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DRAFT GUIDELINES FOR SUSTAINABLE AQUACULTURE

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FOREWORD

This section will be completed as part of the final document.

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ABBREVIATIONS AND ACRONYMS

ASD 2030	2030 Agenda for Sustainable Development
AMA	aquaculture management area
AMR	antimicrobial resistance
AqGR	aquatic genetic resources for food and agriculture
AquaGRIS	global information system for aquatic genetic resources
AVC	aquaculture value chain
BMP	Best/better management practice
BT	Blue Transformation
CAC	Codex Alimentarius Commission
CBD	UN Convention on Biodiversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Code	Code of Conduct for Responsible Fisheries
COFI	FAO Committee on Fisheries
COFI:AQ	Sub-Committee on Aquaculture of the FAO Committee on Fisheries
CSO	civil society organization
EAA	Ecosystem Approach to Aquaculture
EIA	environmental impact assessment
FAO	Food and Agriculture Organization of the United Nations
GSA	Guidelines for Sustainable Aquaculture
HH	high health
ICT	information and communications technology
ICZM	integrated coastal zone management
IGO	intergovernmental organization
IPPC	International Plant Protection Convention
LCA	Life Cycle Assessment
MRA	Mutual Recognition Agreement
MSP	marine spatial planning
NAP	National Adaptation Plan
NDC	nationally determined contribution
NGO	Non-governmental Organization
NTMs	Non-tariff Measures
PMP/AB	Progressive Management Pathway for Improving Aquaculture Biosecurity
PO	professional organization
PPA	Programme Priority Area
PPP	public-private partnership
REIO	Regional economic integration organization
SDG	Sustainable Development Goal
SPF	specific pathogen-free
SPR	specific pathogen resistant
SPS	Sanitary and Phytosanitary Measures
TBT	Technical Barriers to Trade
UNFCCC	United Nations Framework Convention on Climate Change
VNR	Voluntary National Review
WOAH	World Organisation for Animal Health
WTO	World Trade Organization

PREFACE

The Guidelines for Sustainable Aquaculture (GSA) have been developed to support the implementation of the 1995 Code of Conduct for Responsible Fisheries (Code) of the Food and Agriculture Organization of the United Nations (FAO), the FAO Strategic Framework 2022-31, the 2030 Agenda for Sustainable Development (ASD 2030) and its Sustainable Development Goals (SDGs) as well as the United Nations Decades for Ecosystem Restoration and Family Farming. As such, the Guidelines support the visibility, recognition and enhancement of the important role of aquaculture in contributing to global, regional and national efforts towards the eradication of hunger and poverty and to support socioeconomic development for the benefit of current and future generations, in full respect of the environment, ensuring restoration and protection of aquatic habitats, biodiversity and ecosystems.

Aquaculture is a millennia-old activity that had expanded slowly for centuries, integrating with natural, social, economic, and cultural environments. Since the 1970s, aquaculture has experienced rapid expansion and major developments as the fastest-growing food production industry, fueled by scientific progress, technological innovations, and investment, amid a consistently and sharply increasing global demand for aquatic food. Expansion and intensification of the aquaculture sector has been a major factor in the doubling of global per capita fish consumption since 1960 making increasing contributions to the provision of food and livelihoods for a growing population. FAO projects further increase in production, consumption and trade of aquatic food products, accelerated mainly by a sustained growth in aquaculture.

However, some of these developments have caused undesirable social and environmental impacts, leading to conflicts between users of land, water, and living aquatic resources, and negatively affecting the aquatic environment, its biodiversity and its valuable ecosystem services. In particular, concerns remain regarding habitat destruction and modification; the irresponsible and unregulated use of chemicals and veterinary medicines; the impact of escapees on wild fish stocks, the use of feed ingredients that are not sustainably sourced.

In 1995, Members adopted the Code as the reference framework for national, regional, and international efforts to ensure sustainable production, harvesting and utilization of living aquatic resources in harmony with the environment, considering all their relevant biological, technological, economic, social, environmental and commercial aspects.

Several other international instruments and initiatives of relevance to sustainable fisheries and aquaculture have been developed and implemented concurrently to the Code (Annex 2). They address responsible governance principles of tenure, equitable livelihoods, sustainable resources management, including feed, biological diversity, biosecurity, environmental protection, climate change and natural disasters, social responsibility and gender equality, international trade, responsible investment, innovation and science. While there is a great need for further improvements, significant progress has been made in several areas of aquaculture research, technology and practice.

The FAO Strategic Framework 2022–2031 supports the transformation to more efficient, inclusive, resilient and sustainable food systems for achieving better production, better nutrition, better environment and better life, leaving no one behind. The Four Betters represent aspirations and organizing principles for how FAO intends to contribute directly to its three guiding SDGs: SDG 1 (No poverty), SDG 2 (Zero hunger), and SDG 10 (Reduced inequalities), as well as support the broader SDG agenda, crucial for attaining FAO's overall vision. The FAO Strategic Framework 2022–2031 is built around 20 Programme Priority Areas (PPAs) addressing the various food and agriculture sectors and representing important building blocks to support FAO work and the ASD 2030. FAO also applies four cross cutting/cross sectional accelerators: *technology, innovations, data and complements (governance, human capital and institutions)* in its programmatic interventions to accelerate progress and maximize efforts to realize its aspirations: *the Four Betters*.

Blue Transformation, a vision for FAO's work on aquatic food system, is a targeted effort by which agencies, countries and communities use existing and emerging knowledge, tools and practices to secure and sustainably maximize the contribution of aquatic food systems to food security, nutrition and affordable healthy diets for all. The three global objectives of Blue Transformation are: i) sustainable aquaculture intensification and expansion satisfy global demand for aquatic food and distribute benefits equitably; ii) effective management of all fisheries delivers healthy stocks and secures equitable livelihoods; iii) updated value chains ensure the social, economic and environmental viability of aquatic food systems.

In 2017, the 9th Session of the Sub-Committee on Aquaculture (COFI:AQ) of the FAO Committee on Fisheries called for the identification of successful initiatives in support of sustainable aquaculture and their documentation and compilation into the Guidelines for Sustainable Aquaculture, towards better implementation of the Code and achievement of the SDGs through the contributions of the aquaculture sector. In this regard, FAO carried out a global process to consult its Members, partners and stakeholders including representatives of farmers, civil society organizations (CSOs), governments, regional organizations and academia, to develop the Guidelines for Sustainable Aquaculture.

[A draft of the Guidelines (Draft Guidelines) was presented as an information paper to the 11th Session of the COFI:AQ. The Session recommended their review by Members with a view to their finalization. A virtual meeting of a Members' Task Force was convened in January 2023. The Task Force reviewed the Draft Guidelines and requested FAO to finalize the draft and submit it to the 12th Session of COFI:AQ for guidance. On [Date], the 12th Session of COFI:AQ adopted the Draft Guidelines, and on [Date], the 36th Session of COFI endorsed the Guidelines for Sustainable Aquaculture and urged FAO and its Members, partners and stakeholders to implement the Guidelines.]

The Guidelines recognize that countries have diverse challenges, needs and capacities with respect to aquaculture development, including in relation to aquatic resources, infrastructure, investment, institutions, levels of education and technical capacities. At the same time, there are major common challenges and opportunities at national, regional and global levels.

At the request of FAO Members, the Guidelines aim to provide a clear direction for the development of sustainable aquaculture and identify the concrete actions that need to be implemented for aquaculture to best contribute to food security, poverty alleviation, preservation of ecosystems and biodiversity and the broader goals of the ASD 2030 and its SDGs.

A – VISION, OBJECTIVES, SCOPE AND GUIDING PRINCIPLES

Sustainable aquaculture is generally understood as the practice of producing safe aquatic food and associated products in a manner that is environmentally and socially responsible, economically viable, and able to meet the needs of present and future generations.

1 Vision and objectives

The vision of the Guidelines for Sustainable Aquaculture (Guidelines) is an aquaculture sector that contributes significantly to a world free from hunger and to equitable improvement of the living standards of all actors in its value chain, including the poorest, and:

- advances towards more productive, efficient, resilient, climate-smart and socially and environmentally responsible agrifood systems;
- fulfils its potential to meet the increasing demand for safe, healthy, accessible and affordable aquatic food and aquatic products with reduced impacts on the global environment;
- contributes to sustainable development and helps to eradicate poverty, malnutrition and hunger; and
- matures in an economically, socially and environmentally sustainable way.

The objectives of the Guidelines are to:

- provide normative guidance for the development and implementation of public policies, strategies, and plans and legal and institutional frameworks for sustainable aquaculture growth;
- enhance the contribution of aquaculture to global food security, nutrition and poverty eradication as well as societal wellbeing and economic development;
- improve the socioeconomic situation of communities depending on aquaculture for their livelihoods through decent work and economic growth; and
- contribute towards achieving the sustainable use, responsible management, conservation and restoration of living aquatic resources, ecosystems and biodiversity consistent with the Code and other international instruments relevant to aquaculture, as well as climate change mitigation (Annex 2).

2 Nature and scope

The Guidelines are voluntary. They are global in scope and should be adapted to apply to aquaculture in its varied contexts, systems, scales (including subsistence, commercial small, medium and large-scale, individual or corporate operations), farmed species and farmed types (including fed and unfed species of aquatic animals, plants and microorganisms), environments (including marine, brackish and freshwater), location (including rural, urban and peri-urban zones) and activities, including feed and seed production, grow-out and post-harvest activities.

The Guidelines focus on the aquaculture sector while recognizing the important linkages between aquaculture and other sectors such as fisheries, agriculture, forestry, wildlife, coastal and marine tourism, energy production, mining and transportation.

The Guidelines are addressed to FAO Member and non-Member States (hereinafter, “States”), subregional, regional, international, intergovernmental organizations (IGOs), professional organizations (POs), civil society organizations (CSOs), non-governmental organizations (NGOs), academia and the research community, the private sector and other stakeholders including decision makers and groups along the aquaculture value chain.

The Guidelines should be interpreted and applied in a manner compatible with national policies, legal systems and their institutions and which ensures transparency and accountability, including through effective participatory and consultative processes, so that the voices of men, women, youth, vulnerable and marginalized groups and people with disabilities are considered.

The Guidelines should be interpreted and applied in a responsible manner consistent with existing rights and obligations under national and international law with due regard to voluntary commitments under applicable regional and international instruments. They are complementary to and support national, regional, and international initiatives that address sustainable aquaculture. Nothing in the Guidelines should be interpreted as limiting or undermining any rights or obligations to which a State or Regional economic integration organization (REIO) may be subject under international law. The Guidelines may be used to guide updates, amendments and inspire new or supplementary policy, legislative and regulatory frameworks and best practices.

