establishes specific permitting requirements for the import of: (a) live aquatic animals of alien (non-indigenous) species for use in aquaculture; (b) the import of live aquatic animals of species listed in Annex II or III CITES for use in aquaculture; and (c) genetically modified aquatic animals for use in aquaculture.

In practice the import of non-indigenous aquatic animals is often an issue that is regulated in the relevant fisheries law, particularly if it relates to re-stocking. It is important to verify that the scope of such a provision is sufficiently broad to apply also to aquaculture.

Another key point to note is the issue of what counts as an "alien species" particularly in the case of a large country. This is because biodiversity obviously does not recognize national boundaries. A species may be "native" to the extent that it can be found within the national territory of a particular country but at the same time the introduction of such a species into a bio-geographical region where it does not naturally occur can be devastating to the local ecology. For this reason, the relevant European Union legislation[87] distinguishes between "alien species" and "locally absent species" both of which are subject to control.

Very often the import of alien species, species protected under CITES and genetically modified species will be separately regulated on the basis of environmental legislation. The role of aquaculture legislation should usually be to cross refer to the relevant law or laws.

71. Inspection and border control

Having authorized the import of aquatic animals, the legislation must next provide for the inspection of such animals at the border. In practice such

[87] Council Regulation (EC) No. 708/2007 of 11 June 2007 concerning use of alien and locally absent species in aquaculture (OJ L 168, 28.6.2007, p. 1).

an inspection is usually a "paper" inspection by customs/border officials to verify that the paperwork is in order (in terms of certificates).

Next the legislation must clearly identify the competent body for the purpose of undertaking a technical inspection and authorizing the import of live aquatic animals in terms of animal health. This may be the aquaculture administration or the agency responsible for implementing the animal health legislation. It is also important to ensure that the relevant legislation identifies the body competent to physically inspect consignments of live aquatic animals that are subject to CITES or which are genetically modified.

The legislation should also provide for the quarantine, as necessary and appropriate, of imported live aquatic animals and should confer the necessary powers upon the relevant agency (which may be the body responsible for the animal health legislation or the aquaculture administration) to impose other measures relating to animal health such as treatment requirements and/or the certification of imported aquatic animals.

72. Breeding, gathering bloodstock/aquatic animals for aquaculture

Imports are obviously not the only source of aquatic animals for use in aquaculture. While many types of aquatic animals are bred in hatcheries, shellfish farming is often based on specimens born in the wild. Moreover, even in cases where aquatic animals are bred in an aquaculture facility, it may be necessary to replenish the brood stock from wild stocks from time to time to maintain its genetic health.

In principle the definition of aquaculture should be sufficiently broad to include hatcheries, although in some jurisdictions, such as Indonesia, additional permits are required for fish breeding. In terms of breeding in captivity it is important to ensure that strict hygiene standards are maintained throughout the process in order to ensure that diseased eggs/juveniles are not introduced into aquaculture facilities. To this end it is necessary to be able to control and certify production of eggs and juveniles. For example, Article 24 of Viet Nam's aquaculture legislation requires the certification of breeding facilities based on a range of issues including

the separation of stock at different stages in the breeding process, the presence on site of technicians "trained in aquaculture, aquatic pathology or biology" and the application of quality control and biological safety systems, with additional controls over the quality of stock that is used for breeding purposes.

As regards the capture of stock/brood stock, in the case of finfish this is typically regulated on the basis of the fisheries legislation (given that it is a catching activity).[88] However, in the case of shellfish, the local collection of stock is so much part of the aquaculture process that it may in fact be regulated on the basis of aquaculture legislation. Article 16(4) of Portugal's aquaculture law provides that the collection of bivalves for use in aquaculture is regulated on the basis of the relevant aquaculture licence.

73. Movement

With regard to the movement of live aquatic animals (at all stages of life) within a given jurisdiction, it is important to ensure that the legislation requires the prior authorization of movement across regions, including zones and compartments established for the purpose of disease prevention and control as further discussed in section 120 below, based on an assessment of the presence or absence of diseases/disease risk.

74. Recording movements

It is also essential to ensure that the relevant legislation requires each aquaculture licence holder to maintain records of: (a) movements of live aquatic animals into/out of the aquaculture facility; (b) the mortality of aquatic animals in each movement. Without this kind of basic information, it becomes difficult to track the spread of animal disease.

75. Movement requirements

The movement of live aquatic animals should be regulated in terms of: (a) licensing the transport of live aquatic animals; (b) specifying standards

[88] As discussed in section 1 above, in 'capture based aquaculture' the fishing of live animals should usually also be regulated on the basis of fisheries legislation.

for aquatic animal health requirements during transport to prevent stress and harm to the animals concerned that may also increase the risk of disease; (c) requiring the transporter to maintain a record of animal mortality during transport; (d) controlling water exchange during transport and the eventual safe disposal of such water both to ensure that aquatic animals are transported in water of appropriate quality but also so as to prevent the potential escape of pathogens when water is disposed of; and (e) the quarantining of such animals on arrival at their final destination.

76. Placing on the market of live animals

It is also important to ensure that the relevant legislation requires authorization for the placing on the market of imported or non-indigenous live aquatic animals. This is an issue that may be addressed specifically in aquaculture legislation.

77. Introduction of non-native species to an aquaculture facility

The relevant legislation should also regulate the introduction into an aquaculture facility of non-native species so as to ensure this does not pose an unacceptable risk to: (a) biodiversity; and/or (b) aquatic animal health. Here it may be appropriate to distinguish in the legislation between an ordinary aquaculture facility and a closed facility, such as a RAS. The relevant European Union legislation on the introduction of alien species and locally absent species[89] defines a "closed aquaculture facility" as a land-based facility:

> (a) where:
>
> (i) aquaculture is conducted in an aquatic medium which involves recirculation of water; and
>
> (ii) discharges do not connect in any way to open waters before screening and filtering or percolation and treatment to prevent the release of solid waste into the aquatic environment and the escape from the facility of farmed species and non-target species that might survive and subsequently reproduce;
>
> (b) and which:

[89] Council Regulation (EC) No. 708/2007 of 11 June 2007 concerning use of alien and locally absent species in aquaculture (OJ L 168, 28.6.2007, p. 1).

> (i) prevents losses of reared specimens or non-target species and other biological material, including pathogens, due to factors such as predators (e.g. birds) and flooding (e.g. the facility must be situated at a safe distance from open waters following a proper assessment made by the competent authorities);
>
> (ii) prevents, in a reasonable way, losses of reared specimens or non-target species and other biological material, including pathogens, due to theft and vandalism; and
>
> (iii) ensures appropriate disposal of dead organisms;

In contrast, an "open aquaculture facility" is defined as a facility "where aquaculture is conducted in an aquatic medium not separated from the wild aquatic medium by barriers preventing the escape of reared specimens or biological material that might survive and subsequently reproduce".

b) Aquatic plants

Although the impacts of aquatic animal disease in aquaculture have received greater public attention, aquatic plants used in aquaculture can be just as much at risk from disease. This can be equally costly for producers especially in the case of aquatic plants used for food and food products. At the same time the risk to biodiversity of the introduction of invasive non-indigenous aquatic plant species must be addressed. It follows that the rigorous regulation of aquatic plants as aquaculture inputs is just as important as the regulation of aquatic animals.

78. Legislation on imports

As described in part 2.1 above, the legal framework that regulates the import of aquatic plants is provided at the international level by the IPPC. The import of aquatic plants also has potential risks as regards invasive alien species although to date this threat has yet to manifest itself as regards aquaculture plants.

The first question that arises is whether or not the relevant plan health legislation unambiguously applies to aquatic plants used for aquaculture. Most countries have special legislation on plant health to enable them to

fulfil their obligations under the IPPC. As described above, though, the IPPC does not explicitly refer to aquatic plants and it was only in 2014 that its application to aquatic plants was put beyond doubt. Plant health issues might also be regulated under broader biosecurity legislation, sanitary and phytosanitary (SPS) legislation or agriculture legislation (FAO, 2020a). It is also important to note that genetically modified plants, along with other genetically modified organisms, may be regulated on the basis of specific biosafety legislation or environmental legislation.

A potential grey area concerns aquatic plants used in ponds and aquaria. If they are placed directly on the market following import this is probably not an issue that falls within the legal framework for aquaculture (although it is most certainly an issue that should be addressed in accordance with environmental legislation to prevent the introduction of alien/invasive species). On the other hand, the import of such plants for the purpose of reproduction should be included under the heading of aquaculture.

79. Mechanisms for coordination

Next it is important to ensure that the necessary legal and administrative mechanisms are in place to ensure coordination between the aquaculture administration and the plant protection organization (as identified in section 14 above).

80. Import of alien/genetically modified species

It is then necessary to verify that the relevant legislation regulates the import of: (a) alien (non-indigenous) aquatic plants; (b) genetically modified aquaculture plants; and (c) plants and products from plant origin that may harbor biological risks. Again, these issues are likely to be addressed in environmental legislation.

81. Import controls

In order to ensure that only healthy aquatic plants are imported a number of specific import controls are necessary. First, the relevant legislation

should require imported aquatic plants to be accompanied by a valid plant health certificate in accordance with the IPPC. Next it is important that the legislation provides for imported aquatic plants to be placed into quarantine. In accordance with WTO rules this must be done on a nondiscriminatory basis.

The legislation should also enable the application of phytosanitary measures to imported of aquatic plants, plant products and other regulated articles. This may be done through inspection, prohibition on importation, and mandatory treatment. Import control measures should be imposed on the basis of a pest risk analysis. And finally, the plant protection organization must have the legal power to refuse entry or to detain or to require the treatment or destruction of diseased aquatic plants or plant products.

82. Placing on the market

It is also important to ensure that the relevant legislation regulates the placing on the market of aquatic plants for use in aquaculture as well as the transport of such plants including through the establishment of area-based restrictions based on the identification of pest free areas and also that it also regulates the discarding of the water used during transport.

83. Introduction and use

Finally, the relevant legislation should also regulate the introduction and use in aquaculture of alien aquatic plants both in general and on land-based facilities that are completely separated from the aquatic environment

c) Feed

While, as already noted, shellfish farming is primarily based on nutrients provided by the environment, other aquatic animal species used in aquaculture need to be fed. Indeed, production from fed aquaculture is almost twice that of non-fed aquaculture (FAO, 2022). Moreover, aquaculture animal feed is usually an important cost production factor, up to 70 percent in Indonesia for example.

The regulation of aquaculture feed (including additives) seeks to ensure that only feed of appropriate quality is used in aquaculture, in terms of ensuring that such feed does not contain pathogens, but also as regards ensuring the sustainability of aquaculture feed inputs. As with the other aquaculture inputs, feed can be imported or produced within the jurisdiction meaning that it is important that the scope of the legal framework includes the manufacture, import, labelling and placing on the market of aquaculture feed.

