Food and Agriculture Organization of the United Nations

DRAFT GUIDELINES FOR SUSTAINABLE AQUACULTURE (GSA)*

***Preliminary copy**

Guidance for providing written inputs

Please provide your written inputs on this document (*Draft GSA for Written Inputs.pdf*) as follows:

- To provide your inputs (comments, suggestions, etc.) proceed section by section and use the "comment function" to write them next to the section you want to input in. For example, if you want to input in Section 6.1 Governance, Paragraph 6.1.1, then place your inputs (comments, suggestions, etc.) directly next to Paragraph 6.1.1.

Table of contents

FOREWORD

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

ABBREVIATIONS AND ACRONYMS

AMA	aquaculture management area
AqGR	aquatic genetic resources for food and agriculture
AquaGRIS	aquatic genetic resources information system
ASD	2030 Agenda for Sustainable Development
AVC	aquaculture value chain
BMP	better management practice
CAC	Codex Alimentarius Commission
CBD	Convention on Biological Diversity
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COFI:AQ	Sub-Committee on Aquaculture of the FAO Committee on Fisheries
COP	Conference of the Parties
CSO	civil society organization
EAA	ecosystem approach to aquaculture
FAO	Food and Agriculture Organization of the United Nations
GSA	Guidelines for Sustainable Aquaculture
IAS	invasive alien species
ICZM	Integrated Coastal Zone Management
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NGO	non-governmental organization
NTMs	non-tariff measures
PPA	Programme Priority Area
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
VNR	Voluntary National Review
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organization

PREFACE

The Guidelines for Sustainable Aquaculture (GSA) have been developed with the aim to support the implementation of the overall principles and provisions of the 1995 Code of Conduct for Responsible Fisheries (the Code) of the Food and Agriculture Organization of the United Nations (FAO), the FAO Programme Priority Area (PPA) Blue Transformation and the achievement of the2030 Agenda for Sustainable Development (ASD). As such, theGuidelines can 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 socio-economic development for the benefit of current and future generations, in full respect of the environment.

Aquaculture is a millennia-old activity that has expanded slowly for centuries, integrated with its natural,social, economic, and cultural environments. During the recent decades, aquaculture experienced rapid expansion and major developments fuelled by scientific progress, technological innovations, and investment, amid a consistent and fast-growing global demand for aquatic food.

However, these developments have also caused undesirable social and environmental impacts in severalparts of the world, often leading to social 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, they have raised concerns regarding habitat destruction (for example of mangroves) and modification; the use of harmful chemicals and veterinary drugs; the impact of escapees on wild fish stocks; and negative social and cultural impacts on aquaculture dependent communities and workers.

The need to develop and promote sustainable aquaculture practices emerged already in the 1990s and has since gained strong momentum. In 1995, FAO adopted the Code, the reference framework for national, regional, and international efforts to ensure sustainable production and harvesting of living aquatic resources in harmony with the environment, taking into account all their relevant biological, technological, economic, social, environmental and commercial aspects.

Several other international instruments of relevance to sustainable aquaculture have been developed concurrently to the Code. They address biological diversity, environmental protection, climate change, aquatic food safety, biosecurity, social responsibility and international trade. Building on previous achievements and initiatives, the 2030 ASD has identified 17 SDGs and 169 targets, covering a comprehensive set of issues on technical, institutional and policy changes needed to achieve sustainable development. Food and nutrition security, poverty alleviation, and sustainable management and use of natural resources are highly featured across theSDGs, making FAO a key organization in their achievement.

The FAO 2022–2030 strategy supports the transformation to more efficient, inclusive, resilient and sustainable agri-food systems for achieving better production, better nutrition, better environment and better life and leavingno one behind. The four betters represent an organizing principle 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. This FAO strategy is built around 20 PPAs addressing the various food and agriculture sectors and representing important building blocks to support FAO work and the ASD, including Blue Transformation (BT), the PPA for fisheries and aquaculture.