3 Guiding principles

The Guidelines are based on principles, standards and practices of sustainable development according to the ASD 2030 and its relevant SDGs, the Code and other instruments (Annex 2) with relevant bearing on sustainable aquaculture development, namely:

- a) Sustainability: striving to achieve economic, social and environmental sustainability and viability in aquaculture through governance frameworks and strategies that reflect local, national or regional realities, are climate-smart, socially, economically and environmentally

- sound.
- b) Environmental stewardship: responsibly using and protecting the natural environment through conservation and sustainable practices to quantifiably enhance ecosystem resilience and human well-being.
 - c) Rule of law: adopting laws and regulations that are widely accessible, applicable to all, equally enforced and independently adjudicated, consistent with obligations under national, regional and/or international law, and with due regard to commitments under voluntarily applicable regional and international instruments.
 - d) Non-discrimination and respect of cultures: promoting the elimination of all kinds of discrimination in policies and in practice in aquaculture and recognizing and respecting existing forms of organization, traditional and local knowledge, and practices of aquaculture communities.
 - e) Equity and equality: promoting justice and fair treatment – both legally and in practice – for all, including the enjoyment of all human rights, using affirmative action or preferential treatment where required, to achieve equitable outcomes and equal opportunities, particularly for women, youth, vulnerable and marginalized groups, indigenous communities and ethnic minorities, small-scale farmers and people with disabilities.
 - f) Consultation and participation: ensuring free effective and informed participation of all aquaculture stakeholders in decision-making, promoting strong partnerships among different actors and conflict resolution mechanisms considering existing power imbalances between different individuals and groups.
 - g) Transparency and accountability: clearly defining, widely publicizing, and making accessible policies, laws, regulations, procedures, and decisions, holding individuals, public institutions, and non-state actors responsible for their actions and decisions according to the principles of the rule of law.
 - h) Holistic and integrated approaches: recognizing, adopting and implementing the Ecosystem Approach to Aquaculture (EAA) as a key strategy for the integration of aquaculture activities within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems and ensures effective coordination among the various relevant sectors to reconcile economic, social, and environmental objectives.

B – GUIDELINES FOR PROMOTING SUSTAINABLE AQUACULTURE

There is no universally agreed upon definition of sustainable aquaculture, it is generally understood as the practice of producing safe aquatic food and associated products in a manner that is environmentally and socially responsible, economically viable, and able to meet the needs of present and future generations. It involves using production systems and technologies that minimize negative impacts on the environment, livelihoods and communities and promotes the long-term health and productivity of aquatic ecosystems.

Sustainable aquaculture practices may include using non-fed aquaculture, recirculating aquaculture systems or integrated aquaculture, to reduce the use of water and land resources and minimize waste. They may also involve sourcing feed and other inputs from sustainable sources, conservation and effective management of aquatic biodiversity, minimizing the use of antibiotics and other chemicals, and ensuring high animal welfare standards.

Sustainable aquaculture should be guided by robust governance frameworks, well targeted policies, strategies and proper planning and transparent, predictable and enforceable legislation, underpinned by effective capacity building. Further it proactively considers social and economic factors, such as long-term profitability and competitiveness, fair labour practices and community involvement, and gender equality, to ensure that the industry is not only environmentally sustainable but also socially responsible and economically viable in the long term.

This section contains conditions and actions required to make sustainable aquaculture development happen. The list is not exhaustive and may be complemented with additional conditions and actions

based on the regional or national specificities and complexities of the social-economic-environment context, aquaculture farming systems, geographical locations, species, technology, scale, practices and ecosystem services.

4 Governance and planning

Governance and planning of aquaculture are parts of the backbone of the sector sustainability. Principles of good governance, such as accountability, equity, effectiveness and efficiency of government services, and predictability of the rule of law, are means of achieving sustainability.

Both governance and planning reduce risks to society, but also risks and transaction costs to farmers. In the absence of effective governance and proper planning, there will be misallocation of resources. Without the rule of law, there will be little security, so farmers will have no incentive to take risks or to invest.

4.1 Governance frameworks

Aquaculture governance is the set of processes by which a jurisdiction manages its aquaculture resources and defines how aquaculture stakeholders participate in making and implementing decisions affecting the development of aquaculture. Governance frameworks determine how decision-makers are held accountable to aquaculture stakeholders and ensure observance and enforcement of applicable laws and regulations in collaboration with national, regional and international organizations as appropriate, thereby, fostering adherence to the rule of law.

Having and enforcing implementation of good aquaculture governance frameworks is one of the necessary conditions for the sector to fully realize its potential for growth and prosper over time. Such frameworks, which should be comprehensive and inclusive, take into consideration the specificities and complexities of the social-economic-environment context and the diversity of aquaculture systems, geographical locations, species, technology, scale, practices and ecosystem services, and should include policy, institutional and administrative, and legal and regulatory frameworks.

4.1.1 Policy frameworks

States should:

4.1.1.1 Recognize and prioritize, as appropriate, aquaculture in national food development strategies and plans, and ensure the integration of aquaculture within national food security and nutrition, health and climate policies and action plans.

4.1.1.2 Develop and ensure implementation of policies, strategies and plans, laws and regulations, institutional and administrative arrangements that promote economically efficient, environmentally friendly, technically feasible, and socially responsible aquaculture and encourage the active engagement of the private sector and civil society in these processes.

4.1.1.3 Promote effective and transparent consultation and participation of all stakeholders and entities involved in or impacted by aquaculture in the processes of establishing, reviewing and implementing policy, legal and institutional frameworks to ensure that their interests are taken account of.

4.1.1.4 Provide procedures and mechanisms in national legal frameworks for the review of decisions and actions of public institutions and other aquaculture stakeholders and reporting, auditing and enforcement to ensure accountability for decisions and actions.

4.1.1.5 Establish and publish directives, mechanisms and processes to clarify the relationship between different aquaculture stakeholders and their respective rights and responsibilities, grant security and enforceability of property and lease rights, tenure and land and water access rights and facilitate their access to aggrieved stakeholders.

4.1.1.6 Build coherence between the policy frameworks of the aquaculture sector and those of other sectors including fisheries, agriculture, water and forestry, investment, trade and the environment to provide a predictable and transparent environment for investment in aquaculture.

4.1.1.7 Promote safe and nutritious aquatic foods in national food-based dietary guidelines, school feeding programmes, and other food and nutrition strategies.

4.1.1.8 Ensure that public incentives for aquaculture, fiscal or otherwise, if provided in the overall policy and/or legal frameworks, support the implementation of and promote compliance with such policy and legal frameworks as well as applicable codes of best practice.

4.1.1.9 Require the industry to provide accurate and reliable data, statistics and reports to enable the competent authority to design policies, strategies, plans and laws and regulations appealing to the public.

States and relevant stakeholders should:

4.1.1.10 Reconcile the multiple and sometimes competing objectives of aquaculture development to ensure optimum utilization of resources, equitable distribution of the costs and benefits, long-term viability and transparency, consistency, and fairness in making and enforcing decisions and developing national programmes by involving stakeholder representatives in the processes from the onset.

4.1.1.11 Deliver efficiently or enable efficient delivery of essential services and tools to use natural resources and mitigate risks in the most cost-effective way, providing incentives, supporting market instruments and avoiding duplication and unnecessary multiple administrative layers at all government levels.

4.1.2 Institutional and administrative frameworks

States should:

4.1.2.1 Designate departments to administrate aquaculture and establish a competent authority as the lead agency with clearly specified roles and responsibilities, and aggregate processes as appropriate for authorizing or permitting aquaculture activities (e.g. licensing of farms) and facilitating communication and interaction between applicants and decision-making authorities.

4.1.2.2 Clearly delineate administrative and decision-making responsibilities, delegate decision-making to competent authority, define and approve criteria for making decisions in advance, make timely decisions, and put in place a mechanism for appealing administrative decisions.

States and relevant stakeholders should:

4.1.2.3 Create inclusive networks and dialogue platforms that can lead to shared understanding and negotiated solutions in a coordinated manner within and across sectors, and promote collaboration among their professional associations, including cooperatives, clusters, NGOs and CSOs.

4.1.2.4 Support, international, regional and subregional cooperation to enhance capacity development including appropriate and mutually agreed technology transfer and information sharing.

4.1.3 Legal and regulatory frameworks

States should:

4.1.3.1 Establish, where possible, aquaculture specific legislation and regulations while avoiding overregulation, overlapping, and conflicting legislations and regulations, and ensure national legal frameworks supporting aquaculture, including aquaculture-specific legislation, are aligned with international laws and applicable international instruments and standards including the Code (Annex 2).

4.1.3.2 Promote, where appropriate, the use of non-legally binding governance instruments such as a codes of conduct, codes of practice, best management practices, good aquaculture practices, and economic incentives and disincentives, to supplement laws and regulations.

4.1.3.3 Consider establishing anti-trust agencies and competition panels where industrial concentration has or is suspected to have a negative impact on the sector growth or consumers. Voluntary codes of practice for corporate governance to minimize the risk of dumping should also be established.

4.1.3.4 Enhance coordination and cooperation among the different competing/complementary authorities for the development of relevant legislation applicable to aquaculture.

4.1.3.5 Build relevant capacity and provide adequate human and financial resources to encourage compliance and implementation of legislation and regulations.

4.2 Planning

Planning for sustainable aquaculture growth implies two main dimensions; the first involves the formulation of sector policies, strategies and development plans; the second concerns spatial planning. Aquaculture must share the space, marine or inland, and other resources such as water, consider the needs of other users including farmers, fishers, transport and tourism, and mitigate against negative impacts. This is accomplished through a proper planning and management of resource use, especially through zoning. Zoning enables countries to select the spatial area for developing their aquaculture, and the areas that must be free from aquaculture. This spatial selection must be carried out in a responsible manner in line with international instruments and agreed good practice; planning and management need to align aquaculture development objectives with wider development objectives, contribute to achieve sustainable development of local communities, minimize interference with existing enterprises and protect the ecosystem; and reconcile economic, social, and environmental objectives of relevant sectors while permitting the aquaculture sector to contribute to national economy and benefit society in a sustainable manner.

States should:

4.2.1 Promote a holistic food system perspective, integrating the development of sustainable aquaculture, including upstream and downstream sectors (e.g. seed, feed, farming technology, processing, logistic, marketing, branding and digital infrastructure) with other sectors using land, water, aquatic resources and maritime space to develop joint objectives and integrated actions across these sectors.

4.2.2 Integrate the expansion of aquaculture into public policies for food systems and economic development to enable better planning and use of public resources including for investment in basic infrastructure across sectors to promote economies of scale that minimize running costs and render aquaculture operations competitive.

4.2.3 Adopt a clear, transparent, equitable and inclusive process to designate aquaculture zones and sites within each zone, which involves identifying and including concerned stakeholders from the beginning of the process, especially in areas with potential for conflict between competing activities or special consideration, such as sensitive habitats or protected areas, and protect the entire process by a supportive framework including appropriate guidance and good practices need to be provided to the users and monitored by the competent authorities.