84. Scope

Animal feed is typically regulated in stand-alone feed legislation, in food safety legislation, in veterinary legislation, in animal health legislation or in agriculture legislation of more general scope (hereafter referred to as "feed legislation"). Although aquaculture feed shares similarities with other types of food/feed it has its own specific characteristics

The first issue is therefore to identify which laws regulate aquaculture feed. If this is not done in the aquaculture legislation does the feed legislation apply to aquaculture feed? If not, then it may be appropriate to revise the aquaculture legislation accordingly. For example, Article 31 of Viet Nam's aquaculture legislation contains somewhat detailed provisions on aquaculture feeds:

> 1. Aquatic feeds and products for adjusting aquaculture environment shall satisfy the following requirements before being launched:
>
> a) They have declaration of conformity in accordance with regulations of law;
>
> b) Their quality is conformable with applied standards;
>
> c) Their information has been sent to the Ministry of Agriculture and Rural Development in accordance with regulations of law.
>
> 2. The Minister of Agriculture and Rural Development shall:
>
> a) Issue national technical regulations on aquatic feeds and products for adjusting aquaculture environment;
>
> b) Issue the list of chemicals, biological preparations and microorganisms banned from use in aquatic feeds and products for adjusting aquaculture environment;

> c) Issue the list of chemicals, biological preparations, microorganisms and materials for manufacturing aquatic feeds allowed to be used in aquaculture in Viet Nam based on testing results or results of science and technology missions that have been recognized or approved by the competent authorities or results of review, investigation and realistic assessment;
>
> d) Provide instructions on inspecting conditions of producers, traders and importers of aquatic feeds and products for adjusting aquaculture environment; quality of produced, imported and exported aquatic feeds and products for adjusting aquaculture environment prescribed in this Law and law on quality of goods and products; procedures for applying technical methods for dealing with violations of quality of aquatic feeds and products for adjusting aquaculture environment;
>
> dd) Provide detailed guidelines for Point c Clause 1 of this Article; prescribe naming and allowable errors in analysis of quality of and technical criteria on aquatic feeds and products for adjusting aquaculture environment that shall have declaration of standard conformity

85. Coordination mechanism

If aquaculture feed is regulated on the basis of feed legislation by an agency other than the aquaculture administration, it is important to ensure that there is a mechanism to enable consultation and coordination between that agency and the aquaculture administration.

86. Import restrictions

With regard to the import of aquaculture feed, it is important to ensure that the relevant legislation creates a legal basis for preventing, restricting or otherwise controlling the import of aquatic animal feeds and feed ingredients on a non-discriminatory basis including on the grounds that such feed: (a) contains additives, in order to ensure that these have been subject to a recognized risk assessment; (b) have been manufactured with fishmeal or fish oil harvested from endangered species.

As regards the import of aquaculture feed, Viet Nam's aquaculture legislation also contains rather detailed provisions:

> Article 36. Import and export of aquatic feeds and products for adjusting aquaculture environment

1. Quality of imported aquatic feeds and products for adjusting aquaculture environment shall be inspected.

2. Organizations and individuals may import aquatic feeds and products for adjusting aquaculture environment containing chemicals, biological preparations, microorganisms and materials of aquatic feeds included in the list of chemicals, biological preparations, microorganisms and materials of aquatic feeds allowed to be used in aquaculture in Viet Nam. Import of aquatic feeds and products for adjusting aquaculture environment containing chemicals, biological preparations, microorganisms and materials of aquatic feeds included in the lists prescribed in Points b and c Clause 2 Article 31 of this Law for testing, scientific research, display in fairs and exhibitions shall be licensed by the Ministry of Agriculture and Rural Development.

3. Exported aquatic feeds and products for adjusting aquaculture environment shall satisfy the requirements prescribed in law of the exporting country and Viet Nam law.

4. The Ministry of Agriculture and Rural Development will consider inspecting systems for managing and producing aquatic feeds and products for adjusting aquaculture environment in the exporting country in accordance with regulations of Viet Nam law and international treaties to which the Socialist Republic of Viet Nam is a signatory if:

a) The assessment is made for mutual recognition;

b) There are risks of food quality, food safety, epidemic or environmental issues caused by products imported to Viet Nam.

5. The Government shall provide detailed guidelines for this Article.

87. Manufacture, placing on the market and packaging

It is also, of course, necessary to ensure that there is legislation in place to control the manufacture of aquaculture feed in the jurisdiction concerned that can be used to establish and enforce quality and content requirements. It is also necessary to ensure that the legislation controls the placing on the market of both imported and nationally produced feed and that aquaculture feed is subject to packaging (possibly re-packaging in the case of imported feed) and labelling requirements.

A particular concern with regard to aquaculture feed is the risk that it can be a source of infectious disease in aquatic animals. This is because aquatic animals are often themselves a principal ingredient in aquatic animal feed and the use of semi-processed, raw and live feed continues to be a common

practice.[90] To this end the Aquatic Animal Health Code sets out detailed recommendations relating to such matters as institutional responsibility concern the disease risk from animal feed, risk pathways and exposure and risk management.

88. Specific fish feed restrictions

One negative environmental impact from aquaculture can be the use in fish feed of fish from stocks that may have a food use, or which are endangered, or which are not managed in a sustainable manner. In this regard, *Supplement 5 Aquaculture Development - Use of Wild Fish as Feed in Aquaculture* (FAO, 2011) to the *Technical Guidelines for Responsible Fisheries No. 5* set out four relevant principles for fish feed as follows:

> Principle 1: Aquaculture should utilize resources from sustainably managed fisheries.
>
> Principle 2: Where wild aquatic organisms are harvested for use as feed, responsible fisheries management frameworks should be put in place and implemented (CCRF Article 9.1.49).
>
> Principle 3: Reduction fishery and directed feed-fish fishery operations should not significantly impact the environment or create significant negative ecosystem-level impacts, including impacts on biodiversity.
>
> Principle 4: Using fish as feed should not adversely impact the livelihoods and compromise food security of poor and vulnerable groups, especially those directly dependent upon the resource.

To address this issue, the relevant legislation should prohibit or restrict the placing on the market and/or use of feed containing: (a) fish species that may have a food use; (b) endangered fish species including species that are protected under national or international law or which are subject to CITES; (c) fish feed from fisheries that do not come from sustainably managed fisheries.

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[90] Aquatic Animal Code, Article 4.8.1.

89. Medicated feed

The use of medicated feed is widespread in aquaculture. Medicated feed is a mixture of fish feed and veterinary medicinal products. Produced under controlled conditions it has the purpose of treating or controlling disease in aquatic animal species used in aquaculture. Because it contains medicinal products, it is important to ensure that the import, placing on the market, sale and use of medicinal feed, including feed that contains antimicrobial growth enhancers or other antimicrobial/ medicinal products including probiotic and other additives that are not antimicrobial, are regulated as medicines/medicinal products. This is the topic of the next section.

d) Medicines

Medicines, including medicinal products, clearly have an important role to play in aquaculture in terms of treating diseased aquatic animals. At the same time, residues from medicines in aquatic animals used for food may have negative human health impacts. Concerns have also arisen about the prophylactic use of medicines in aquaculture including antimicrobial medicinal products, as a means both of promoting growth and farming in poor quality water. The over-use and prophylactic use of antimicrobial products in aquaculture contributes to the growing global problem of antimicrobial resistance (AMR). Chapter 6.1 of the Aquatic Animal Health Code sets out detailed recommendations for controlling AMR.

As regards the use of medicines in aquaculture in general, paragraph 9.4.4. of the Code of Conduct states:

> Safe, effective and minimal use of therapeutants, hormones and drugs, antibiotics and other disease control chemicals should be ensured.

90. Application of medicines legislation

Depending on the jurisdiction concerned, the use of medicines in aquaculture may be addressed in general pharmaceuticals legislation (in Norway all veterinary medicinal products are approved by the Norwegian Medicines Agency), in animal health legislation, in animal production

legislation, in specific legislation on veterinary pharmaceutical products, in public health legislation or in aquaculture legislation. In some countries, there is separate legislation for livestock and aquaculture, including separate legislation for veterinary medicinal products for terrestrial and aquatic animals (FAO, 2020a).

Whichever approach is taken it is important to ensure that there is a clear legal basis for regulating the use of medicines in aquaculture, including fish oral drugs, external antimicrobial, anti-parasitic compounds and medicated feed. Even if more generally applicable legislation applies to medicinal products used in aquaculture, it may be useful to provide in the aquaculture legislation for the adoption of specific regulations to address the use of medicines in the sector. For example, Section 11.2 of the Newfoundland aquaculture law confers powers upon the minister to adopt regulations that address, among other matters, the use of vaccines and drugs in aquaculture.

91. Identification of medicines authority

It is also necessary to ensure that the relevant legislation clearly identifies the agency responsible for the approval of medicines for aquatic animals.

92. Coordination mechanism

If an agency other than the aquaculture administration is responsible for the approval of medicines for aquatic animals, it is important to ensure that the legislation provides for clear legal mechanisms to promote collaboration and information exchange. For example, Section 46 of Namibia's aquaculture legislation provides that:

> **Use of drugs, antibiotics or chemicals**
>
> The Minister, in exercising any power or responsibility under this Act in relation to the use of drugs, antibiotics or other chemicals to control diseases in aquaculture products, must act with the concurrence of the Minister responsible for public health.

93. Import and placing on the market

It is important to ensure that medicines for aquatic animals are subject to approval as regards: (a) importation; (b) placing on the market, including as regards labelling requirements; (c) use in aquaculture particularly as regards aquatic animals used for food. In other words, the situation should not arise in which medicines approved only for land animals can be lawfully used to treat aquatic animals.

94. Prescription of medicines

To ensure that only approved medicines are used and that they are used correctly, it is important that the relevant legislation provides that only authorized veterinarians and fish health biologists are allowed to issue veterinary prescriptions for the use of medicines to treat aquatic animals. It is also important to ensure that the length of time that must elapse between medication and slaughter of aquatic animals used for food (withdrawal time) is specified in order to ensure that they are safe for human consumption.

95. Use of medicines

Medicines are potentially dangerous products. It is therefore also important to ensure that the relevant legislation requires their use in aquaculture to take place in a safe manner. This is often a complex area involving a combination of medicines legislation, veterinary legislation and animal health legislation.