Blue Transformation is a targeted effort by which agencies, countries and dependent 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. It builds on existing successes while providing a framework to overcome sustainability challenges. The three global objectives of BT are: (i) sustainable aquaculture intensification and expansion satisfies global demand for aquatic food and distributes 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 Ninth Session of the Sub-Committee on Aquaculture of the FAO Committee on Fisheries (COFI:AQ) called for the identification of successful initiatives in support of sustainable aquaculture and their documentation and compilation into Guidelines for Sustainable Aquaculture. The aim is to help countries improve implementation of the Code, while engaging and enabling their aquaculture sector to participate effectively in the implementation of the 2030 Agenda and building collectively the future of a sustainable aquaculture sector. Since then, FAO has engaged its Members and partners through wide consultative processes, to share policy and scientific developments and technological innovations, and the lessons learned in different regions,countries, and contexts. In parallel, existing national, regional and international guidelines and experiences were reviewed during expert and regional consultations, to identify the gaps that need to be filled, the updates to be undertaken,as well as the specific constraints, needs and expectations of Members.

The participatory and consultative process used to develop these Guidelines has involved representatives of farmers, civil society organizations (CSOs), governments, regional organizations, academia andother stakeholders. These 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 at national, regional and global levels.

These Guidelines are enshrined in recent developments impacting the contribution of aquaculture to the FAO 2022-2030 strategy, in particular the PPA Blue Transformation and other strategies and actions relevant to aquaculture development. At the request of FAO members, the Guidelines aim to provide a clear vision of what aquaculture needs to become in the coming years, describe the pathways that the sector should take and identify the concrete actions to implement in order to achieve that vision, building on previous undertakings by FAO and its partners and on the more recent research and innovation relevant for the development of aquaculture in a way that best contributes to the achievement of the SDGs.

A – VISION, SCOPE AND GUIDING PRINCIPLES

1. Vision and Objectives

1.1 The Guidelines for Sustainable Aquaculture aim to provide a vision whereby aquaculture contributes significantly to free the world of hunger and to equitably improve the living standards of all actors in the aquaculture value chain, especially the poorest, in an economically, socially and environmentally sustainable manner.

1.2 The objectives of the Guidelines for Sustainable Aquaculture are:

a) to enhance the contribution of aquaculture to global food security, nutrition and poverty eradication as well as to ecosystems resiliency and societal wellbeing;

b) to improve the socio-economic situation of communities depending on aquaculture for their income and livelihoods through decent work and economic growth;

c) to achieve the sustainable use, responsible management, and conservation of living aquatic resources consistent with the Code and other international instruments relevant to aquaculture;

d) to provide normative guidance for consideration by Members and stakeholders for the development and implementation of public policies, strategies, and legal and institutional frameworks for the enhancement of sustainable aquaculture.

2. Nature and scope

2.1 These Guidelines are voluntary. They are global in scope and should be adapted to apply to aquaculture in its varied contexts.

2.2 These Guidelines are relevant to aquaculture in marine, inland and brackish waters. They concern women and men, working in the full range of activities along the entire aquaculture value chain, including pre-farming, grow out and post-harvest activities. The important linkages between aquacultureand other sectors such as fisheries, agriculture, forestry, coastal and marine tourism, mining and transportation are recognized, but these Guidelines principally focus on the aquaculture sector.

2.3 These Guidelines are addressed to FAO Members and non-Members, at all levels of the country, aswell as to subregional, regional, international, and intergovernmental organizations (IGOs) and aquaculture actors (farmers, workers, their communities, traditional and customary authorities), and related professional organizations and CSOs. They are also aimed at research and academic institutions, the private sector, non-governmental organizations (NGOs) and all other entities concerned with the aquaculture sector, coastal and rural development and the use of the aquatic environment, including in urban and peri-urban zones.

2.4 These Guidelines recognize the great diversity of aquaculture systems, operation scales (from subsistence to commercial farms and from small-scale family operated farms to large-scale corporate operations) and farmed species. To ensure transparency and accountability in the application of the Guidelines, it is important to ascertain meaningful and substantive participatory and consultative processes so that the voices of men, women, youth, and vulnerable and marginalized groups are considered. All parties should support and participate in such processes, as appropriate, in the form of co- management.

2.5 These Guidelines should be interpreted and applied in accordance with national legal systems and their institutions.

3. Guiding principles

3.1 These Guidelines are based on principles, standards and practices of sustainable development according to the ASD and its relevant SDGs, the Code and other instruments with relevant bearing on sustainable aquaculture development:

a) Sustainability: Economic, social and environmental sustainability whereby policies, strategies, plans, initiatives, projects and actions based on the GSA are socially, economically and environmentally sound, reflect local, national or regional realities, and balance socioeconomic and environmental outcomes by pursuing economic performance and ensuring societal wellbeing and environmental protection, including by being climate-smart.