4.2.4 Pay special attention to the small-scale sector and support the establishment of cluster farming in suitable areas to enhance technical skills and value chain development through the application of good farming practices, continuous on-the job training, marketing facilities and biosecurity practices.

States and relevant stakeholders should:

4.2.5 Apply EAA as the key strategy for planning and management for aquaculture, and specifically: take account of the landscape/seascape approach with a full range of ecosystem products, functions and services, including biodiversity, and not threaten the sustained delivery of these to society or lead to their degradation beyond their capacity to regenerate; support the improvement of human well-being with equity for all stakeholders; consider the linkages and interactions across freshwater, brackish and marine environments, as appropriate; and, take account of the policies and goals of other relevant sectors, as appropriate.

4.2.6 Design aquaculture management areas (AMAs) such as aquaculture parks and aquaculture clusters to ensure that aquaculture development contributes to the sustainable development of local

communities. Best available knowledge and resources should be secured to perform scoping studies to enable proper zoning, site selection and AMAs with consideration of the carrying capacity of ecosystems.

4.2.7 Develop and provide data for spatial planning tools which take due account of the aquaculture stakeholders' interests and roles, and apply spatial planning and management to allocate and manage suitable farming zones and farm sites. The designation of these areas should be accompanied by the setting up of appropriate mechanisms in order to monitor the impact of the operations on environmental, social and economic sustainability.

4.2.8 Take into consideration the specific biological needs of the aquatic organisms in order to optimize production and productivity, minimize environmental impact, and stress and disease. This requires reconciling the physical, ecological, production and social carrying capacity of the ecosystem; economic profitability; risks and risk management; access to land and water and conflict mitigation among resource users; infrastructure; resilience to climatic change and other external threats and disasters; and improve transparent and efficient information sharing, and public perception and acceptability.

5 SUSTAINABLE RESOURCE USE, ECOSYSTEM AND FARM MANAGEMENT

Aquaculture is an important and rapidly growing food production sector. It utilizes diverse farming systems and a wide diversity of species, with traditional, improved and innovative management practices to increase production and provide employment.

Unfed aquaculture requires less resources especially in inland areas and is particularly attractive for the delivery of valuable ecosystem services in coastal areas. At the same time, there is scope to reduce the environmental impact of fed aquaculture, such as pollution and global warming, by paying attention to scaling, site selection, and the health of the production environment.

Water access and usage can be significant challenges which may require further attention to promote water recycling in land-based systems, to reduce water consumption, and facilitate nutrient recovery and re-use.

Aquatic biodiversity is essential for healthy ecosystems and human well-being and aquaculture should be conducted in a manner that recognizes this importance and conserves and enhances it as a valuable resource for the future.

To ensure sustainable development of aquaculture, we need to integrate it into nutrition-sensitive, circular, and sustainable food systems. This will require promoting the sustainable management and use of resources and ecosystem management using innovative farming systems such as polyculture, integrated agriculture-aquaculture farming, culture-based fisheries, integrated multi-trophic aquaculture and aquaponics.

5.1 Sustainable resources and ecosystem management

Aquaculture is reliant on the services provided by our ecosystems, which are impacted by human activities. It is important to ensure that aquaculture development does not have negative effects on the wider ecosystem by exceeding the environmental carrying capacity. Aquaculture can help restore ecosystems and provide valuable services, so practices that promote sustainability should be prioritized. To ensure long-term conservation and sustainable use of resources, everyone involved in managing land and water resources for aquaculture should take measures to protect them.

States and relevant stakeholders should:

5.1.1 Develop and implement national or regional strategies for sustainable use of water, land, genetic resources, and energy that address the needs and challenges of the aquaculture sector. Strategies should emphasize efficient water use in land-based systems and facilitate nutrient recovery and reuse to reduce the carbon footprint of aquaculture and integrate it into nutrition-sensitive, circular, and sustainable agrifood systems.

5.1.2 Conserve, protect, enhance, and restore aquatic ecosystems, their services, and their biodiversity, water, and soil resources, while preventing pollution of land, water, and the sea.

5.1.3 Reduce the environmental and carbon footprints of aquaculture by applying sustainable practices throughout production, processing, transportation, storage, and feed manufacturing, including decreasing the use of veterinary medicines.

5.1.4 Apply the concepts of physical, ecological, and social carrying capacity in aquaculture planning, use strategic environmental impact assessments, and monitor aquaculture operations to prevent and minimize environmental risks.

5.1.5 Promote low-trophic aquaculture species such as filter-feeding finfish, algae/seaweeds, and bivalve molluscs that provide ecosystem services, have a lower impact on surrounding ecosystems, and play a role in integrated multi-trophic aquaculture.

5.1.6 Promote aquaculture systems that provide habitat and refuge for both terrestrial and aquatic biodiversity, where appropriate.

5.1.7 Encourage energy efficiency and the use of clean and renewable energies, promote the recirculation of water and co-products in the feeding process, and develop waste management systems that minimize the environmental footprint of aquaculture activities.

5.1.8 Develop and disseminate guidance that addresses best practices for the management and use of aquaculture resources, supported by regular and targeted training.

5.1.9 Promote intensification of aquaculture and farm management by improving farm design and infrastructure, adopting up-to-date technologies at scale, promoting digitalization, on-farm recirculation and treatment of waste, using physical, biological, and responsible chemical methods, and monitoring and recycling “waste-streams” or underutilized aquaculture nutrients through regenerative, multi-trophic, and integrated aquaculture systems.

5.1.10 Expand aquaculture in locations where it is feasible and has potential for sustainable development. Assess social and economic viability, adopt appropriate environmental precautions and social safeguards, and ensure aquaculture expansion is responsible, exists within the environmental carrying capacity, and does not negatively affect biodiversity, ecosystems, or livelihoods.

5.1.11 Set an appropriate balance between species diversification and concentration on key species, that best meets market demands and responds to the drivers of species use, and adopt farm production and management schedules that align with market requirements and are responsive to environmental constraints.

5.2 *Integration of aquaculture with agriculture and other sectors*

Aquaculture can work together with agriculture and other sectors to improve efficiency and sustainability by using innovative management systems and production practices. In coastal areas, integration of aquaculture with tourism or energy sectors can deliver important synergies, and in inland areas its integration into local and small-scale farming systems can be a catalyst especially for poor communities to address the wider challenges of improving food and nutrition security, increasing farm biodiversity and building resilience to climate change.

Integration will lead to better use of resources, such as fisheries, water, land, and forests, and restore ecosystem services and functions. By planning and making decisions together, we can manage our natural and human resources more effectively and meet the diverse needs of society in the short,

medium, and long term. This approach will optimize the sustainable use of resources by addressing the complex linkages among different resource users.

States and relevant stakeholders should:

5.2.1 Promote the integration of aquaculture with agriculture and other sectors by preparing and implementing supportive national policies, regulations and legislation.

5.2.2 Encourage diversification of food production and income by integrating aquaculture with other systems, such as combined rice and fish farming, aquaponics, and other integrated farming practices. This will enhance sustainability, productivity, efficiency, and resilience of people, communities, and ecosystems.

5.2.3 Support research and innovation partnerships that promote integrated agriculture-aquaculture farming systems involving multiple stakeholders.

5.2.4 Promote the integration of aquaculture with fisheries through culture-based fisheries and stock enhancement, especially in seasonal water bodies, while preserving ecosystems and biodiversity.

5.2.5 Recognize aquaculture's role in the social and biophysical interlinkages of agrifood and ecosystems, and strengthen the application of participatory processes such as the EAA as a strategy for aquaculture's further integration.

5.2.6 Develop and promote innovative technologies for nutrient recycling and monitoring from aquaculture effluent to ensure re-use within the ecosystem through integrated and circular economy approaches.

5.3 *Conservation of aquatic biodiversity, genetic resource management and sustainable seed supply*

Sustainable aquaculture development requires effective management of genetic resources for both wild stocks (for conservation and as a resource for aquaculture) and for farmed types used in aquaculture. Effective management of AqGR should be informed by robust data on the national, regional, and global status of AqGR which should also help ensure that AqGR will be represented in the future developments and monitoring of the status of global biodiversity within international instruments such as the SDGs and the CBD Kunming-Montreal Global Biodiversity Framework.

There is huge potential to enhance productivity of domesticated farmed types through improved genetic management within aquaculture seed supply systems and the accelerated uptake of genetic improvement, with a focus on selective breeding.

Conservation of aquatic biodiversity, including management of aquaculture's impact on this diversity, is of critical importance to the future sustainable development of aquaculture. It is thus important to apply risk assessment to introductions and transfers, especially for non-native species and developed farm types, and recognize and monitor species, wild stocks and farmed types under threat, and promote their effective conservation.

5.3.1 *Conservation of aquatic biodiversity and genetic resources*

States and relevant stakeholders should:

5.3.1.1 Mainstream conservation and effective management of AqGR and biodiversity in aquaculture and in the wild by implementing the initiatives established in international instruments including the Global Plan of Action for the Conservation, Sustainable Use and Development of Aquatic Genetic Resources for Food and Agriculture (Global Plan of Action), the CBD Kunming-Montreal Global

Biodiversity Framework and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Annex 2).

5.3.1.2 Strengthen national institutions and adapt, develop or create strategies, policies and legislation to support effective management and monitoring of genetic resources.

5.3.1.3 Adopt measures from the aforementioned global instruments to mitigate the risk of harm to genetic resources, deliver equitable access and benefit sharing, prevent degradation of natural habitats, create conservation and/or species management areas where required, and explore incentives for valuing ecosystem services applied to biodiversity conservation and management.

5.3.1.4 Develop national registries of AqGR (for farmed types and wild stocks) using tools such as FAO's AquaGRIS, as a basis for understanding the status of the AqGR, the specific properties and characteristics of national AqGR, and to enable monitoring of the status of AqGR against specific indicators of progress in enhancing their management.

5.3.1.5 Recognize and monitor wild stocks and farmed types under threat and where necessary establish conservation programmes, prioritizing *in situ* conservation when possible, such as through aquatic protected areas and sustainable fisheries management, and supplemented by *ex situ* conservation in the form of live gene banks or *in vitro* gene banks such as cryo-conserved gametes or embryos, where necessary.

5.3.1.6 Apply a precautionary approach based on sound risk assessment and adaptive management to minimize harmful effects of accidental or deliberate introductions and transfers of AqGR (including non-native species and developed farmed types).