To this end it is important to ensure that relevant legislation: (a) requires the sale of medicines for aquatic animals to take place only in accordance with a prescription issued by a duly qualified veterinarian; (b) requires the use/application of medicines to take place only under the supervision of a duly qualified and accredited veterinarian or support worker; (c) specifies how such medicines are to be stored; (d) specifies how such medicines are to be used/applied; (d) prohibits or restricts the use of antimicrobial agents for growth promotion; (e) confers upon the agency

responsible for the implementation of medicines legislation or the aquaculture administration the right to restrict the use of antimicrobial agents for prevention (profilaxis) and control and to ensure that these terms are properly defined in legislation; (f) specifies labelling and expiry requirements.

In terms of aquaculture legislation, it is important to refer to this issue but there may be limits as to what can be usefully added. For example, Canada's federal aquaculture regulations[91] create a number of rules for the deposit of "deleterious substances" in a licensed aquaculture facility which include "drugs whose sale is permitted or otherwise authorized, or whose importation is not prohibited, under the Food and Drugs Act". Regulation 5 provides:

> **Drugs**
>
> In the case of a deposit of a drug,
>
> (a) if by or under an Act of Parliament the drug may only be sold under a prescription, it must be prescribed by a person who is duly authorized to practise veterinary medicine
>
> (i) under the laws of the province in which the aquaculture facility is located, or
>
> (ii) under the laws of any province, if the aquaculture facility is not located in a province;
>
> (b) the owner or operator of the facility must take measures to minimize the risk of an accidental deposit of the drug; and
>
> (c) if the drug is deposited to control a pest as defined in the Pest Control Products Act, the owner or operator must consider, before depositing the drug, whether there are alternatives to the deposit of that drug and make a record of that consideration.

In other words, the regulation clarifies that prescription drugs may only be used in an aquaculture facility on the basis of a prescription issued by an authorized person in accordance with the laws of the relevant province and, as relevant, in accordance with the (Federal) Pest Control Products Act, 2002.

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91 Aquaculture Activities Regulations, 2015.

96. Information about of medicine use in aquaculture (pharmacovigilance)

In order both to monitor the effectiveness of medicines used in aquaculture and to prevent overuse or misuse, it is also important to ensure that the relevant legislation requires: (a) the reporting of adverse reactions and/or lack of effectiveness of medicines; (b) the establishment of a surveillance system for AMR from the use of medicines for aquatic animals; (c) the provision of information to veterinarians so as to ensure prudent use of antimicrobial agents; (d) veterinarians to periodically report to the competent authority the number and type of prescriptions they have issued for antimicrobial products for aquatic animals; and (e) measures to prevent negative impacts from medicine use on wild stocks.

In this connection, chapter 6.3 of the Aquatic Animal Health Code sets out detailed recommendations on monitoring the quantities and usage patterns of antimicrobial agents used in aquatic animals. Again, while the basic obligations regarding the use of medicines in aquaculture may derive from medicines legislation it can also be prudent to refer to this matter in aquaculture legislation as well. For example, Article 90 *quater* of the Chile's aquaculture legislation requires the provision of reports not only on the sanitary situation in aquaculture facilities (an issue returned to below) but also specifically on the use of antimicrobials by quantity and type.

It is also important to ensure that possible impacts of the use of medicine beyond aquaculture facilities are observed and report. For example, Canada's federal regulations provide:

> 13 (1) If fish morbidity or mortality outside the aquaculture facility is observed from any part of the facility within 96 hours after the deposit of any drug or pest control product referred to in paragraph 2(a) or (b), the owner or operator of the facility must immediately notify a fishery officer of
>
> (a) the name of the facility and its operator;
>
> (b) the geographic coordinates of the fish observed;
>
> (c) the estimated number and, if known, species of the fish observed; and
>
> (d) the product name of the drug or pest control product deposited and the date of the deposit.

97. Disposal

Finally, it is important to ensure that the relevant legislation set out rules for the safe and environmentally sound disposal of unused medicines prescribed for aquatic animals. Such rules may be set out in medicines legislation or in specific legislation on the disposal of hazardous wastes.

e) Chemicals

Chemicals, including chemical products such as pesticides, biocides, anti-fouling agents, and fertilizers, are used for a range of different purposes in aquaculture including the removal of weed, cleaning and treatment. Evidently, the use of such chemicals can have negative impacts on the environment and ultimately on the aquatic animals and plants within aquaculture facilities with possible negative human health impacts from residues in cases where aquaculture products are used for food.

At the same time, though, chemicals are also used for just about every other economic activity. To this end, as described in Chapter Two, particularly dangerous or hazardous chemicals are subject to specific prior authorization regimes and the code of conduct for pesticides. However, national legal frameworks for the import and use of chemicals are unlikely to refer specifically to their use in aquaculture.

98. Chemicals

At the general level it is important to ensure that there is legislation in place to restrict or ban the import of hazardous chemicals, including pesticides, that that are banned or restricted by the Rotterdam Convention on Prior Informed Consent (PIC), the Stockholm Convention on Persistent Organic Pollutants (POPs) or classed as "extremely hazardous" or "highly hazardous" by the World Health Organization (WHO).

99. Placing on the market and use for aquaculture

As regards the use of chemicals in aquaculture it is important that the legislation not only authorizes which chemicals can be used in the sector

(because chemicals authorized for use for other purposes may not be suitable for use in aquaculture) but that it also specifies how such uses are to take place. Aquaculture legislation typically cross refers to other legislation in this respect, but one approach is to provide for the adoption, pursuant to the aquaculture legislation, of a list of chemicals that are permitted for use in aquaculture.

100. Storage, labelling, training, recording requirements

It is important to ensure that the relevant legislation: (a) regulates the storage and use of chemicals; (b) specifies labelling requirements; (c) require awareness raising/training for aquaculture workers regarding chemicals and their use; and (d) require records to be kept regarding the use of chemicals in aquaculture facilities. For example, Regulation 8 of Ireland's water quality regulations[92] specifically refer to aquaculture in terms of the obligation to maintain records of the use of "dangerous substances", which term includes chemical products and medicines:

> Records to be kept by licensee
>
> 8. (1) A licensee shall maintain and make available for inspection by an authorized officer records which relate to the activity subject to an aquaculture licence.
>
> (2) Without prejudice to the generality of paragraph (1), records which a licensee shall maintain and keep available include—
>
> (a) records of receipt of a dangerous substance,
>
> (b) each prescription issued in respect of an animal remedy (within the meaning of the European Communities (Animal Remedies) (No. 2) Regulations 2007 (S.I. No. 786 of 2007) which consists of or contains a dangerous substance,
>
> (c) records of storage of a dangerous substance, (d) records of use of a dangerous substance, and (e) such other records as the Minister may specify.
>
> (3) The Minister may determine the format of records to be maintained under this Regulation and if he or she does so, a licensee shall maintain the records in that format.
>
> (4) Records under this paragraph may be maintained in machine readable form if capable of being translated into readable form.

[92] S.I. No. 466/2008 - European Communities (Control of Dangerous Substances in Aquaculture) Regulations 2008.

4.6. Production – facility management

Having examined the regulation of inputs into aquaculture facilities the next issue to address is the framework that governs the management of aquaculture facilities, bearing in mind that some of these issues will be addressed in the relevant aquaculture licence. This topic includes what can be described as general management issues as well as matters that relate specifically to the protection of the environment and routine animal and plant health management.

101. Code of practice

One useful approach is to provide for the adoption by the minister/aquaculture administration, in consultation with relevant stakeholders, of one or more codes of practice or non-binding standards for the aquaculture sector or segments of the aquaculture sector.

For example, in Thailand the Agricultural Commodity Standards Act B.E. 2551 (A.D. 2008), confers power on the Agricultural Commodity Standards Committee, chaired by the Minister of Agriculture and Cooperatives, to determine a range of standards relating to the agriculture sector. Such standards can be mandatory or voluntary. As regards the aquaculture sector, one mandatory standard has been adopted to date (TAS 7432-2015" titled "Good Aquaculture Practices for Hatchery of Disease Free Pacific White Shrimp (*Litopenaeus vannamei*)) along with 23 voluntary standards (see Table 3).

Table 3
Thailand aquaculture standards

No.	Code	Title	Issued date
1	TAS 7422-2010	Good Aquaculture Practices for Marine Shrimp Hatchery and Nursery	4 October 2010
2	TAS 7401-2019	Good Aquaculture Practices for Marine Shrimp Farm	4 December 2019
3	TAS 7417-2016	Good Aquaculture Practices for Freshwater Animal	18 November 2016
4	TAS 7421-2018	Good Aquaculture Practices for Freshwater Animal Hatchery and Nursery	9 February 2018
5	TAS.7429-2016	Good Aquaculture Practices for Marine Finfish Farm	20 October 2016
6	TAS 9000–2009	Organic Agriculture Part 1: The Production, Processing, Labelling, and Marketing of Produce and Products from Organic Agriculture	1 October 2009
7	TAS 7700-2016	Good Aquaculture Practices for Crocodile Farm	26 July 2016
8	TAS 7701-2019	Good Aquaculture Practices for Crocodile Breeding and Nursing Farm	31 October 2019
9	TAS 7426-2012	Good Aquaculture Practices for Ornamental Freshwater Animals Farm	6 July 2012
10	TAS 7433-2018	Good Aquaculture Practices for Ornamental Marine Animals Farm	9 February 2018
11	TAS 7434-2019	Good Aquaculture Practices for Seaweed Farm	18 September 2019

Table 3 *(cont.)*

No.	Code	Title	Issued date
12	TAS 7431-2016	Good Hygienic Practices for Fish Landing Site	31 May 2016
13	TAS 9043-2015	Principles for Establishment of Compartmentalization for Shrimp Farm	21 September 2015
14	TAS 7430-2013	Good Practices for Post-Harvest Handling of Fish and Shellfish	20 April 2013
15	TAS 7428-2012	Good Practices for Aquatic Animal Disease Control in Aquaculture Establishment	20 August 2012
16	TAS 7427-2012	Good Aquaculture Practices for Blue Swimming Crab Farm and Mud Crab Farm	20 August 2012
17	TAS 7425-2012	Code of Practice for Fish and Fishery Products Part 4: Live and Raw Bivalve Molluscs	6 June 2012
18	TAS 7424-2011	Good Aquaculture Practices for Marine Bio-Shrimp Farm	25 October 2011
19	TAS 7410-2011	Code of Practice for Fish and Fishery Products Part 1: General Requirements	25 October 2011
20	TAS 9000-2009	Organic Agriculture Part 3: Organic Aquatic Animal Feed	30 September 2009
21	TAS 7419-2009	Good Aquaculture Practices for Marine Shrimp Farm: Disease Free Marine Shrimp Production	30 September 2009

Similarly in the Philippines, Section 47 of the aquaculture law[93] provides for the establishment by the aquaculture administration of a "code of practice for aquaculture that will outline general principles and guidelines for environmentally-sound design and operation to promote the sustainable development of the industry". Section 47 goes on to provide that the code is to be "developed through a consultative process with relevant stakeholders including fish workers, fishpond owners, fisherfolk cooperatives, small-scale operators, research institutions and academia".