b) Rule of law: adopting a rules-based approach for a sustainable aquaculture sector through laws and regulations that are widely accessible, applicable to all, equally enforced and independently adjudicated, and that are consistent with existing obligations under national, regional and international agreement/law, and with due regard to voluntary commitments under applicable regional and international instruments.

c) 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, including indigenous peoples and ethnic minorities, encouraging the role of women in leadership.

d) Equity and equality: promoting justice and fair treatment – both legally and in practice – of all peoples, including gender equity and equality of rights and opportunities. Women's vital role in aquaculture should be recognized and, At the same time, differences between women and men should be acknowledged and specific measures taken to accelerate equality and equity, i.e. using affirmative action or preferential treatment where required, to achieve equitable outcomes, particularly for vulnerable and marginalized groups, including women, youth and the people with disabilities.

e) Consultation and participation: ensuring active, free, effective, meaningful, and informed participation of all aquaculture stakeholders and considering existing power imbalances between different individuals and groups. This should include feedback and support from those who could be affected by decisions prior to these being taken and responding to their contributions.

f) Transparency and accountability: clearly defining, widely publicizing, and making accessible policies, laws, regulations, enforcement and procedures, and widely publicizing decisions in applicable languages and in formats accessible to all. holding individuals, public institutions, and non-state actors responsible for their actions and decisions according to the principles of the rule of law.

g) Holistic and integrated approaches: recognizing the ecosystem approach to aquaculture (EAA) as an important guiding principle to develop policies and strategies that balance economic, social, and environmental objectives, embracing the notions of comprehensiveness and sustainability, and ensuring cross-sectoral coordination as aquaculture operations are closely linked to and dependent on many other sectors that use the coastal and aquatic environment.

4. Sustainable aquaculture and the Sustainable Development Goals

4.1 These GSA aim to support the achievement of the ASD, which calls on countries to declare their priorities and commitments, to formulate strategies and adopt policies, programmes and partnerships toachieve their national goals and associated targets. In this regard:

a) The development of a sustainable aquaculture sector has significant linkages and bearing for most SDG of the 2030 Agenda. The SDGs of high bearing are: SDG1 (end poverty in all its forms everywhere); SDG2 (end hunger, achieve food security and improved nutrition and promote sustainable agriculture); SDG5 (achieve gender equality and empower all women and girls); SDG8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all); SDG12 (ensure sustainable consumption and production patterns); SDG13 (take urgent action to combat climate change and its impacts); SDG14 (Conserve and sustainably use the oceans, seas and marine genetic resources for sustainable development); SDG15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt biodiversity loss, halt and reverse land degradation; and SDG17 (Strengthen the means of implementation and revitalize the global partnership for sustainable development).

b) Planning, implementing, and reporting on SDGs should be country led and country driven, and emphasis at the national or local levels can change according to contexts, circumstances, conditions, and national priorities. As a result, certain SDGs and targets in given situations will weigh more than others in terms of importance and impact on sustainable development.

c) Relevant SDGs and associated targets offer significant opportunities for raising the profile of sustainable aquaculture development. Similarly, sustainable aquaculture when developed appropriately, can contribute significantly to the achievement of many SDGs and their targets.

d) Members are encouraged to align their aquaculture development policies and strategies to the relevant SDGs and their targets, ensuring regular mapping and update, monitoring, reporting and analysis of progress.

5. Relationship with other international instruments

5.1 These Guidelines should be interpreted and applied in a voluntary, responsible and consistent mannerwith existing rights and obligations under national and international law and 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 development. The Guidelines were developed to complement the Code and to support the ASD, the BT and sustainable use of living aquatic resources in accordance with the Code and other related instruments.

5.2 Nothing in the Guidelines should be read as limiting or undermining any rights or obligations to which a Member may be subject under international law. These Guidelines may be used to guide amendments and inspire new or supplementary policy, legislative and regulatory provisions.

B- PATHWAYS FOR SUSTAINABLE AQUACULTURE DEVELOPMENT

These Guidelines consider four pathways as pillars for sustainable aquaculture development. They include: (i) governance and planning for aquaculture development; (ii) sustainable resources management; (iii) social responsibility and gender equality; and (iv) value chains, market access and trade.

6. Pathway 1: Governance and planning for aquaculture development

Although aquaculture is a millennia-old activity, its development into a structured food production system and commercial activity is recent. Whereas successful national aquaculture governance frameworks exist and are well documented, there are still many nations with weak and/ or non-enforceable governance mechanisms, which renders the latter ineffective. Aquaculture governance is still often considered under the governance framework of other sectors such fisheries, agriculture, water and forestry, trade, or environment, with fragmented policy and regulations and multiple institutional actors.