5.3.1.7 Raise awareness of the importance of monitoring and managing the genetic status of farmed types, including through the provision of genetic monitoring tools, especially in major seed supply chains supporting large-scale aquaculture production. Support the sustainable use of the genetic resources through adherence to basic principles of genetic management, such as by maintaining adequate effective population size and avoiding uncontrolled hybridisation.¹

5.3.1.8 Promote long-term selective breeding programmes (incorporating other innovative technologies such as genomic selection, with appropriate assessment of risk) through awareness raising, capacity building, appropriate research and development, supportive policies and legislation, and effective engagement of the private sector, with consideration of appropriate resourcing and/or outsourcing.

5.3.2 Sustainable seed supply

States and relevant stakeholders should:

5.3.2.1 Develop national policies or strategies for seed supply to ensure a consistent supply of quality seed to meet producer demand. Such strategies should consider the role of infrastructure development, such as establishment of breeding nuclei as a source of quality broodstock and decentralisation of seed multiplication and promote credible seed certification schemes.

5.3.2.2 Strengthen broodstock domestication and development, supply chains and seed production and distribution systems that integrate effectively with the steps taken for the conservation, sustainable use

¹ FAO. 2008. Aquaculture development. 5. Genetic resource management. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 3. Rome, FAO. www.fao.org/3/i0283e/i0283e.pdf

and development of wild and farmed types of AqGR.

5.3.2.3 Ensure efficient use of broodstock to maximise seed production and integrate biosecurity measures into seed supply systems, for example through the supply of specific pathogen-free or pathogen resistant seed.

5.3.2.4 Recognize the respective roles of the public and private sectors in seed supply systems, especially in the case of genetic improvement programmes. Such programmes are necessarily long term and public sector programmes should look to build in options for transition to the private sector to ensure that programmes have long-term sustainability based on elements of cost recovery.

5.3.2.5 Build technical capacity in both public and private hatchery sectors related to genetic management, broodstock husbandry, seed and larval rearing methods, and seed transport to ensure maintenance of seed quality throughout seed supply chains.

5.4 Sustainable feed

Fed aquaculture species represent around half of total aquaculture production and their farming is projected to expand to meet the increasing demand for aquatic food. Scientific and technological advances in feed formulation and processing have been part of the recent evolution of aquaculture.

The sustainability of fed aquaculture requires practices and systems that improve productivity while reducing costs, feed waste and environmental pollution. Diversifying ingredient sources is fundamental to ensure availability and access. Developing ingredient alternatives, feed formulations and processing capacity can guarantee the expansion of aquaculture in distinct regions. Improving feed management practices is paramount for the sustainable intensification of aquaculture, allowing greater efficiency.

States and relevant stakeholders should:

5.4.1 Develop and implement national or regional strategies for supply of quality aquaculture feed based on sustainable sourced ingredients, appropriate to the national production sectors.

5.4.2 Promote the development and use of sustainably sourced ingredients in feed formulations, striving to achieve affordable, safe and healthy feeds and encouraging an increase in feed performance and reduction in environmental impact.

5.4.3 Follow FAO technical guidance² in the use of wild fish and fish by-products as aquafeed to minimize negative impacts on livelihoods, food security and the environment and to ensure they come from sustainably managed fisheries, without compromising safety and quality of aquaculture products.

5.4.4 Support investment in research and innovation to identify alternative feed ingredients, including from local resources, with good nutritional value that optimize feed conversion rates while being environmentally and socially responsible. These may include insects, algae, single-cell proteins, agriculture by-products and fish/food processing wastes.

5.4.5 Promote feeding practices that avoid contamination by pathogens, parasites, heavy metals, antimicrobials (antibiotics, parasiticide, antifungal and antiviral medicines) and other substances potentially harmful to humans.

5.4.6 Engage with the feed industry to encourage the development and utilization of diversified and improved feeds that are precisely formulated and manufactured to meet the nutritional requirements of species and farmed types based on life cycle stage, genotype, environment and immune status, purpose

² FAO. 2011. Aquaculture development. 5. Use of wild fish as feed in aquaculture. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 5. Rome, FAO. www.fao.org/3/i1917e/i1917e.pdf

of culture (food/seed). Such feeds should maintain or enhance product quality and the human health benefits of farmed aquatic food.

5.4.7 Promote feeding strategies, feed-management practices and production systems that ensure precision-use of feeds and high conversion efficiency in aquaculture, in particular for small and medium-scale aquaculture, while contributing to reducing feed costs, feed waste and environmental pollution.

5.4.8 Develop systems to regulate the safe use of feed additives and support the development and use of natural feed ingredients or additives that reduce or replace the use of synthetic substances, recognizing that feed ingredients and formulations may be proprietary trade information.

5.4.9 Promote studies to assess the conflicting use of ingredients for aquatic feed and human nutrition, mapping possible interferences in food security/safety and recommend alternative solutions.

5.4.10 Encourage feed manufacturing waste reduction by optimizing production processes and practices and recycling of waste materials, and improving storage conditions of feeds and feed ingredients to safeguard quality and guarantee a longer shelf life, including the use of eco-friendly packaging using recyclable or biodegradable materials.

5.5 *Biosecurity and animal welfare*

Healthy and resilient aquatic organisms, produced through good farming practices, disease prevention and long-term biosecurity management, are fundamental to sustainable aquaculture. Protecting the health and welfare of aquatic organisms requires the adoption of regulations and standards on health of aquatic organisms and on antimicrobial use, at all steps in the production cycle.

The implementation of biosecurity protocol requires a national aquatic organism health strategy and associated action plans, enforced by enhanced national capacities with cost-effective management of the risks posed by infectious agents. Furthermore regulations and standards and their enforcement should be based on international instruments in order to meet technical requirements concerning biosecurity, health management and animal welfare (Annex 2).

States and relevant stakeholders should:

5.5.1 Develop and formalise national and regional strategies on aquatic organism health consistent with the four-stage Progressive Management Pathway to Aquaculture Biosecurity (PMP/AB). Such strategies should contain short-, medium- and long-term national and regional action plans based on related needs and priorities, with an emphasis on augmenting collaboration among aquaculture value chain players to support the implementation of the PMP/AB (Annex 2).

5.5.2 Enhance national capacities to prevent and mitigate health risks and promote biosecurity, including in risk analysis, disease prevention, integrated disease and pest management, preparedness and rapid response to abnormal mortality events in aquatic populations, and encourage measures to improve aquatic organism health and welfare through good husbandry and biosecurity.

5.5.3 Promote the close cooperation of States and aquaculture stakeholders in a transparent manner to meet international standards and control and manage transboundary diseases of aquatic organisms, through the rapid sharing of information on national disease status, new disease occurrences, and the spread of existing diseases.

5.5.4 Provide training for competent authorities and aquaculture workers on aquatic organisms' health and welfare management practices to ensure awareness of their roles and responsibilities in maintaining aquatic organism health and welfare and support and promote research and innovation.

5.5.5 Provide affordable and easy access to aquatic health support services (e.g. health monitoring, diagnostics, surveillance, disease outbreak investigation) and farm-level biosecurity practices to small-scale aquaculture producers through farmer field schools, regular information dissemination and communication on disease prevention, and practical on-farm demonstration.

5.5.6 Promote reduction in the use of antimicrobials, develop the technical capacity and infrastructure needed to establish national action plans on AMR and enforce appropriate regulations, critical to ensure minimal, prudent and responsible use of veterinary medicines, including antimicrobials. These regulations should also promote the exploring alternatives to the use of antimicrobials in aquaculture including the development and use of vaccines, immunostimulants, phage therapy and medicinal plants.

5.5.7 Encourage and support aquaculture producers to implement measures for prevention, early detection and control to reduce the sector's exposure to exotic, endemic and emerging pathogens and diseases and thereby reduce the need for veterinary medicines, notably antimicrobials. This should be done through the dissemination and implementation of good husbandry and biosecurity practices, vaccination, use of specific pathogen free (SPF), specific pathogen resistant (SPR) and high health (HH) seed and farmed types.

5.5.8. Initiate, support and provide platforms to develop and establish public and private sector partnerships to deal with health and biosecurity challenges affecting the aquaculture sector.

5.5.9 Promote credible certification schemes using the guidance of the FAO Technical Guidelines on Aquaculture Certification, particularly the pillar on animal health and welfare to enhance trust throughout the aquaculture value chain.

5.6 *Strategies to address climate change, natural disasters, pollution and pandemics.*

Climate resilient aquaculture and disaster risk reduction must be built on policies, strategies and plans developed in full and effective consultation with all aquaculture stakeholders, in accordance with the recommendations of the UNFCCC, the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction and the FAO Strategy on Climate Change. The main natural and climate hazards can be identified through risk and vulnerability assessment.

It is necessary to encourage the transition towards more climate resilient practices in aquaculture, notably for decarbonizing aquaculture to supply low-carbon and nutrition-sensitive diets. At the same time, climate mitigation potential of certain types of aquaculture, where proven, should be enhanced (e.g., carbon sequestration by algae or mollusc farming). The contribution of aquaculture, including extensive practices, to the protection and restoration of marine, coastal and inland ecosystems in response to climate change impacts such as sea level rise or floods, should also be promoted.

States should:

5.6.1 Develop and implement policies and strategies that ensure that the role of aquaculture in adaptation to and mitigation of climate change are addressed in international instruments such as the Nationally Determined Contributions (NDCs) and in National Adaptation Plans (NAPs).³

5.6.2 Recognize and proactively promote emerging opportunities for aquaculture arising from climate change due to the diversity of farmed types and culture systems available to the farmers.

5.6.3 Provide adaptation and mitigation strategies, and recovery and aid plans for aquaculture dependent communities affected by climate change and other disaster risks along with necessary assistance and support, in collaboration with the private sector and other partners.

5.6.4 Enhance national capacities for risk and vulnerabilities assessments, establish early warning systems and promote adoption of best practices and other relevant instruments.

³ United Nations. 2015. The Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf

5.6.5 Plan and coordinate effective emergency response and disaster recovery for aquaculture dependent communities, applying the concept of the relief-development continuum, covering the immediate relief phase, rehabilitation, reconstruction and recovery phases, including the concept of ‘building back better’ with long-term development objectives.

States and relevant stakeholders should:

5.6.6 Strengthen climate change and disaster preparedness that involves contingency plans, coordination arrangements, public information and training, including: applying risk analysis for aquaculture planning and management; assessing sector vulnerabilities; implementing risk reduction and adaptation strategies, investing in monitoring and early warning systems; maintaining reserves of feed and equipment; promoting technologies and systems that increase the adaptive capacity of aquaculture; and building institutional capacity and support related training and technical assistance to producers to support climate resilient aquaculture practices.

5.6.7 Use systematic analysis tools, especially Life Cycle Assessment (LCA) tools, to quantify the carbon footprint and analyse carbon emission “hotspots” in aquaculture production and value chains. This can help identify mitigation measures to further reduce the carbon emission intensity of aquaculture products and prevent the migration of carbon emissions along the aquaculture value chain.