By its nature a code of conduct is a voluntary instrument and therefore not legally enforceable. But this does not necessarily mean that such an instrument is entirely without legal impact. For example, Tonga's aquaculture law provides for the adoption by the minister of "codes of practice". While these too are voluntary, Section 10(3) provides that, "(t)he failure to comply with a code of practice shall be taken into consideration in the grant or disqualification of any authorization under this Act". In other words, failure to comply with a relevant code of conduct can have legal implications in terms of licensing decisions taken by the aquaculture administration.

102. Site management plan

As a matter of good practice, every aquaculture facility should be required to have its own site management plan and the aquaculture legislation should indicate the main issues to be addressed. The focus of such a plan should be both on the environmental aspects of aquaculture, particularly the impacts, but also the health of the aquatic animals/plants being cultivated. These could include: (a) the maintenance of structures and aquaculture equipment; (b) actions to avoid or minimise disease in aquaculture stock; (c) a response plan for dealing with escapes and interactions with wild stocks; (d) actions for dealing with dead aquaculture stock; and (e) the regular inspection and monitoring of the facility.

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93 The Philippine Fisheries Code of 1998.

103. Social aspects

A sustainable aquaculture sector implies not only economic and environmental sustainability but also social sustainability. In this respect it is important to ensure that the rights and working conditions of the 20 million or people engaged (on a full-time, part-time or occasional basis) in aquaculture around the world are appropriately addressed. This is increasingly necessary in the light of the growth of the different eco-label related certification schemes described in Chapter Two of this Study. Put simply, consumers in rich countries do not want to eat seafood produced on the basis of forced or otherwise exploited labour. Ensuring that workers in aquaculture, who as seen in Chapter Two are not subject to specific international labour standards, are treated fairly is likely to become increasingly important for the economic sustainability of the sector in ensuring continued access to export markets.

In this regard a number of issues may potentially arise. A first question concerns the labour status of aquaculture workers and the extent to which their employment rights are recognised by the relevant legislation. In particular, are they classified as "farmers" or "fishers" and as a result are they entitled to benefit from any features of either of those two employment regimes?

A next question concerns social security entitlements. Again, are the rights of workers in aquaculture recognized? Similarly do provisions on tracking and child labour apply to aquaculture facilities? And finally, what about health and safety legislation? Aquaculture by definition implies working in and around water, which can be dangerous. Do existing health and safety rules regarding work on or around water also apply to aquaculture? These are of course all issues to be addressed primarily in labour related legislation. Nevertheless, there is no reason why aquaculture legislation should not cross-refer to such laws and thereby strengthen their implementation. For example, Article 38 of Viet Nam's aquaculture law specifically requires each aquaculture facility to comply with occupational safety regulations, among other matters.

104. Technical capacity

Given the technical nature of aquaculture, aquaculture legislation typically requires the holder of an aquaculture licence either: (a) to be appropriately qualified; or (b) to employ staff that hold appropriate qualifications. For example, Article 21 of Croatia's aquaculture law provides that the holder of an aquaculture licence must either hold relevant professional qualifications, as described in subordinate legislation, or employ professionally qualified full-time staff, failing which mandatory training must be undertaken.

105. Use of vessels

Particularly as regards aquaculture that makes use of pens and cages, it is usually necessary to use vessels in routine operations. Two particular areas tend to be regulated in aquaculture legislation. The first is the regulation or licensing of the vessels themselves. In Croatia, for example, Article 22 of the aquaculture law requires vessels used in aquaculture to be registered in the fishing fleet register in accordance with a specific item of subordinate legislation. On the other hand, Portugal's aquaculture legislation simply states that vessels used in support of aquaculture for the transport of aquaculture products, workers and inputs are to be classified as "local" or "coastal auxiliary vessels".

Chile's aquaculture legislation also requires vessels used in aquaculture, to be equipped with a GPS- based vessel monitoring system (VMS) and, like the relevant legislation in Scotland,[94] contains provisions for specific rules on the hygiene of "well boats" used to transport live salmon.

106. Monitoring and Reporting

In order to ensure the availability of the data necessary for the management of the aquaculture sector, it is important for aquaculture legislation to require the holders of aquaculture licences to provide annual information to the aquaculture administration regarding such matters as aquaculture production, losses, sales and overall financial performance.

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[94] Aquaculture and Fisheries (Scotland) Act 2007.

Even if the basic reporting requirement is set out in the aquaculture law, the precise reporting requirements are typically set out in subordinate legislation as is the case, for example, in Article 24 of Croatia's aquaculture law. Portugal's aquaculture law goes further in that it requires (in Article 32) annual reports to be submitted in electronic form except if the licensed holder has neither the means nor the computer skills to do so in which case the reports can be submitted on paper (provided the aquaculture administration is informed accordingly).

a) Environmental impacts of aquaculture production

107. Environmental monitoring & reporting

Increasingly, given growing concerns over the relationship between aquaculture and the environment, aquaculture legislation can require the holder of an aquaculture licence to the monitor environmental impacts from the facility and to periodically submit reports of those findings to the aquaculture administration. For example, Regulation 22 of the South Australia aquaculture regulations requires the submission of an annual report concerning the operation of the facility particular as regards inputs:

> 22—Annual reporting on general environmental matters
>
> A licensee must, on or before the reporting day in each year, furnish a report to the Minister—
>
> (a) containing the following details (or so many of the following details as may be specified by notice given to the licensee by the Minister) in relation to the preceding reporting year:
>
> (i) the location (using WGS84 or GDA94 datum) of farming structures in the licence area;
>
> (ii) the number, dimensions or spacing of farming structures in the licence area;
>
> (iii) details about farming practices carried on by the licensee, for example—
>
> (A) the amount and type of any supplemental feed used in the licence area; or
>
> (B) the amount and type of chemical substances used in the licence area; or
>
> (C) the dates on which the chemical substances were used; or
>
> (D) in the case of aquatic organisms requiring regular feeding—an estimate of

> the number and biomass of such organisms in the licence area; or
>
> (E) the scale or intensity of farming in the licence area;
>
> (iv) if the author of the report is not the licensee—the author's name and address;
>
> (v) any other details required by the Minister and specified in the notice; and
>
> (b) accompanied by a copy of the most recent report (if any) on the aquatic environment prepared by the licensee under regulation 23.

Moreover, the following regulation goes on to provide that the minister may require the preparation of a specific report concerning actual environmental impacts:

> 23—Periodic reporting on aquatic environment
>
> (1) The Minister may, by notice in writing to a licensee, require the licensee to prepare, within a period specified in the notice, a report on the condition of the aquatic environment in or around the licence area.
>
> (2) A notice under this regulation may require the licensee—
>
> (a) to collect evidence of the condition of the aquatic environment, by—
>
> (i) taking, in a specified manner and form, photographs or other visual images or recordings of or relating to aquatic flora and fauna or the sea floor; or
>
> (ii) taking and analysing, in a specified manner (including by the use of services of an accredited laboratory), specified samples of aquatic flora and fauna or the sea floor; or
>
> (iii) taking any other specified samples or measures; and
>
> (b) to prepare and submit to the Minister, in a specified manner and form, a report containing the specified details about the condition of the aquatic environment in or around the licence area found by the evidence collected under paragraph (a).

108. Preventing escapes

Apart from licence conditions intended to prevent escapes, aquaculture legislation typically also specifies what is to happen if aquatic animals, usually fish, escape. For some species, such as salmon in particular, escapes are some of the most serious challenges facing the aquaculture sector due to the risk of undesirable genetic impacts on wild populations. In order to prevent escapes, it is important for aquaculture legislation to provide for

the setting of specific rules to prevent escapes by requiring: (a) the use of equipment/materials that comply with relevant technical standards in the construction of aquaculture facilities; (b) the use of effective screens or barriers; (c) regular inspection of aquaculture facilities in order to verify structural integrity; and (d) such inspections to be recorded and periodically reported to the aquaculture administration.

109. Escape response

What should be the legal consequences if an escape takes place? First, the aquaculture legislation typically requires attempts to be made to recover the escaped animals. For example, Section 77 of Ireland's aquaculture legislation provides:

> (1) The [aquaculture administration] may take such action as it considers necessary to recapture stock which has escaped from a facility operated under a licence.
>
> (2) The Minister, or an officer of the Minister designated by the Minister for the purposes of this section, may, notwithstanding any other provision of this Act or of the Fisheries Acts, 1959 to 1995, authorize a licensee or other person or body to take such action as is specified in the authorization to recapture stock which has escaped from a facility operated under a licence.
>
> (3) An authorization referred to in subsection (2) may be granted subject to such conditions, if any, as the Minister or the designated officer, as the case may be, considers necessary or expedient.
>
> (4) The reasonable costs of a person taking action in pursuance of an authorization under subsection (2) may be recovered from the licensee as a debt due and payable to the person who incurred the costs.

Next, it is important to record the details of any such escape and to report the escape to the aquaculture administration. For example, Article 19 of Croatia's aquaculture legislation requires the holders of aquaculture licences both to "keep records of the escape of aquatic organisms from breeding installations" and to "submit accurate information on the escape of water organisms from breeding installations on the prescribed forms within three months of the completion of the reference calendar year" in a format and in accordance with a procedure set out in regulations.

And what if escaped aquatic animals cannot be recovered? As already mentioned, Chile's aquaculture legislation provides in Article 118 *quater* that:

> in the event of escape or massive loss of resources in intensive cultivation systems or the detachment or loss of exotic hydrobiological resources in extensive systems, it will be presumed that there is damage in accordance with Law No. 19.300 if the owner of the facility does not recapture at least 10% of the animals within 30 days from the event...".

Article 3 of Law No. 19.300, Law on General Environmental Bases and Regulation of the Environmental Impact Assessment System, in turn provides:

> Notwithstanding the penalties provided by law, any party which negligently or with wilful misconduct causes damages to the environment, shall be required to materially repair same, at its own expense, if this were possible, and to provide compensation for same in accordance to law.

What is not clear from the texts themselves, though, is how compensation is to be calculated in such a case.

110. Predator control

Aquaculture facilities full of aquatic animals are a potentially a bounteous food source for high-level predators which can also be endangered species. It is therefore appropriate to provide in the aquaculture legislation that, where practical, only non-lethal management measures to exclude, deter or remove endangered predator species should be used. Sometimes, however, a situation can arise in which lethal measures are the only realistic solution. In such a situation, lethal methods should only be used with the express approval of the environment agency or other body responsible for protected species.