5.6.8 Apply proven genetic improvement approaches, with a focus on selective breeding, to develop farmed types adapted to changing environmental conditions caused by climate change (e.g. to expand temperature and salinity tolerances).

5.6.9 Develop and adopt improved farming systems that have greater adaptive capacity, enhancing resilience of the sector in response to climate change.

5.6.10 Develop and adopt climate-proofing innovations, which may include GHG emissions reduction technology, renewable energy systems such as co-locating aquaculture with wind turbines or photovoltaic power generation, or using renewable energy for heating and cooling systems as well- as hydropower, and using gravity fed effluent systems.

6 SOCIAL RESPONSIBILITY, DECENT WORK AND GENDER EQUALITY

Enhancement of social responsibility, decent livelihoods, working conditions and gender equality are necessary for the development of a sustainable aquaculture sector that provides access to social protection, safe, healthy and fair working conditions, respecting labour rights, with mechanisms to prevent and halt forced labour, and with measures towards improving the standards of living. Acknowledgement by all parties of the critical role of women in aquaculture is necessary to promote women’s equal access to, control over and benefit from natural resources, assets, markets, infrastructures, information, financial services, training and entrepreneurship.

6.1 Social responsibility and decent work

Social acceptability is one the pillars of aquaculture sustainability. It refers to the degree to which aquaculture activities are accepted by the local communities, by various interest groups and by the wider society. Support by local communities, various interest groups and by the wider society is influenced by the perceived benefits that accrue to them. It requires that industry has an ethos of corporate social responsibility, which is the duty to support economic, environmental, cultural and social development to improve the quality of life of people, communities and society. This suggests that decent work in aquaculture is one of the necessary conditions for social acceptability of aquaculture ventures; it involves rights at work, employment, social protection and social dialogue.

States should:

6.1.1 Enact and enforce labour policies which are sound, inclusive and non-discriminatory, taking in consideration the interests of the different groups working in aquaculture, with a particular focus on

promoting and safeguarding the interests of women, youth, vulnerable and marginalized groups, people with disabilities, and future generations.

States and relevant stakeholders should:

6.1.2 Eliminate illegal practices such as forced labour, prevent debt-bondage, child labour, and unfair payment; and otherwise enable fish farmers, aquaculture workers and business stakeholders to earn a fair return from their labour, investment and skills.

6.1.3 Promote responsible social practices in the aquaculture value chains, including the respect of human and labour rights, decent work and equal-pay, freedom of association, collective bargaining social protection programmes and social dialogues.

6.1.4 Create conditions for men and women in aquaculture to work in an environment free from any sort of abuse, including but not limited to crime, forced labour, child labour, violence, organized crime activities, piracy, theft, sexual exploitation, corruption, and abuse of authority.

6.1.5 Support appropriate training of workers on good practices along the aquaculture value chain and harness the full potential of all technological progress and digitalization to create decent jobs and sustainable enterprises in the sector.

6.1.6 Create adequate working conditions, and safety and health at work, and access to universal, comprehensive, adequate and sustainable social protection, including the provision of accident, life and health insurance, and social insurance, regardless of the nature of their employment status or working arrangements in the formal or informal sector.

6.2 Youth empowerment

Young people can play a central role in aquaculture development. It is important to empower them to ensure that they play a leading role today and are active in shaping the future of aquaculture growth. Empowering them will require a tailored and multifaceted approach.

States should:

6.2.1 Develop national strategies and action plans targeting youth employment in aquaculture, establish aquaculture enterprise incubation programmes and infrastructure projects that hire and train young people and incentivize education institutions and private operators to do the same.

6.2.2 Incorporate aquaculture into educational curricula to offer students appropriate training and better prepare them for the job market in aquaculture.

6.2.3 Foster entrepreneurship in aquaculture and link entrepreneurship education and access to finance with the aim of making aquaculture attractive to youth.

6.2.4 Develop policies specific to disadvantaged young people such as equipping them with the practical, strategic and tactical tools they need to become financially self-sufficient through aquaculture.

States and other stakeholders should:

6.2.5 Create a network of operators and local institutions interested in building a governance system which promotes the development of new projects and which distinguishes opportunities for young people.

6.2.6 Promote quality apprenticeships, informal or formal, and on-the-job training programmes in aquaculture to improve young people's skills as well as providing entry-level job opportunities to ensure school-to-work transition.

6.2.7 Build partnerships to scale-up youth-targeted investments in aquaculture to create decent jobs for youth.

6.3 Gender equality and women's empowerment in aquaculture

Aquaculture activities are often gender imbalanced. Acknowledgement by all parties of the critical role of women in aquaculture is necessary to promote women's equal access to, control over and benefit from natural resources, assets, markets, infrastructures, information, financial services, training and entrepreneurship.

States should:

6.3.1 Develop and implement evidence-based policies and legislation that promote gender equity, youth in aquaculture and, as appropriate, revise, remove or repeal policies, legislation and measures that perpetuate the subjugation of women based on social, economic, historical or cultural aspects.

6.3.2 Develop gender-specific indicators and establish more efficient data collection systems, data collection infrastructures, produce homogeneous and consistent sex-disaggregated data to recognize women's contribution to the aquaculture sector development.

6.3.3 Mainstream gender equality in all aquaculture development strategies to secure women's equal voice and participation in decision-making processes, encouraging their participation in aquaculture organizations, and providing them with relevant organizational and leadership development support.

6.3.4 Adopt specific measures to address discrimination against women, while creating space for CSOs, women workers and their organizations, to participate in supporting and monitoring implementation.

States and relevant stakeholders should:

6.3.5 Promote women as agents of change by providing them opportunities to access decision-making and remunerative activities and redressing the gendered division of labour.

6.3.6 Encourage women and youth to participate in aquaculture organizations, and provide them with relevant organizational and leadership development support. Engage value chain stakeholders at individual, household and community level to tackle social norms that constrain women's empowerment and decision-making power.

6.3.7 Support the development of and work in cooperation with women's collectives and organizations to facilitate access to credit and savings for women entrepreneurs; remove barriers to markets, including regional and international markets; increase women's bargaining power within the value chain and voice in decision making processes; inform, promote and implement policies to eradicate gender-based violence.

6.3.8 Implement transformative actions for achieving gender equity and equality by facilitating the recruitment of more women in all areas of the aquaculture value chain and ensuring their equal access to extension and technical services, legal and financial support, considering specific constraints, needs and priorities

7 VALUE CHAINS, MARKET ACCESS AND TRADE

The sustainable development of aquaculture should always be associated with a competitive, efficient and inclusive value chain. A well performing value chain includes post-harvest, processing, logistics, cold chain, trade and quality control, etc., based on the local, external and international market needs.

To establish and improve the aquaculture value chain, planning, regular monitoring and analysis should be conducted and enabling decision-makers and aquaculture value chain (AVC) actors to develop informed policies, strategies and suitable market instruments which promote sustainable aquaculture and value addition.

The AVC performance and competitiveness can be improved through policy interventions, public investment, capacity building, fiscal and economic incentives and public-private partnerships (PPPs),

through a participatory approach with government institutions, professional organizations, private actors and other stakeholders.

Aquaculture development requires access to markets and market-based tools that can be used to improve the sustainability of aquaculture. Trade and market entry are facilitated by promoting Mutual Recognition Agreements (MRA), the adoption of voluntary standards, equivalence and transparency of standards and technical regulations, based on internationally agreed norms and on scientific evidence using the risk assessment methodology and recognized institutions.

7.1 Sustainable aquaculture value chains

A comprehensive aquaculture value chain covers production and its inputs and is dependent on the length of the chain from the water to the plate, technical classifications, and resources management issue.

A market driven approach helps to improve the effectiveness of the value chain, and good governance supports fair trade, transparent decision making, appropriate use of technology innovations and improves the quality and efficiency of the value chain.

States and relevant stakeholders should:

7.1.1 Provide effective regulatory and support mechanisms that create an enabling environment for the development of AVCs and ensures their long-term sustainability, including infrastructure, technology, standards and best practices.

7.1.2 Promote the integration of AVC actors and stakeholders, including inter-professional organisations, within the aquaculture business and policy environment to address access and entry barriers, the role and influence of the different AVC actors to facilitate equitable relationships and distribution of benefits and risks between AVC actors.

7.1.3 Promote AVC innovation and investment that increase consumer value, safety and nutritional benefits of aquaculture products, improve the efficiency of input use and reduce negative impacts along the entire AVC, including through research and development, species selection, products diversification, application of new technologies, and the wider adoption of market-based tools such as traceability, certification, eco-labelling, branding and digital applications.

7.1.4 Promote capacity building and access to relevant information and services in particular for small-scale aquaculture farmers and operators, women, youth, vulnerable and marginalised groups to help them adjust to changing conditions and benefit equitably from market opportunities, value addition, enhancing traceability and market competitiveness.

7.2 Transparent and predictable market requirements and international trade

An efficient aquaculture value chain relies on international tools and standards to safeguard aquaculture workers, as well as consumers. Adequate knowledge and understanding of the value chain among its key stakeholders should ensure and protect the aquatic food resource, and the benefits of all stakeholders including the traders and consumers. Full traceability and transparency and predictability of markets should guarantee the rights of the suppliers and producers along the value chain.

States and relevant stakeholders should:

7.2.1 Promote access of farmers to markets and information with higher efficiency, transparency and competitiveness taking into consideration the specific needs of small-scale aquaculture farmers.

7.2.2 Ensure that market entry rules, standards and technical regulations are consistent with the national regulations and international agreements, such as WTO Agreements, in particular the Sanitary

and Phytosanitary Measures (SPS) Agreement and the Technical Barriers to Trade (TBT) Agreement, and standards and technical regulations on protecting the environment, consumers, animal health and welfare and social rights of AVC workers (Annex 2).

7.2.3 Promote the harmonization of technical regulations and standards for aquaculture products with internationally recognized norms, such as the Codex Alimentarius Commission (CAC) for food safety and quality, FAO technical guidelines, the World Organisation for Animal Health (WOAH), the International Plant Protection Convention (IPPC) for aquatic plants, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the norms of other international organizations where applicable for biodiversity (Annex 2).

7.2.4 Promote the development of frameworks for the improvement and verification of the aquatic product quality, traceability, and e-commerce.

7.3 Reducing aquatic food loss and food waste.

Aquatic food is highly perishable and as such easily susceptible to spoilage, especially under hot climate. This ultimately leads to food loss and waste. It is therefore paramount that appropriate actions be taken in time along the value chain to prevent and reduce losses.

States and relevant stakeholders should:

7.3.1 Enhanced policies and interventions to regulate production, distribution and traceability through implement the Voluntary Code of Conduct for Food Loss and Waste Reduction⁴ and promote awareness raising, education and incentives in support of resilient and sustainable production, processing and consumption.