111. Lost equipment

Global concerns about the increased volumes of plastic in the environment apply equally to aquaculture equipment. Aquaculture facilities can be

relatively fragile, and cages, nets and lines can quite easily be lost both at sea and inland water courses. Aquaculture legislation typically requires the recovery of lost aquaculture gear. In this regard requiring gear to be marked with the relevant licence/registration number can facilitate recovery.

b) Aquatic animal and plant health management

As regards aquaculture facility management, the Code of Conduct states, in paragraph 9.4.4, that "(s)tates should promote effective farm and fish health management practices favouring hygienic measures and vaccines".

An issue that arises again is how best to promote appropriate farm practices that are conducive to aquatic animal and plant health. Is this best achieved through legislation and enforcement or on the basis of codes of practice? Generally speaking a combination will be most effective, although sometimes aquaculture legislation can focus on extremely detailed, yet important matters. For example, Article 39 of Quebec's commercial aquaculture regulations, goes down to the following level of detail: "(a)all persons must use the foot baths, if any, and wash and disinfect their hands".

112. Vaccination

Vaccination is playing an increasingly important role in maintaining the health of aquatic animals. In Norway, for example, all salmon farmed in the sea are vaccinated against a number of diseases, primarily bacterial diseases. As a result, antibiotic use in Norwegian aquaculture industry is now extremely low. In order to create an effective aquaculture vaccination programme, it is necessary to ensure that the relevant legislation: (a) regulates the vaccination of aquatic animals against specified diseases; and (b) makes provision for the mandatory vaccination of aquatic animals against specified diseases.

113. Testing/recording

Once, again coming back to the importance of data and information it is important to require aquaculture licence holders to maintain records regarding the animal health aspects of the day-to-day management of

an aquaculture facility and to record treatment measures undertaken. Without such information it is difficult for the aquaculture administration/competent authority to have a clear picture of the animal health situation at facility level. To this end it is important that the relevant legislation requires each holder of an aquaculture licence: (a) to maintain a stock register that includes details of batches of aquatic animals/plants moved into and out of the facility; (b) to periodically test aquatic animals/plants for pathogens in accordance with regulations, which may be varied from time to time or licence conditions; (c) to record the results of pathogen testing and to alert the aquaculture administration/competent authority/plant protection organization in the event that pathogens are detected; (d) to maintain daily inspection records of the animals or plants being cultivated; (e) to record the names, reasons for use, dates, amounts and withdrawal times of all veterinary medicines and chemicals/plant treatments used within the aquaculture facility; and (f) to report all mortality events with daily mortality above the average to the veterinarian or competent authority/plant protection organization or aquaculture administration.

For example, Regulation 15 of the South Australia aquaculture regulations requires the maintenance of detailed stock registers that make it possible, among other matters, to follow the health of individual batches of aquatic animals:

> 15 Stock register
>
> (1) licensee must maintain a stock register in accordance with this regulation. Maximum penalty: $5 000.
>
> Expiation fee: $315.
>
> (2) The stock register must contain (in a clear and legible form)—
>
> (a) the following information in respect of aquatic organisms supplied to the licensee:
>
> (i) the date on which the aquatic organisms were received by the licensee;
>
> (ii) the name and address of the person who supplied the aquatic organisms;
>
> (iii) the species of aquatic organisms;
>
> (iv) the number or biomass of aquatic organisms received;
>
> (v) the age or developmental stage of the aquatic organisms when received;
>
> (vi) details identifying the place at which the aquatic organisms were last

reared before supply or the place at which the aquatic organisms were collected; and

(b) the following information in respect of aquatic organisms collected by the licensee:

(i) details identifying the authority within the meaning of the Fisheries Management Act 2007 under which the aquatic organisms were collected;

(ii) the date the aquatic organisms were collected;

(iii) details identifying the place at which the aquatic organisms were collected;

(iv) the species of aquatic organisms;

(v) the number or biomass of aquatic organisms collected; and

(c) the following information in respect of the movement of aquatic organisms from the licensee's licence area to another licence area (whether or not the 2 licence areas are occupied by the same licensee):

(i) the date of the movement of the aquatic organisms;

(ii) the name and address of the licensee receiving the aquatic organisms;

(iii) the species and the number or biomass of the aquatic organisms; and

(d) the following information in respect of the supply of aquatic organisms by the licensee to another person (other than in circumstances referred to in paragraph (c)):

(i) the date on which the aquatic organisms were supplied;

(ii) the name and address of the person to whom the aquatic organisms were supplied;

(iii) the species and the number or biomass of the aquatic organisms; and

(e) the following information in respect of aquatic organisms that have died in the course of aquaculture carried on by the licensee:

(i) the species of aquatic organisms;

(ii) the date (or an estimate of the date) the aquatic organisms died;

(iii) the number or biomass (or an estimate of the number or biomass) of aquatic organisms that have died;

(iv) the age or developmental stage of the aquatic organisms at death;

(v) the date on which the aquatic organisms were last checked;

(vi) a description of how and where the aquatic organisms were disposed of; and

(f) details of treatment administered for therapeutic or prophylactic purposes to aquatic organisms kept under the licence including—

(i) the reasons for the treatment; and

(ii) the dates on which the treatment was administered; and

(iii) the name (including trade or patent name) of each substance used as part of the treatment and the dosages or amounts administered; and

(iv) information that identifies the aquatic organisms that received treatment by reference to tank or cage number or by other means.

(3) A record required to be entered in the stock register must, subject to subregulation (4), be entered within 7 days after the event to which it relates.

(4) However, if a licensee has notified the Minister of an unusually high mortality rate under regulation 13, the Minister may require the licensee to update the stock register as required within 24 hours after the notification.

(5) A record entered in the stock register must be retained for 5 years from the date on which it was entered.

(6) A person who is required to keep a record under this regulation must, at the request of a person authorized in writing by the Minister, produce the record for inspection.

A similar level of detail regarding stocks of aquatic animals in an aquaculture facility is called for by Quebec's aquaculture regulations[95] which also address such matters as the medicines used, water processing products and cleaning products for equipment and facilities in contact with aquatic animals, details of feed used, consultations with veterinarians, analyses and test results, medicines purchased, treatments administered and so forth.

114. Hygiene and welfare standards

It is also important to ensure that the relevant legislation contains mechanisms to apply minimum hygiene standards for aquatic animals as well as minimum welfare standards. While the link between hygiene and animal health is obvious it is also important to note that the susceptibility of aquatic animals, particularly fish, to disease is greatly influenced by stress. Factors that can increase stress in fish include high stocking densities and poor nutrition.

Article 13 of Chile's aquaculture legislation provides, for example, that as a general principle, "(a)quaculture must include standards that protect

[95] Regulation 18.

animal welfare and procedures that avoid unnecessary suffering". In a similar manner, Article 71 of Indonesia's government regulation on aquaculture[96] provides:

> (1) The implementation of aquatic animal welfare as referred to in Article 55 paragraph (2) letter g, is applied to fish breeding, transporting, stunning, and fish killing.
>
> (2) The welfare of fish as referred to in paragraph (1) shall be done by applying principles which includes:
>
> a. freedom from hunger and malnutrition and thirst;
>
> b. freedom from pain and illness;
>
> c. freedom from fear and distress;
>
> d. freedom from injury; and
>
> e. free to express the normal patterns of behaviour.
>
> (3) Provisions concerning Fish Welfare in each activity as referred to in paragraph (1) shall be regulated by Minister Regulation.

115. Animal welfare – stunning and killing

It is also important to ensure that the relevant legislation provides for the establishment of appropriate standards for the stunning and killing of aquatic animals in routine operations as well as for the destruction of aquatic animals for the purpose of disease control.

In this regard, recommendations regarding the welfare aspects of stunning and killing farmed fish for human consumption are set out in Chapter 7.3 of the Aquatic Animal Health Code which address such matters as the training of personnel, the design of holding facilities, the unloading, transferring and loading of aquatic animals and different stunning and killing methods.

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[96] Government Regulation Number 28 of 2017 Concerning Aquaculture Practices.

4.7. Disease prevention and control

While part 4.6 b) was concerned with routine aspects of aquatic animal and plant health in an aquaculture facility, this part is concerned with the measures that should be taken at government level, and in by particular the competent authority/plant protection organization and aquaculture administration to prepare for, prevent and respond to disease outbreaks. Evidently these measures should be backed by the relevant legislation.

As discussed above, aquatic animal disease is one of the most serious constraints to the expansion and development of sustainable aquaculture. A global trend in aquatic animal aquaculture is that a previously unreported pathogen that causes a new and unknown disease emerges, spreads rapidly, including across national borders, and causes major production losses approximately every three to five years (FAO, 2019b).

Aquatic plants used in aquaculture are also subject to disease and while, so far, the impacts have not been as severe as for aquatic animals, this is nevertheless a valuable sector and particularly for countries with a major aquatic plant aquaculture sector similar measures to manage and mitigate disease risk are called for.

The only way to effectively deal with risk of aquatic animal disease, as well as aquatic plant disease, is to prepare in advance.

a) Preparatory measures

Preparatory measures include the active surveillance of aquatic animal and plant health risks as well as the establishment of the necessary systems procedures to respond animal/plant health disease outbreaks before they occur.

116. Contingency Planning

Contingency planning has a paramount role to play in preventing the entry of exotic pathogens and in detecting, containing and if possible, eradicating serious pathogens if they appear in susceptible species within a national

territory or shared water body (Subasinghe and Bondad-Reantaso, 2008). Detailed provisions on planning are contained in the FAO NACA guidelines on preparedness and response to aquatic animal health emergencies in Asia. It is important also to ensure that planning and contingency measures are supported through legislation.

Chapter 4 of the Aquatic Animal Code also sets out detailed provisions on contingency planning to address the risk of the introduction of diseases that may threaten aquatic animals used in aquaculture as well as wild stocks. A first key requirement, set out in Article 4.5.2 is that countries must have the legal powers to implement the contingency plan:

> Countries must establish the necessary legal provisions that are needed for the implementation of a contingency plan(s). Such legal powers must include provisions for establishing a list of diseases for which action is needed, definitions of how such diseases should be managed if detected, provisions for access to infected/suspected sites, and other legal provisions, as needed.

Issues to be addressed in a contingency plan include: the establishment of one or more crisis centres, at central or local level, to be responsible for coordinating the control measures to be undertaken; and the identification of the personnel and training programs needed. Article 4.5.5 goes on to recommend that countries establishing a continency plan should also prepare a detailed set of instructions on actions to be taken when a specified aquatic animal disease is suspected or confirmed.

The IPPC legal framework has fewer recommendations concerned with planning but for a country with a major aquatic plant aquaculture sector the importance of advanced planning to address disease risks would seem clear.