7.3.2 Promote the application of the circular economy approach to reuse and recycle waste, and assessment of the main causes of food losses and wastes to identify the best solutions.

7.3.3 Promote best practices to prevent food loss and waste along the AVC, in particular the improvement of post-harvest technology, cold-chain, processing and logistics.

7.3.4 Increase investment in aquaculture value chain infrastructure, especially logistic system, live transportation, cold chain system and markets and support the adoption of resource-efficient technologies.

7.3.5 Promote effective collaboration by sharing knowledge through “Food Loss and Waste in Fish Value Chains” tools and hubs (Annex 2).

C – IMPLEMENTATION AND MONITORING OF THE GUIDELINES FOR SUSTAINABLE AQUACULTURE

Arrangements for the implementation of the Guidelines should be in place for Members and related stakeholders, supported with national policy, regulation and investment. Efficient dissemination and implementation of the Guidelines require mobilization of financial and technical resources, a strong research and innovation approach, effective communication and strong capacity building to support local, national, regional and international initiatives, strategies and plans of action. Relevant initiatives should be implemented by FAO and other global, regional and national agencies in collaboration with technical and financial institutions, NGOs, CSOs and industry representatives.

⁴ FAO. 2022. Voluntary Code of Conduct for Food Loss and Waste Reduction. Rome.
<https://doi.org/10.4060/cb9433en>

There is also need for monitoring, regular evaluation and reporting on their relevance, effectiveness and outcomes, as well as relate the feedback to stakeholders.

FAO plays a role in providing technical support in data collection, assessment methodologies, and knowledge sharing for a better understanding and documentation of the true contribution to aquaculture sustainable development. FAO reporting mechanisms can facilitate wider experience sharing and dissemination of these outcomes.

8 MECHANISMS AND SERVICES REQUIRED TO SUPPORT SUSTAINABLE AQUACULTURE DEVELOPMENT

Sustainable development of aquaculture requires the provision of key services such as extension, training, laboratory analyses, communication and information on markets, practices and technology, funding and financing, research and innovations. Access to modern technological tools and digitalization can improve significantly productivity, practices and supply of inputs. The promotion of Public Private Partnerships and networking between institutions and industry organizations to develop national and regional research and training capacity in aquaculture can facilitate significantly transfer of experiences, technology, skills and knowhow, prevention of diseases and resilience to climate change and pandemics

8.1 *Funding and financing*

Sustainable aquaculture growth requires funding to, among other things, put in place an enabling governance environment, infrastructure, research and innovation systems, proper planning, human capital, including skills/know-how, and human capacity to support the function and growth of the sector. Funding for aquaculture development is not always readily available and necessarily involves different sources and mechanisms.

States should:

8.1.1 Facilitate and enhance comprehensive and adequate long-term public and private funding and investment in aquaculture to increase productivity and production in an environmentally and socially sustainable way, with significant impact on economic development, food security and poverty eradication.

8.1.2 Develop investment policies and strategies that attract investors and prompt financial institutions to fund the sector. The strategies should target infrastructure, new technologies, capacity development including training, research and innovation to fully unlock the potential of sustainable aquaculture and support food and nutrition security, poverty eradication, employment, ecosystems protection and restoration and biodiversity conservation, adaptation to and mitigation of the impacts of climate change. These strategies should build on successful experiences in aquaculture and in areas such as agriculture or fisheries.

8.1.3 Establish aquaculture funding and investment rules and processes that are transparent, verifiable, allowing for accountability of investors and other stakeholders, within a proper business, legal, and regulatory environment. These rules and processes should recognize the rights of access to land, water and natural resources, whether statutory or customary, owned by individuals or communities. They should also ensure that investors and other stakeholders respect the rule of law, reflect the industry best practices, and their investments are viable economically, and result in sustainably and equitably shared prosperity and values.

8.1.4 Explore and communicate to the public new opportunities for inclusive aquaculture financing. These opportunities may include agricultural investment funds, investment promotion, guarantee funds and provision of information and communications technology (ICT), blended financing and philanthropic funding, to increase the level of financing while lowering the risks to investors.

8.1.5 Provide financial investment support to farmers who are normally unable to access financing from financial institutions, and organize, facilitate and provide funds and loans that support implementation of Better Management Practices (BMPs).

States and relevant stakeholders should:

8.1.6 Promote domestic and foreign investment, funding and insurance schemes that offer significant potential and opportunities to complement national public resources and allow for a better access to capital, technology, skills and markets and to help farmers and other investors along the value chain mitigate risks and expand their activities.

8.1.7 Assess funding and investments in aquaculture for their social and environmental impacts and certify that they strengthen and not jeopardize food security through adverse effects on any of its aspects including availability, access, utilization or stability.

8.2 Research and innovation

Investing in research and innovation is essential for sustainable aquaculture. It enables the development of new technologies and practices that can improve the sector's economic, environmental, and social performance. Incorporating the knowledge and practices of indigenous peoples and family farmers is crucial to ensuring contextually appropriate development. By prioritizing research and innovation, stakeholders can address the challenges facing the sector, including improving efficiency, reducing environmental impacts, and ensuring long-term sustainability. It is essential to invest in these areas to ensure the continued growth and development of sustainable aquaculture.

States and relevant stakeholders should:

8.2.1 Invest in aquaculture research and innovation to improve its economic, environmental, and social performance throughout the value chain. This investment should prioritize sustainable development and aim for long-term improvements.

8.2.2 Develop and implement innovative technologies that can make aquaculture systems more precise, smart, and climate resilient. These technologies should be adapted to the local context and resources available.

8.2.3 Establish participatory and consultative processes to identify research and development priorities for aquaculture. This should target new technologies and innovations to unlock the full potential of aquaculture while recognizing the importance of traditional knowledge, culture, and practices, particularly of aquaculture-dependent communities. Public-private partnerships should be strengthened to improve efficiency, reduce the environmental footprint, enhance environmental services, and improve economic viability.

8.2.4 Strengthen partnerships by establishing and maintaining centers of excellence on aquaculture across the industry, academia, state and non-state actors. This will stimulate demand-led and relevant research and innovation. Public-private partnerships and investments should be encouraged to achieve this goal.

8.3 Communication

Effective communication is vital for enhancing positive public perception and building consensus among stakeholders on the direction of aquaculture development. The sector's credibility depends on its ability to communicate its current and potential role in sustainable development. Prioritizing communication efforts can increase awareness of the benefits and challenges of aquaculture development through various channels, including workshops and media campaigns. Engagement of all stakeholders, including local communities and indigenous peoples, will build consensus and ensure sustainable development of the aquaculture sector.

States and relevant stakeholders should:

8.3.1 Develop information sharing and communication tools accessible to all stakeholders and the general public to contest misinformation and enable informed decision-making.

8.3.2 Create innovative communication strategies that increase transparency, credibility, and social acceptability of the industry. These strategies should aim to inform and educate the public on the importance of aquaculture for sustainable development.

8.3.3 Promote participatory experience sharing, engagement of stakeholders, and reliable data collection, creation, dissemination, and use of knowledge to improve communication and collaboration between stakeholders.

8.3.4 Establish open and transparent aquaculture information systems and improve data collection and analysis, including sex-disaggregated data and statistics, to accurately report the progress and contribution of the sector to sustainable development objectives.

8.4 Capacity development

Effective capacity development of individuals and organizations is essential for addressing the specific needs of communities, and it should be carried out by local actors in accordance with national context and priorities. The development of capacity will prepare the future workforce for aquaculture development by developing competencies with strong technical aquaculture skills enhanced with and adapted to the new world of information technology and artificial intelligence. It must be anchored in national systems and local expertise to ensure its sustainability.

Collaborating with national, regional, and international partners is crucial for the success of capacity development efforts. Long-term participatory interventions are necessary for sustainable capacity development and may include diverse elements such as governance, extension, education, entrepreneurship, infrastructure, financing, logistics, safety and quality control. Partnerships and sustained efforts can build the capacity of individuals, organizations, and institutions to drive progress towards the collective goal of sustainable development.

States should:

8.4.1 Develop and implement national policy and strategy on capacity building in sustainable aquaculture, from an organizational or institutional perspective, to ensure that the necessary skills and knowledge are in place to drive sustainable development in the aquaculture sector.

8.4.2 Enhance capacity of aquaculture stakeholders at all levels, especially small-scale farmers, to enable their participation in decision-making processes and implementation of best practice.

8.4.3 Provide dedicated capacity development opportunities including formal and non-formal education, such as Farmer Field Schools, women's networks and similar mechanisms to enable women, youth, and vulnerable and marginalized groups to benefit equitably.

8.4.4 Support investment in capacity development, innovation and extension services, exchange of innovation and know-how, and provide and transfer demand-driven information, technologies, training and practices, solutions, and other innovations to farmers, using appropriate formats and local languages.

8.4.5 Implement capacity development programs and modernization, as appropriate, supporting innovative approaches, digital technologies, and education and extension activities, and concurrently invest in upstream and downstream business to unlock private funding and employment opportunities along the aquatic value chain.

8.4.6 Ensure that extension services equitably reach all stakeholders, including women, youth, small-scale producers, and vulnerable and marginalized groups, providing training on aquaculture socioeconomics, building skills, and entrepreneurship capacities to enhance their ability to avail

themselves of new opportunities and markets. By doing so, they will help to empower all stakeholders and promote inclusivity in the sector.

8.4.7 Promote interventions to improve access to credit such as improving financial literacy and management skills and facilitating improved access to finance from the formal banking sector and other credit organizations.

8.4.8 Encourage North-South and South-South and triangular cooperation mechanisms, promoting cooperation and collaboration in the sector, driving progress and fostering innovation.

9 IMPLEMENTATION ARRANGEMENT AND TECHNICAL SUPPORT

Effective implementation of the Guidelines requires action by both Member States and stakeholder agencies including FAO. It is also important that responsible authorities are identified and mechanisms are established to identify and implement key actions.

States should:

9.1 Establish a National Task Force for the implementation, monitoring, evaluation and reporting on the GSA to the relevant authority.

9.2 Identify implementation competent authorities and partners, including specialized agencies of the United Nations, and regional organizations to support their efforts to implement the Guidelines.

9.3 Enhance technical cooperation, financial assistance, institutional capacity development, knowledge sharing and exchange of experiences, assistance in developing national policies for sustainable aquaculture and transfer of know-how, innovation and technology, and international cooperation mechanism, such as South-South and Triangular Cooperation.

States and relevant stakeholders should:

9.4 Create awareness of these Guidelines by disseminating simplified and translated versions and related policy briefs and best practices.

9.5 Provide financial and technical support in implementing the Guidelines in accordance with national priorities and circumstances.

FAO should:

9.6 Encourage COFI and COFI:AQ to guide and support the development of donor funded initiatives to implement the Guidelines as a component of the FAO Blue Transformation roadmap and review its progress at its regular Sessions.