The next question concerns the legal basis for contingency planning. In many countries such issues will already be addressed in animal health/plant protection legislation, although the focus is typically slanted towards terrestrial animals and plants. Increasingly, given the risks to the aquaculture sector and its specificities, animal and plant health issues are addressed in aquaculture legislation. Sometimes the aquaculture legislation simply cross refers to relevant legislation. In other cases, it sets out more substantive provisions. For example, Article 3 the aquaculture

legislation of the Republic of Korea sets out a relatively complex framework for addressing the risk of outbreaks of disease in both aquatic animals and aquatic plants:

> Article 3 (Measures for Control of Aquatic Organism Diseases)
>
> (1) In order to prevent outbreaks and the spread of aquatic organism diseases, the Minister of Oceans and Fisheries shall establish and implement comprehensive control measures (hereinafter referred to as "measures for the control of aquatic organism diseases") every five years. In such cases, the Minister of Oceans and Fisheries shall consult in advance with the heads of related central administrative agencies.
>
> (2) Measures for the control of aquatic organism diseases shall include the following matters:
>
> 1. Establishment of a reporting system for the prevention and early detection of aquatic organism diseases;
>
> 2. Establishment and implementation of emergency measures for the control of each aquatic organism disease;
>
> 3. Cooperation with related agencies in the control of aquatic organism diseases;
>
> 4. Education and public relations activities for the control of aquatic organism diseases;
>
> 5. Collection and analysis of information about the control of aquatic organism diseases;
>
> 6. Nurturing of professional human resources for the control of aquatic organism diseases;
>
> 7. Other matters concerning measures for the control of aquatic organism diseases.
>
> (3) The Minister of Oceans and Fisheries shall notify the Special Metropolitan City Mayor, a Metropolitan City Mayor, a Do Governor, and the Governor of a Special Self-Governing Province (hereinafter referred to as "Mayor/Do Governor") of the measures established pursuant to paragraph (1) for the control of aquatic organism diseases.

What is interesting about this law is that it goes on, in Article 4, to provide for the establishment of a special "Council for the Control of Aquatic Organism Diseases" as follows:

> Article 4 (Council for Control of Aquatic Organism Diseases)
>
> (1) There is hereby established a Council for the Control of Aquatic Organism Diseases (hereinafter referred to as the "Control Council") under

> the jurisdiction of the Minister of Oceans and Fisheries to provide advice to the Minister of Oceans and Fisheries with respect to major policies relating to the control of aquatic organism diseases.
>
> (2) The Control Council shall invite persons who have expertise in an area relating to the farming of aquatic organisms or aquatic organism diseases to participate in the Council.
>
> (3) Matters necessary for the composition and operation of the Control Council shall be prescribed by Ordinance of the Ministry of Oceans and Fisheries.

117. Risk based surveillance

Next, it is important to require the competent authority/plant protection organization or aquaculture administration to undertake a risk-based approach to the surveillance of aquaculture facilities, involving periodical inspections, visits, audits, and where appropriate, sampling, depending on the type of production. Such a requirement may be set out in animal health or plant health legislation, in which case it may be useful to cross refer to it in the aquaculture legislation, or it may be specifically addressed in the aquaculture legislation. For example, relatively detailed provisions on surveillance are contained in subordinate legislation adopted pursuant to in the aquaculture legislation of Indonesia[97] as follows:

> Article 57
>
> (1) Surveillance and monitoring as referred to in Article 56 letter a shall at least cover activities:
>
> a. planning, including the establishment of surveillance methods, targeting of the disease, location and number of samples and the appointment of a test laboratory;
>
> b. implementation, which includes sampling and testing;
>
> c. evaluation of surveillance and monitoring results;
>
> d. determination of status of fish disease location of target fish surveillance and monitoring; and
>
> e. fish disease notification.
>
> (2) Surveillance and monitoring as referred to in paragraph (1) shall be done actively and passively.

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[97] Government Regulation Number 28 of 2017 Concerning Aquaculture Practices.

(3) Further provisions concerning surveillance and monitoring of fish diseases shall be regulated by a Ministerial Regulation.

Chapter 1.4 of the Aquatic Animal Health Code contains detailed recommendations on aquatic animal health surveillance, while Article IV of the IPPC includes the surveillance of growing plants and products under cultivation in storage or in transport (with the objective with the object of reporting the occurrence, outbreak and spread of pests, and of controlling those pests) as one of the duties of a national plant protection organization.

118. Laboratories

While in some cases evidence of aquatic animal/plant disease may be apparent to the naked eye, the precise nature of the disease or pest can usually only be determined on the basis of laboratory analysis. To this end it is necessary to ensure that the legislation provides for the designation of appropriately qualified accredited laboratories (including official and reference laboratories) to undertake examinations, to confirm the presence or absence of diseases and/or to undertake diagnostic services relating to: (a) aquatic animal health; and (b) aquatic plant health.

For example, Article 4.5.6 of the Aquatic Animal Health Code provides that countries establishing a contingency plan (or plans) should establish national reference laboratories that have the necessary facilities, so that diagnostic work on aquatic animal diseases that can be carried out rapidly. Moreover, it may be necessary for an initial diagnosis to be confirmed at an WOAH Reference Laboratory as also described in the code.

119. Coordination

Particularly in countries where the competent authority and the plant protection organization are located under a different ministry to the aquaculture administration it is important to ensure that there are robust procedures to ensure effective information exchange, coordination and collaboration. This is an issue that should be addressed in a contingency plan and updated from time to time. For example, as seen above the measures for the control of aquatic organism disease foreseen in

Article 3 of the aquaculture legislation of the Republic of Korea, include a heading, "cooperation with related agencies in the control of aquatic organism diseases".

120. Establishment of zones and compartments

As mentioned in section 48 above, the Aquatic Animal Health Code recommends the establishment of zones to separate distinct sub-populations of aquatic animals used in aquaculture as a means of preventing the spread of disease. Detailed provisions on both zoning and compartmentalization are set out in part 4.1 of this study. The difference between zoning and compartmentalization is that zoning applies when a subpopulation is defined on a geographical basis while compartmentalization applies to a subpopulation when management practices relating to biosecurity are the defining factors.

121. List of notifiable diseases

Next, it is important that the relevant legislation requires the competent authority/plant protection organization to maintain a list of: (a) notifiable aquatic animal diseases; and (b) notifiable aquatic plant diseases. The duty to maintain such lists will usually be imposed in animal health/plant protection legislation. But again, it can be useful to refer to them in aquaculture legislation. For example, Article 2(2) of Japan's aquaculture legislation states:

> In this Act, "a specified disease" refers to an infectious disease of a farm-raised aquatic animals and plants, those are not confirmed to have occurred in Japan or has occurred in only one part of Japan and which is specified by ordinance of the Ministry of Agriculture, Forestry and Fisheries as a disease likely to seriously injure the farm-raised aquatic animals and plants if the disease spreads.

122. Duty to notify WOAH

The relevant legislation should require the competent authority to notify WOAH of: (a) the first occurrence of a listed disease within the jurisdiction

concerned; (b) the recurrence of a listed disease following the earlier filling of a final report declaring that a previous outbreak had ended; (c) the first occurrence of a new strain of pathogenic agent of a listed disease; (d) a sudden and unexpected change in the distribution or increase in incidence or virulence of, or morbidity or mortality caused by the pathogenic agent of a listed disease; and (e) the occurrence of a listed disease in a new host species.

123. Declaration of disease outbreak

The relevant legislation should also provide for the making of a declaration by the competent authority/plant protection organization of the outbreak of a notifiable disease relating to aquatic animals or aquatic plants.

124. Mandatory reporting requirements

In order to generate the necessary information, it is essential that the relevant legislation requires the mandatory reporting by aquaculture farmers, plant/aquatic animal health management professionals, and diagnostic laboratories to the competent authority/plant protection authority of: (a) notifiable diseases in aquatic animals; (b) new/unknown diseases and/or abnormal morbidity levels in aquatic animals; and (c) notifiable or new/unknown diseases in aquatic plants.

This may be done in the animal health or plant health legislation or specified in aquaculture legislation as is the case of Article 7-2 (1) of Japan's aquaculture law which states:

> When a person operating or engaged in aquaculture finds that any farm-raised aquatic animal or plant he/she owns or manages has actually or possibly contracted a specified disease, he/she shall notify the Governor having jurisdiction over the location of said farm-raised aquatic animals and plants to that effect without delay according to the procedure provided by ordinance of the Ministry of Agriculture, Forestry and Fisheries.

Article 7-2 (2) goes on to provides that the Governor may next order an inspection of the relevant aquaculture facility and if s/he finds evidence

that the disease may be present, s/he must promptly inform the Minister of Agriculture, Forestry and Fisheries and other relevant Governors.

a) Response measures

The next step is to ensure that the legal tools exist to implement necessary response measures in the event that aquatic animal or aquatic plant disease is identified.

125. Mandatory treatment

In terms of possible response measures, it is important that the relevant legislation confers legal powers on the competent authority/plant protection organization or the aquaculture administration to: (a) order treatment or take other corrective action with regard to diseased aquatic animals; and (b) order treatment or take other corrective action with regard to diseased aquatic plants.

126. Monitoring disease impact

It is also necessary for the relevant legislation to require the competent authority/plant protection organization or aquaculture administration: (a) to monitor the impact of disease in aquatic animals under aquaculture, on wild aquatic animals; and (b) to take measures to reduce, and as far as possible, to prevent the further spreading of the disease in wild aquatic animals.

127. Emergency powers

Next, in order to prevent the spread of disease the relevant legislation should also at a minimum confer the necessary powers on the competent authority/plant protection authority and/or the aquaculture administration to undertake a range of emergency actions. These are powers: (a) to order a halt to the movement of aquatic animals between zones, compartments or other defined areas; (b) to order a halt to the movement of aquatic plants between different areas; (c) to order the compulsory treatment of aquatic

animals; (d) to order, in the case of a land-based facility, an immediate halt to the discharge of wastewater from the facility; (e) to order a halt to the harvesting and sale of diseased aquatic animals or aquatic plants; (f) to order the destruction of diseased aquatic animals or aquatic plants; (g) to suspend all imports of species of the type that is subject to a declaration of disease outbreak; (h) to suspend all exports of aquatic animal or aquatic plant species of the type that is subject to a declaration concerning an outbreak of a notifiable disease. Detailed recommendations are set out in Chapter 4 of the Aquatic Animal Health Code.