9.7 Support the development and implementation of local, national, regional and international strategies and plans of action to support the implementation of the Guidelines, in collaboration with technical and financial institutions, NGOs, CSOs and industry representatives.

10 MONITORING, DATA COLLECTING, DATA ANALYSING AND REPORTING

Monitoring and reporting of the status of sustainable aquaculture is critical to the implementation of this Guideline and to identify potential emerging problems. Monitoring should include data collection and analysis on aquaculture development, aquaculture performance and impact of aquaculture on the environment, economies, community and societies at national, regional and global levels. There is a need to establish mechanisms to monitor the implementation of the guideline, such as work plans, progress reviews, analytic tools and indicator development, application and reporting.

Regular monitoring and reporting processes relies on Members' support and participation. FAO may facilitate monitoring and reporting on the impact of the Guidelines upon the request of Members.

States and relevant stakeholders should:

10.1 Facilitate the formation of national-level platforms, with cross-sectoral representation, to oversee the implementation of the Guidelines, as appropriate.

10.2 Enhance the coordination of data collection to support decision-making on sustainable aquaculture management, monitoring and reporting, and feed back into policy formulation and implementation. Data disaggregation, for example by gender and for other specific data needs, can be instrumental in targeting interventions of aquaculture expansion to specific groups, leaving no one behind.

10.3 Build on these Guidelines to elaborate participatory assessment methodologies, including legitimate representatives of aquaculture farmers and dependent communities and stakeholders should be involved both in data collection, monitoring and reporting on the implementation of these Guidelines.

10.4 Support FAO in the establishment and monitoring of indicators of the development of sustainable aquaculture.

FAO should:

10.5 Support the updated data collection methodology, analysis framework, and mechanism of reporting, as well as feedback to Members;

10.6 Design, develop and implement, with Members' support, a robust indicator framework to monitor, evaluate and report the progress of aquaculture's contribution to sustainable development, and build accountability;

10.7 Include a GSA implementation monitoring report to COFI and its Sub-Committee on Aquaculture, effectively integrated into Members' progress reporting on implementation of aquaculture activities under the Code of Conduct of Responsible Fisheries, the COFI Declaration on Sustainable Fisheries and Aquaculture, and the Blue Transformation roadmap.

10.8 Support the knowledge sharing and capacity building in data collection, analysis and reporting, as well as indicator development.

ANNEX 1: DESCRIPTION OF KEY TERMS OF THE GSA

Aquaculture legal framework: for the purposes of these Guidelines, aquaculture legal frameworks refer to the framework of laws within which aquaculture takes place and applies to aquaculture or regulates matters or activities that impact on aquaculture planning, development, management and operations including aquaculture specific legislation and other laws such as land and water tenure legislation, spatial planning legislation, environmental legislation, animal and plant health and production legislation, food safety and quality legislation and biosafety legislation.

Aquaculture-specific law: for the purposes of these Guidelines, aquaculture-specific laws refer to laws including legislation which clearly express that they apply to or regulate aquaculture planning, development, management and operations.

Best/better management practices (BMPs): Management practices aimed at improving the quantity, safety and quality of products taking into consideration animal health and welfare, food safety, environmental and socioeconomical sustainability. BMP implementation is generally voluntary. The term “better” is preferred rather than “best” because aquaculture practices are continuously improving (today’s “best” is tomorrow’s “norm”).⁵

Climate-smart approaches in fisheries and aquaculture: address three key objectives, namely sustainable food systems, adaptation and mitigation. In particular, the first objective is connected to the overarching goal of achieving sustainable food systems, which encompasses the environmental, social and economic aspects of fisheries and aquaculture. The second objective focuses on the need for adaptation to climate change, including climate-induced extreme events and disasters, by reducing the sector’s vulnerability and increasing its resilience. The third objective is to enable the sector, where possible, to contribute to the mitigation of GHG emissions.⁶

Commercial/industrial aquafeed: an aquafeed comprised of a number of ingredients that are mixed in various proportions to complement one another to form a nutritionally complete compound diet. Such feeds are manufactured in industrial feed milling plants and are distributed and sold using conventional market chains. Commercial aquafeeds are commonly produced in different forms: compressed sinking pellet, extruded floating pellet or crumble, and extruded soft pellet.⁷

Culture-based fisheries: A fishery in which the use of aquaculture facilities is involved in the production of at least part of the life cycle of a conventionally fished resource. Aquaculture is usually the initial hatchery phase that produces larvae or juveniles for release into natural or modified habitats.⁸

Ecosystem Approach to Aquaculture (EAA): 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.⁹

Ecosystem services: the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life. Examples include the provision of clean water

⁵ FAO. 2011. Aquaculture development. 5. Use of wild fish as feed in aquaculture. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 5. Rome, FAO. www.fao.org/3/i1917e/i1917e.pdf

⁶ FAO. 2021. FAO’s work on climate change – Fisheries and aquaculture 2020. Rome. www.fao.org/3/cb3414en/cb3414en.pdf

⁷ FAO. 2011. Aquaculture development. 5. Use of wild fish as feed in aquaculture. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 5. Rome, FAO. www.fao.org/3/i1917e/i1917e.pdf

⁸ Responsible stocking and enhancement of inland waters in Asia, FAO, 2015 (<https://www.fao.org/3/i5303e/i5303e.pdf>). No. 5. Rome, FAO. www.fao.org/3/w4493E/w4493e03.htm

⁹ FAO. 2010. Aquaculture development. 4. Ecosystem approach to aquaculture. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 4. Rome. www.fao.org/3/i1750e/i1750e.pdf

and food (fishery resources), maintenance of liveable climates (carbon sequestration), pollination of crops and native vegetation, and fulfilment of people's cultural, spiritual, and intellectual needs.¹⁰

Environmental Carrying Capacity: refers to the magnitude of aquaculture production that can be supported without changes in ecological processes, species richness and populations and communities. It is assessed against variables including inputs of aquaculture wastes, deterioration of habitats, eutrophication, biodiversity and escapes and their environmental interactions.

Environmental impact assessment (EIA): is the evaluation of the possible impacts to the environment of any proposed project or development plan. EIA considers into the evaluation both the beneficial and adverse effects to inter-related socioeconomic, cultural and human-health impacts.¹¹

Farmed Type: Farmed aquatic organisms that could be a strain, hybrid, triploid, monosex group, other genetically altered form, variety or wild type.¹²

Feed(s): edible materials(s) that are consumed by animals and contribute energy and/or nutrients to their diet.¹³

Feed additives: chemicals, other than nutrients, that are required by the fish and that are approved for addition to their feed. Also defined as an ingredient or combination of ingredients added to the basic feed mix or parts thereof to fulfil a specific need. Usually used in micro quantities and requiring careful handling and mixing.¹⁴

Gender: refers not to male and female, but to masculine and feminine- that is, to qualities or characteristics that society ascribes to each sex. People are born female or male, but learn to correspond to those societal expectations. Perceptions of gender are deeply rooted, vary widely both within and between cultures, and change over time. But in all cultures, gender determines power and resources for females and males.¹⁵

Gender equality: is when women and men enjoy equal rights, opportunities and entitlements in civil and political life, in terms of access, control, participation and treatment.¹⁶

¹⁰ FAO. 2009. Fisheries management. 2. The ecosystem approach to fisheries. 2.2 Human dimensions of the ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries. No. 4, Suppl. 2, Add. 2. Rome, FAO. www.fao.org/3/i1146e/i1146e.pdf

¹¹ FAO. 2021. Ecosystem Approach to Aquaculture Management: Handbook. Yangon, Myanmar. www.fao.org/3/ca7972en/ca7972en.pdf

¹² FAO. 2019. The State of the World's Aquatic Genetic Resources for Food and Agriculture. FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. 291 pp. www.fao.org/3/ca5256en/ca5256en.pdf

¹³ FAO. 2011. Aquaculture development. 5. Use of wild fish as feed in aquaculture. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 5. Rome, FAO. www.fao.org/3/i1917e/i1917e.pdf

¹⁴ FAO. 2011. Aquaculture development. 5. Use of wild fish as feed in aquaculture. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 5. Rome, FAO. www.fao.org/3/i1917e/i1917e.pdf

¹⁵ FAO. 2017. Towards gender-equitable small-scale fisheries governance and development – A handbook. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, by Nilanjana Biswas. Rome, Italy. www.fao.org/3/i7419en/i7419EN.pdf

¹⁶ FAO. 2017. Towards gender-equitable small-scale fisheries governance and development – A handbook. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, by Nilanjana Biswas. Rome, Italy. www.fao.org/3/i7419en/i7419EN.pdf

Gender equity: means fairness and impartiality in the treatment of women and men in terms of rights, benefits, obligations and opportunities. At times, special treatment/affirmative action/positive discrimination is required.¹⁷

Gender mainstreaming: is the process of assessing the implications for women and men of any planned action, including legislation, policies or programmes, in all areas and at all levels. It is a strategy for making women's and men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres, so that women and men benefit equally and inequality is not perpetuated. The ultimate goal is to achieve gender equality and equity.¹⁸

Integrated agriculture-aquaculture system: is the concurrent or sequential linkage between agriculture and aquaculture occurring on-site, or indirectly through off-site needs and opportunities, or both. Benefits of integration are synergistic rather than additive; and different components of the system may benefit to varying degrees.¹⁹ Integrated agriculture aquaculture has also been described as semi-intensive aquaculture systems in synergy with agriculture (including animal husbandry).²⁰

Landscape/Seascape Approach: is a holistic, collaborative, and tangible solutions to biodiversity conservation and sustainability challenges. Landscape/seascape approach includes measures to protect and add value to the biological and cultural diversity of whole territories and seascapes; Landscapes and seascapes approaches are effective for biodiversity conservation and sustainable use.²¹

Stakeholders: Any individual, group or organization who has an interest in (or a “stake”), or who can affect or is affected, positively or negatively, by a process or management decision.²²

Social carrying capacity: refers to the amount of aquaculture that can be developed without adverse social impacts, including what is acceptable in the community. It is assessed against variables including conflicts over use of water and land, employment, livelihoods, acceptability by communities, value to communities and practices.²³

Veterinary medicines: any substance or combination of substances presented for treating or preventing disease in animals or which may be administered to animals to restore health, and correct or modify physiological functions in animals.²⁴

¹⁷ FAO. 2017. Towards gender-equitable small-scale fisheries governance and development – A handbook. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, by Nilanjana Biswas. Rome, Italy. www.fao.org/3/i7419en/I7419EN.pdf

¹⁸ FAO. 2017. Towards gender-equitable small-scale fisheries governance and development – A handbook. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, by Nilanjana Biswas. Rome, Italy. www.fao.org/3/i7419en/I7419EN.pdf

¹⁹ Adapted from FAO. 2003. Integrated livestock-fish farming systems, by D.C. Little and P. Edwards. Food and Agriculture Organization of the United Nations. Rome, Italy.