Referring, once again, to Japan's aquaculture legislation, Article 8(1) confers powers on the Governor as the representative of the state, as follows:

> Article 8 (1) When any Governor finds that a specified disease may spread, he/she may issue the orders listed in the following items to the extent required to prevent the spread of the disease.
>
> (i) An order restricting or inhibiting the movement of a farm-raised aquatic animals and plants those have actually or possibly contracted a specified disease, issued to the person who owns or controls said farm-raised aquatic animals and plants.
>
> (ii) An order to burn or bury the farm-raised aquatic animals and plants those have actually or possibly contracted a specified disease or to dispose of it by another method capable of destroying the infectiousness of the pathogen of the specified disease, issued to the person who owns or controls said farm- raised aquatic animals and plants.
>
> (iii) An order restricting or inhibiting the movement of the farm-raised aquatic animals and plants (limited to an animal or plant located in the region designated by the Governor concerned) likely to have contracted a specified disease, issued to the person who owns or controls said farm-raised aquatic animals and plants
>
> (iv) An order to sterilize fishing nets, fish reserves and any other articles provided by ordinance of the Ministry of Agriculture, Forestry and Fisheries, on which the pathogen of a specified disease is deposited or has likely been deposited, issued to the person who owns or controls said fishing nets, fish reserves or other articles
>
> (2) The Governor concerned shall report the implementation status and results of orders issued pursuant to the provisions of the preceding paragraph to the Minister of Agriculture, Forestry and Fisheries according to the procedure

provided by ordinance of the Ministry of Agriculture, Forestry and Fisheries, and shall also report to the relevant Governors.

(3) With regard to orders pursuant to the provisions of paragraph (1), appeals pursuant to the Act for the Examination of Appeals against Administrative Conduct (Act No. 160 of 1962) may not be filed.

128. Costs and compensation

The issue of paying the costs of the destruction of diseased animals or aquatic plants as well as the provision of compensation raises some complex questions. On the other hand, while it is important to encourage aquaculture farmers to report disease as soon as possible, they may be reluctant to do so if this increases the risk that their property, aquatic animals or plants, will be destroyed. Therefore, a strong case can be made that compensation should be paid for the destruction of private property (the diseased aquatic animals or aquatic plants) in the public interests of preventing the spread of aquatic animal/plant diseases. For example, Article 9 of Japan's aquaculture law contains rather detailed provisions on compensation:

(1) In the event that a person suffers a loss due to any order pursuant to the provisions of paragraph (1) of the preceding Article, the Governor concerned shall compensate the person for ordinary losses caused by the order.

(2) A person claiming compensation pursuant to the provisions of the preceding paragraph shall submit a written application stating the estimated compensation amount to the Governor concerned.

(3) If the Governor concerned receives an application under the preceding paragraph, he/she shall determine the compensation amount without delay and notify said applicant of the amount.

(4) Any person who is dissatisfied with the compensation amount determined under the preceding paragraph may ask for an increase in the compensation amount by filing an action within six months from the day when he/she receives notification of the determination.

(5) In an action under the preceding paragraph, the prefecture concerned (or the nation in a case where the Minister of Agriculture, Forestry and Fisheries exercises the authority of the Governor concerned pursuant to the provisions of Article 136 of the Fishery Act; the same shall apply in paragraph (3) of Article 13) shall be the defendant.

Conversely, it is also argued that if compensation is payable in the event of a disease outbreak this can deter farmers from taking care to prevent disease in the first place. After all, if they will be compensated then they may have no interest in actually taking care of their animals and plants. Again, there is no simple answer here. On balance, though, it seems advisable to provide for some form of compensation scheme in order to encourage reporting even if the cost is to some extent mutualized (through, for example, a mandatory insurance fund).

129. Temporary closure, treatment and fallowing

Following a disease outbreak, it is also important to take into account the state of the aquaculture facility in which disease is detected given that it may harbour pathogens. To this end it is important to ensure that the relevant legislation confers powers upon the competent authority/aquaculture administration to order: (a) the temporary closure of an aquaculture facility; (b) the treatment of an aquaculture facility; and (c) the fallowing of an aquaculture facility for a defined period. Detailed recommendations on these issues are set out in Article 4.3 of the Aquatic Animal Health Code.

130. Declaration of disease-free status

Finally, once a disease outbreak has been effectively addressed, a legal mechanism is necessary in order to allow the resumption of both the movement of and the trade in aquatic animals and plants. To this end the legislation should confer the necessary legal powers upon the competent authority, plant protection authority or aquaculture administration to: (a) to declare infected zones, compartments or other areas to be free of a notifiable disease and set out relevant criteria for such a declaration; (b) to declare zones, compartments or other areas to have a low prevalence of a disease and to set out relevant criteria for such a declaration; and (c) to declare buffer zones and to set out relevant criteria for such a declaration.

4.8. Post-production

As explained above, the post-production stage includes the post-harvest is stage, in other words the stage after which aquatic animals and plants are harvested, but also the rules that apply following the completion of a different stage in the aquaculture production cycle such as, for example, the movement of juveniles from a hatchery to a grow-out facility. This is another area where different laws may be relevant depending on the jurisdiction concerned including aquaculture legislation, food law, public health law and so on.

a) Food safety and traceability

Food safety and traceability issues are relevant to aquaculture production for food and consumer products. To this end Article 9.4.7 of the Code of Conduct states:

> States should ensure the food safety of aquaculture products and promote efforts which maintain product quality and improve their value through particular care before and during harvesting and on-site processing and in storage and transport of the products.

Two key issues arise with regard to aquaculture production. First, diseased aquatic animal and aquatic plant products should not be allowed to enter the food chain. Having said that, diseases of aquatic animals are not, as a rule, zoonotic, and food safety issues generally relate to the quality of growing water (for bivalves) and hygiene in product handling and processing (Kahn *et al.*, 2012). And second, such products should not contain unhealthy levels of residues from medicines or chemicals used in aquaculture (Taylor, 2009). To this end a robust system of standards and traceability is needed. Food safety traceability issues may typically be addressed in food legislation, fisheries legislation or aquaculture legislation. One point to note is that the food safety/traceability requirements for food products from aquaculture are likely to be the same as for food products from capture fisheries, meaning that the same basic regime may apply to both.

131. Standards and traceability

The detailed elements of a robust system of standards and traceability can usually be set out in subordinate legislation that should at a minimum provide for: (a) the setting of standards for aquaculture facilities, processing establishments, cold rooms, ice plants, fish transportation vehicles and service boats; (b) the setting of binding standards for the transport, handling and storage of aquaculture products applicable to producers and dealers in such products; (c) the preparation and implementation by processing establishments of quality management programmes and checks; (d) the mandatory use of monitoring quality management programmes and application of Hazard Analysis and Critical Control Point (HACCP); (e) the mandatory performance of microbiological and chemical and physical analyses of aquaculture products before they are released for human consumption; (f) the certification of the quality of aquaculture products through the issuance of a sanitary certificate before they are placed on the market; (g) the establishment of a traceability system for aquaculture products at any stage to/from the aquaculture facility; (h) the labelling of aquaculture products placed on the market; and (i) monitoring and treatment requirements.

One important reason for the use of subordinate legislation is the fact that if aquaculture products are to be exported then it will usually be necessary to ensure compliance with the standards applicable in the principal importing markets (such as the United States of America, Japan or the European Union)[98] which may change from time to time. It is obviously easier and faster to respond to such changes through the adoption of new regulations rather than primary legislation. Sometimes, as in the case of the Malaysia Fisheries (Quality of Fish for Export to the European Union) Regulation 2009 (as amended) the name of the export market is included in the name of the item subordinate legislation.

[98] According to FAO, 2022 in 2020, the European Union was the largest fish importing market (34 percent in terms of value), followed by the United States of America (15 percent), China (10 percent) and Japan (9 percent).

132. Residue testing

Residues from the use of various inputs in aquaculture such as medicated feed, medicines and chemicals may have negative human health impacts if contained in food products from aquaculture. It is therefore important to ensure that the relevant legislation requires the monitoring of residues of medicated feed, medicines and chemicals.

b) Transport and export of aquatic animals and plants

Live aquatic animals and aquatic plants may be transported, or even exported, following a particular stage in the aquaculture production process. Export provisions should largely mirror the import requirements described in part 4.5. above.

133. Export of live aquatic animals

As regards the export of live aquatic animals the relevant legislation should either directly or through subordinate legislation: (a) provide for the issuance of aquatic animal health certificates; (b) require each consignment of aquatic animals and aquatic animal products for export to be accompanied by a valid animal health certificate; (c) require each consignment of aquatic animals that is to be moved within the jurisdiction concerned to be accompanied by a valid animal health certificate; (d) set out the procedures for the issuance of aquatic animal health certificates.

134. Export of aquatic plants

For the export of aquatic plants from aquaculture the legislation either directly or through subordinate legislation: (a) provides for the issuance of phytosanitary certificates for aquatic plants, plant products and other related articles; (b) requires each consignment of aquatic plants, plant products and other related articles to be accompanied with a phytosanitary certificate issued in accordance with international standards; (c) sets out the procedure for the issuance of such phytosanitary certificates; and (d) describes the minimum contents of such phytosanitary certificates and a procedure for determining this.

4.9. Inspection and enforcement

Finally given that the legal framework for aquaculture must set out legal rules, it is necessary to be able to ensure that those rules are followed. To this end, effective provisions on inspection and enforcement powers are necessary to ensure compliance with aquaculture legislation as well as the broader legal framework for aquaculture. Such provisions are evidently relevant to all types of aquaculture. This part briefly examines the issue of inspection and enforcement powers relating to aquaculture.

For the purposes of this study, "inspection powers" are those powers that may be exercised in a routine manner in order to verify compliance without their necessarily being any suspicion of wrongdoing. "Enforcement powers", in contrast, are those powers that are exercised only after *prima facie* evidence of wrongdoing has been detected. They include elements of the process of sanctioning non-compliance. As these are police-type enforcement powers that may even include the power of arrest, it is of course important to ensure that they are carefully drafted as the correct exercise of such powers is likely to be closely monitored by the courts.

a) Inspection

While the threat of sanctions is one part of a compliance regime, equally important is the risk that non-compliance will be detected and for this an effective inspection framework is necessary. The complexity of the legal framework for aquaculture is such that it is important not only to ensure that appropriate inspection powers are conferred under each element of the framework but also to ensure that such powers can be implemented in a coordinated manner.

135. Appointment of inspectors

At the level of aquaculture operations, inspection powers are typically set out in: (a) aquaculture legislation; (b) animal/plant health legislation; and (c) environmental legislation. A key point is to ensure that the relevant legislation provides for the appointment of inspectors with powers to routinely inspect aquaculture facilities and related places for the purpose of verifying compliance with the relevant legislation.

136. Duties of inspectors

Because inspectors exercise police-type powers it is important to ensure that, as a minimum, the relevant legislation: (a) requires every inspector to produce on demand evidence of his/her appointment in the course of exercising inspection and/or enforcement powers; and (b) specifies that no action may be brought against an inspector in respect of actions or omissions in good faith during the course of inspection or enforcement.

137. Powers of inspectors

In order to for inspectors be able to undertake effective inspections, it is important to ensure that as a minimum the legislation confers power upon each inspector: (a) to enter, without a warrant, any licensed or registered aquaculture facility for the purpose of inspection/enforcement; (b) to enter, without a warrant, private premises (not used as dwelling places) for the purposes of inspection/enforcement; (c) to order a vessel or a vehicle to stop to permit boarding and/or inspection (for example in the case of a vessel used in connection with floating cages or pens); (d) to take samples of aquatic animals, aquatic plants, feed, chemicals and medicines within an aquaculture facility; (e) to require the production of documents and records relating to aquaculture production; (f) to take pictures and to make copies of documents; and (g) to undertake interviews and to require that answers be provided to questions.

While many of these powers are similar if not identical to those conferred upon fisheries inspectors under fisheries laws, one important difference concerns the power to take samples. Such powers should be carefully described not least because the samples in question are the private property of the operator of the aquaculture facility. For example, Section 5A of Scotland's aquaculture legislation provides as follows:

> Obtaining samples from fish farms
>
> (1) An inspector may take samples of fish, or material from fish, on a fish farm for any of the purposes mentioned in subsection (3).
>
> (2) An inspector may require a person who carries on a business of fish farming to provide the inspector with samples of fish, or material from fish, on the fish farm for a purpose mentioned in subsection (3).

(3) The purposes are—

(a) assisting any investigations into escapes of fish from fish farms that may require to be carried out,

(b) analysing the samples mentioned in subsections (1) and (2) for scientific or other research,

(c) assessing the impact of —

(i) the operations of fish farms on the environment,

(ii) escapes of fish from fish farms on stocks of fish other than those on fish farms, and

(d) developing methods of tracing the origins of fish that escape from fish farms.

...

b) Enforcement

138. Power to serve an enforcement notice

Particularly as regards inputs, facility management and disease prevention and control, given the potentially negative environmental and biosecurity impacts, on discovering a situation of non-compliance, the first reaction of an inspector/the aquaculture administration should usually be to require the operator of an aquaculture facility to take corrective action in order to remedy breaches of aquaculture legislation, animal or plant health legislation or environmental legislation. To this end specific legal powers are needed. For example, Norway's aquaculture law provides:

§ 27 Orders to execute measures

If the provisions prescribed in or pursuant to this Law are contravened, the supervisory authorities may order the execution of measures to remedy the illegal situation and bring it to an end. A time limit may be stipulated for the performance of such measures.

In order to ensure compliance, the law goes on to provide, in Article 28, for the possible imposition of continuous enforceable fines on the person responsible until such time as the situation is not remedied. Moreover, separate fines may be applied for each offence.

In a similar manner, Section 58 of South Australia's aquaculture law confers power on the minister to require a licensee to take an action required by a condition of his/her licence failing which a significant fine is payable. If a licence is suspended or cancelled the minister can in a similar manner also require the removal of aquaculture stock or equipment.

139. Enforcement powers relating to an offence

If, following an inspection, it appears that an offence has been committed, it is necessary to confer a number of enforcement powers upon the inspector. These include the power: (a) to seize and hold evidence of an offence; (b) to arrest any person whom the inspector has reasonable grounds to believe has committed such an offence; (c) to order the cessation of any aquaculture activity which the authorized officer has reasonable grounds to believe has been undertaken in contravention of the relevant legislation; (d) to dispose of seized aquatic animals/plants by sale (in which case a receipt is to be provided) or by destruction; (e) depending on the rules of the jurisdiction concerned, to take sworn statements with evidentiary value: in many civil jurisdictions such a statement (a procès verbale in French) can be used as evidence of fact with the burden being placed upon the accused to disprove the content of the statement; and (f) to provide certificate evidence, usually as regards administrative matters (such as the whether or not a particular aquaculture facility is subject to a valid licence).

In cases where the aquaculture legislation forms part of a broader fisheries law, many of these enforcement powers will be provided for fisheries inspectors.

140. Offences

Depending on the jurisdiction concerned, offences against provisions in the legal framework for aquaculture may be punishable on the basis of criminal law or administrative sanctions (usually fines) or a combination of both. There are advantages and disadvantages to both approaches. Criminal prosecutions are costly to mount, and a very high standard of proof ("beyond reasonable doubt") is almost invariably necessary. On the

other hand, a criminal conviction sends out a very clear message that the offence is socially unacceptable.

Administrative sanctions are much easier to impose, even if they include some form of hearing or tribunal procedure, and the evidential burden is usually much easier to satisfy (on "the balance of probabilities"). On the other hand, the imposition of an administrative penalty does not have the social stigma of a criminal conviction and any fine payable may be treated as no more than a business cost.

The key issue to evaluate is whether or not the relevant legislation creates clear and relevant offenses capable of effective prosecution or sanction on the basis of administrative procedures and that sanctions can be imposed that reflect the seriousness of the offence.

141. Offences by companies

Because commercial aquaculture facilities are often owned and managed by companies, it is important, to the extent possible, to make provision for corporate liability. The problem may be that while it is possible to determine that an offence has been committed, it is not possible to identify precisely who is responsible.

For example, Norway's aquaculture law provides in Section 30 that a company can be subject to a fine if that company "or someone who has acted on behalf of the enterprise violates provisions provided by or pursuant to the law". The relevant provision goes on to state "(t)his is true even if the responsibility for the offense cannot be directed at any individual". Moreover Section 30 provides that if a company is part of a group, "the parent company is liable and the parent company of the group company is part of, subsidiary for the amount".

The South Australia aquaculture law goes even further providing, in Section 88(1), that if a company is found guilty of certain specified offence, each director of the company can in certain specified circumstances also be found guilty of the same offence and liable to the same sanction.

142. Sanctions

Depending on the nature of the offence and the jurisdiction concerned, the type of sanctions available to punish an offence relating to the legal framework for aquaculture will usually depend on whether or not is punishable on the basis of criminal or administrative law. In the latter case, sanctions will usually be limited fines, whereas a criminal conviction may open the possibility of imprisonment.

The key test in any event is for the sanctions to be both proportionate to the offence and sufficiently onerous to serve as a deterrent against misconduct.

5. Conclusion

As described in this study, the aquaculture sector has seen significant growth at the global level and now makes an important contribution to global society in terms both of the economy and in meeting food demand. Given the limits to growth now faced by the capture fisheries sector, now that a majority of fish stocks are fully exploited or over-exploited, the continued development of aquaculture will be necessary to feed a growing world population. But that growth is not necessarily assured. The sector faces increasing threats as a result of environmental pressures, particularly as regards water quality and the emerging impacts of climate change, while potentially also contributing towards environmental degradation. At the same time aquatic animal and plant disease outbreaks can cause economic devastation to the sector and are often themselves linked to environmental conditions in and around aquaculture facilities. In these circumstances a robust but enabling legal environment is an essential pre-requisite for the sustainable development of aquaculture.

At the level of international law, there are few specific references to aquaculture. Unlike the capture fisheries sector there are no global or regional aquaculture agreements. However, aquaculture takes place within a relatively complex body of international law that addresses matters that are relevant to the sector, including the right to use marine space, the protection of biodiversity, international trade, animal and plant health and so on. At the international level, the normative or rule making framework that directly addresses aquaculture is composed entirely of soft law instruments including, in particular, the Code of Conduct and its Technical Guidelines. In particular a series of supplements to the Technical Guidelines specifically address different aspects of the sector. A number of regional bodies have also adopted soft law guidelines for aquaculture but some of the most detailed normative instruments derive not from inter-governmental bodies but from the private sector in the context of certification and ecolabelling schemes.

At the level of national law, the legal framework for aquaculture is rather complex, comprising as it does laws or legal instruments that specifically address aquaculture as well as a range of laws and legal instruments that set out the broader legal framework within which aquaculture takes place. The complexity of the legal framework is exacerbated by the sheer diversity of the sector in terms of the number of animal and plant species that are cultivated, the technologies used and the places where aquaculture takes place. This diversity can in turn have legal consequences with different laws and different provisions in laws applying accordingly.

At the national level, aquaculture has historically been addressed in fisheries laws, usually in a separate chapter. There are logical reasons for this, of course, in that aquaculture shares a number of connections with the capture fisheries sector. Nevertheless, in many ways aquaculture is quite different. For a start aquaculture is a farming activity while fishing is essentially a hunting activity. Moreover, fisheries operations usually take place almost exclusively within the boundaries of the relevant fisheries law (and subordinate legislation) which regulates how much of which type of fish can be caught. In contrast, the aquatic plants and aquatic animals used in aquaculture are the private property of the person undertaking aquaculture, just as with terrestrial farming. At the same time aquaculture is directly subject to a much more complex legal framework that determines not only where it can take place, but which also controls the inputs that can be used as well as the management of aquaculture facilities and in which environmental and animal and plant health issues play an increasingly important role.

One outcome of this degree of complexity is that it can be difficult to systematically assess all of the aspects of legal frameworks for aquaculture not least because of a growing tendency toward specialization and the creation of functional "siloes" within the sector: experts in animal health may be less familiar with the legal framework for plant health, for example.

In these circumstances aquaculture legislation evidently cannot replace the other elements of the legal framework and no purpose would be served by duplication. Instead, a key function for aquaculture legislation is to strengthen the linkages between the different elements

of the legal framework for aquaculture, including in particular as regards environmental and plant health issues. To this end a number of countries have recently adopted specific aquaculture laws while others have substantially expanded the scope and content of aquaculture chapters within fisheries laws. Moreover, within this increasingly complex legal framework another important policy objective is to try and simplify and streamline the administrative procedures for the range of different approvals necessary for investments in the sector.

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While aquaculture has seen extraordinary growth over recent years the sector is still considered to have tremendous potential in terms of food security, export-led growth and new technology often as part of "blue economy" strategies. Within the better production Programme Priority Area of FAO's Strategic Framework 2022–2031 (the four betters – better production, better nutrition, better environment, better life), aquaculture is highlighted as a sector with an underdeveloped status and must be supported to contribute towards achieving transformed blue food systems. However, aquaculture, under the pressure of production expectations faces environmental, biosecurity and disease control challenges that, if not addressed, place the sustainability of the sector at risk. The aim of this study is to identify the legislation necessary for sustainable aquaculture, distinguishing between aquaculture legislation (in the sense of laws that have aquaculture as their specific focus) and the broader legal framework, including environmental and biosecurity legislation, within which aquaculture takes place. It is intended both to act as a guide to what is usually a somewhat complex legal framework and also to serve as the background or resource document for the "Aquaculture Legal Assessment and Revision Tool" (ALART), a separate tool that has been developed by FAO.

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