²⁰ FAO/ICLARM/IIRR. 2001. Integrated agriculture-aquaculture: a primer. FAO Fisheries Technical Paper. No. 407. Rome, FAO. www.fao.org/3/Y1187E/Y1187E00.htm

²¹ www.iucn.nl/en/our-work/landscape-approach/

²² FAO. 2021. Ecosystem Approach to Aquaculture Management: Handbook. Yangon, Myanmar. <https://doi.org/10.4060/ca7972en>

²³ FAO. 2010. Aquaculture development. 4. Ecosystem approach to aquaculture. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 4. Rome, FAO. www.fao.org/3/i1750e/i1750e.pdf

²⁴ FAO. 2019. Aquaculture development. 8. Recommendations for prudent and responsible use of veterinary medicines in aquaculture. FAO Technical Guidelines for Responsible Fisheries. No. 5. Suppl. 8. Rome. www.fao.org/3/ca7029en/ca7029en.pdf

ANNEX 2: LIST OF KEY REFERENCE DOCUMENTS AND WEBSITES (FAO AND NON-FAO)

FAO publications and action plans	Related GSA Sections
FAO. 2011. <i>Technical Guidelines on Aquaculture Certification</i> . Rome. www.fao.org/3/i2296t/i2296t.pdf	Sections 5.5 and 7.1
FAO. 2014. <i>Developing sustainable food value chains, Guiding principles</i> . Rome. www.fao.org/3/i3953e/i3953e.pdf	Section 7.1
FAO. 2015. <i>Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication</i> . Rome. www.fao.org/3/i4356en/i4356en.pdf	Preface
FAO. 2016. <i>Developing gender-sensitive value chains – A guiding framework</i> . Rome, FAO. www.fao.org/3/i6462e/i6462e.pdf	Section 7.1
FAO. 2016. <i>The FAO Action Plan on Antimicrobial Resistance 2016-2020, Supporting the food and agriculture sectors in implementing the Global Action Plan on Antimicrobial Resistance to minimize the impact of antimicrobial resistance</i> . www.fao.org/3/i5996e/i5996e.pdf	Section 5.5
FAO. 2021. <i>2021 COFI Declaration for Sustainable Fisheries and Aquaculture</i> . Rome. https://doi.org/10.4060/cb3767en	Section 10
FAO. 2021. <i>The FAO Action Plan on Antimicrobial Resistance 2021–2025</i> . Rome. https://doi.org/10.4060/cb5545en	Section 5.5
FAO. 2022. <i>Blue Transformation Roadmap 2022–2030: A vision for FAO's work on aquatic food systems</i> . Rome. https://doi.org/10.4060/cc0459en	Preface and sections 9 and 10
FAO. 2022. <i>FAO Science and Innovation Strategy</i> . Rome. www.fao.org/3/cc2273en/cc2273en.pdf	Preface
FAO. 2022. <i>FAO Strategy on Climate Change 2022–2031</i> . Rome. www.fao.org/3/cc2274en/cc2274en.pdf	Section 5.6
FAO. 2022. <i>Global Plan of Action for the Conservation, Sustainable Use and Development of Aquatic Genetic Resources for Food and Agriculture</i> . Commission on Genetic Resources for Food and Agriculture. Rome. http://doi.org/10.4060/cb9905en	Sections 5.3
FAO. 2022. <i>Implementing the Small-Scale Fisheries Guidelines for gender-equitable and climate-resilient food systems and livelihoods</i> , 6–9 June 2022, Accra, Ghana. FAO Fisheries and Aquaculture Proceedings No. 69. Rome. www.fao.org/documents/card/en/c/CC3264EN/	Preface
FAO. 2022. <i>Strategic Framework 2022–2031</i> . www.fao.org/3/cb7099en/cb7099en.pdf	Preface
FAO. 2022. <i>Voluntary Code of Conduct for Food Loss and Waste Reduction</i> . Rome. https://doi.org/10.4060/cb9433en	Section 7.3
FAO. <i>Food Loss and Waste in Fish Value Chains</i> , https://www.fao.org/flw-in-fish-value-chains/en/	Section 7.3.5
FAO. 2022. <i>Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security</i> . First revision. Rome. https://doi.org/10.4060/i2801e	Preface
Walker, C., DeMatteis, L. & Lienert, A., eds. 2021. <i>Selecting value chains for sustainable food value chain development – Guidelines</i> . Rome, FAO. https://doi.org/10.4060/cb7623en	Section 7

FAO Technical Guidelines for Responsible Fisheries	Related GSA Sections
FAO. 1995. <i>Code of Conduct for Responsible Fisheries</i> . Rome. www.fao.org/3/v9878e/v9878e00.htm	Preface and Sections 1, 3, 4.1 and 10
FAO. Fisheries Department. 1998. Responsible fish utilization. <i>FAO Technical Guidelines for Responsible Fisheries. No. 7</i> . Rome, FAO. www.fao.org/3/w9634e/w9634e.pdf	Section 7
FAO. 2001. Aquaculture development. 1. Good aquaculture feed manufacturing practice. <i>FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 1</i> . Rome, FAO. www.fao.org/fishery/en/publication/64879	Section 5.4
FAO. 2005. Increasing the contribution of small-scale fisheries to poverty alleviation and food security. <i>FAO Technical Guidelines for Responsible Fisheries. No. 10</i> . Rome, FAO. www.fao.org/3/a0237e/A0237E00.htm	Preface
FAO. 2007. Aquaculture development. 2. Health management for responsible movement of live aquatic animals. <i>FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 2</i> . Rome, FAO. www.fao.org/3/a1108e/a1108e.pdf	Section 5.5
FAO. 2008. Aquaculture development. 5. Genetic resource management. <i>FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 3</i> . Rome, FAO. https://www.fao.org/3/i0283e/i0283e.pdf	Section 5.3
FAO. 2008. Inland fisheries 1. Rehabilitation of inland waters for fisheries. <i>FAO Technical Guidelines for Responsible Fisheries. No. 6, Suppl. 1</i> . Rome, FAO. www.fao.org/3/i0182e/i0182e.pdf	Preface
FAO. 2009. Information and knowledge sharing. <i>FAO Fisheries Technical Guidelines for Responsible Fisheries. No. 12</i> . Rome, FAO. www.fao.org/3/i0587e/i0587e.pdf	Section 10
FAO. 2009. Responsible fish trade. <i>FAO Technical Guidelines for Responsible Fisheries. No. 11</i> . Rome, FAO. www.fao.org/3/i0590e/i0590e.pdf	Section 7.2
FAO. 2010. Aquaculture development. 4. Ecosystem approach to aquaculture. <i>FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 4</i> . Rome, FAO. www.fao.org/3/i1750e/i1750e.pdf	Sections 3 and 5.2
FAO. 2011. Aquaculture development. 5. Use of wild fish as feed in aquaculture. <i>FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 5</i> . Rome, FAO. www.fao.org/3/i1917e/i1917e.pdf	Section 5.4
FAO. 2011. Aquaculture development. 6. Use of wild fishery resources for capture based aquaculture. <i>FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 6</i> . Rome, FAO. www.fao.org/3/BA0059E/ba0059e.pdf	Section 5.3
FAO. 2017. Aquaculture development. 7. Aquaculture governance and sector development. <i>FAO Technical Guidelines for Responsible Fisheries. No.5. Suppl. 7</i> . Rome, FAO. www.fao.org/3/i7797e/i7797e.pdf	Section 4
FAO. 2018. Aquaculture Development 9. Development of aquatic genetic resources: A framework of essential criteria. <i>FAO Technical Guidelines for Responsible Fisheries. No.5. Suppl. 9</i> . Rome, FAO. www.fao.org/3/ca2296en/ca2296en.pdf	Sections 5.3
FAO. 2019. Aquaculture development. 8. Recommendations for prudent and responsible use of veterinary medicines in aquaculture. <i>FAO Technical</i>	Section 5.5

<i>Guidelines for Responsible Fisheries. No. 5. Suppl. 8.</i> Rome, FAO. www.fao.org/3/ca7029en/ca7029en.pdf	
FAO. 2022. Understanding and implementing catch documentation schemes – A guide for national authorities. <i>FAO Technical Guidelines for Responsible Fisheries No. 14.</i> Rome, FAO. https://doi.org/10.4060/cb8243en	Preface

Agreements and online tools of other UN Organizations	Related GSA Sections
CBD. 2011. 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: Text and Annex. https://wedocs.unep.org/20.500.11822/27555	Section 5.3
CBD. 2022. The Kunming-Montreal Global Biodiversity Framework. https://www.cbd.int/doc/c/e6d3/cd1d/daf663719a03902a9b116c34/cop-15-1-25-en.pdf	Section 5.3
United Nations. 1948. <i>Universal Declaration of Human Rights (UDHR)</i> . www.un.org/sites/un2.un.org/files/2021/03/udhr.pdf	Section 3
United Nations. 2015. <i>2030 Agenda for Sustainable Development</i> . https://sdgs.un.org/2030agenda	Preface and section 3
United Nations. 2015. <i>Sendai Framework for Disaster Risk Reduction 2015-2030</i> . www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030	Section 5.6
United Nations. 2015. <i>The Paris Agreement</i> . https://unfccc.int/sites/default/files/english_paris_agreement.pdf	Section 5.6
United Nations Entity for Gender Equality and the Empowerment of Women (UN Women). 2015. <i>The Beijing Declaration and Platform for Action (BPfA)</i> . https://www.unwomen.org/en/digital-library/publications/2015/01/beijing-declaration	Preface and section 6.3
UN Women. 2016 Convention for the Elimination of all Forms of Discrimination Against Women (CEDAW). www.unwomen.org/sites/default/files/Headquarters/Attachments/Sections/Library/Publications/2016/CEDAW-for-Youth.pdf	Section 6.3
WOAH (The World Organisation of Animal Health). 2022. <i>Manual of Diagnostic Tests for Aquatic Animals</i> . www.woah.org/en/what-we-do/standards/codes-and-manuals/aquatic-manual-online-access/	Section 7.2
WOAH. 2022. <i>The Aquatic Animal Health Code</i> . www.woah.org/en/what-we-do/standards/codes-and-manuals/aquatic-code-online-access/	Section 7.2
WTO (World Trade Organization). 1998. <i>The World Trade Organization's Sanitary and Phytosanitary Agreement (SPS Agreement)</i> . www.wto.org/english/tratop_e/sps_e/spsagr_e.htm	Section 7.2
WTO. <i>The Technical Barriers to Trade (TBT) Agreement</i> . www.wto.org/english/tratop_e/tbt_e/tbt_e.htm	Section 7.2