These Guidelines recognize the increasing need for the governance of the sector in a holistic manner to address its specificities and the complexities of the life cycles and requirements of living aquatic organisms, the diversity of aquaculture in relation to: (i) systems, (ii) sites, (iii) practices and ecosystem services.

6.1 Governance

6.1.1 Aquaculture governance is the set of processes by which a jurisdiction manages its resources, how aquaculture stakeholders participate in making and implementing decisions,how decision-makers are held accountable to aquaculture stakeholders and how the rule of law is appliedand enforced.

6.1.2 The development of a sustainable aquaculture sector in a holistic manner requires the development of national aquaculture governance frameworks bringing coherence within the various legal framework and institutional arrangements and providing a predictable and transparent environment for investment in aquaculture.

6.1.3 Governance frameworks should facilitate the development and 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.

6.1.4 Aquaculture governance should reconcile the multiple and sometimes competing objectivesof aquaculture development to ensure optimum utilization of resources, equitable distribution of the costs and benefits, long-term visibility and transparency, consistency, and fairness in decision-making and enforcement.

6.1.5 The development of an aquaculture governance framework should be guided by the followingprinciples:

a) Cost effectiveness and efficiency: the Governance framework should enable effective enforcement of rules and regulations, efficient delivery of essential services and tools to use natural resources and mitigate risks in the most cost-effective way, promote best aquaculture practices, provide incentives, and support market instruments promoting sustainability. The Governance framework should promote evidence-based and fair rules and regulations, avoid duplication and unnecessary multiple administrative layers, at local and national levels, and support participatory and transparent decision-making processes.

b) Equity: the Governance framework should take into consideration and balance interests of the different groups, without any type of discrimination, with a particular focus on women and youth, persons with disabilities and marginalized groups, as well as safeguard the interest of future generations. The Governance framework should promote participatory approaches, consensus building, and transparent and equitable institutional responsiveness to the stakeholders.

c) Accountability: The Governance framework should hold public institutions and other aquaculture actors responsible for their actions and decisions according to the principles of the rule of law. The Governance framework should promote transparency in decision making based on well-established criteria, evidence and updated and reliable scientific information, including from industry, provided confidentiality is respected.

d) Predictability and stability: the Governance framework should ensure that the application of rules and regulations is fair and consistent and that decision-making is consistent and transparent. The Governance framework should ensure the security of property and lease rights, tenure and water access rights, participation, and transparency in elaborating and applying criteria and procedures for licensing, license renewal or taxation.

6.2 Planning and management

6.2.1 Planning and managing aquaculture development has proven mostuseful to prevent negative environmental and social impacts that can outweigh the benefits of increasing aquaculture output. Aquaculture planning and management enable a balance between environmental carrying capacity, social risks and economic opportunities to minimize negative impactswhile permitting the industry to contribute to the national economy and benefit society at large.

6.2.2 The EAA offers a suitable stepwise process through which aquaculture can be spatially planned and managed and integrated into the local ecological and social context and economy. It provides a planning and management framework to effectively integrate aquaculture into local planning and offers solutions for engaging with producers and the government for the effective sustainable management of aquaculture operations by considering local and national social,economic, environmental and governance objectives.

6.2.3 Promoting the development of sustainable aquaculture should consider spatial planning and management to allocate suitable farming areas and farm sites and management frameworks to: (i) meet the specific biological needs of the aquatic organisms; (ii) ensure that the ecological, productive and social capacity of the ecosystem hosting aquaculture is sufficient to support a defined production; iii) enable economic profitability; (iv) minimize stress and the risks of diseases; (v) secures access to land and water while preventing conflicts with other users (fisheries, agriculture, forestry, tourism, andso on) of inland and coastal zone resources; (vi) provide access to infrastructure (roads, electricity, post-harvest and marketing infrastructure); (vii) support resilience to climatic variability, climate changeand other external threats and disasters; and (viii) improve public perception and acceptability

about potential social and environmental benefits and impacts, as well as externalities of aquaculture sector through transparent and efficient information sharing.

6.2.4 The promotion of planning and management of aquaculture development through zoning, site selection and the design of aquaculture management areas (AMAs), should consider the EAA to balance between the social, economic, environmental and governance objectives of local communities and sustainable development. Based on the EAA, the best available knowledge and resources should be considered to perform a scoping study to enable proper zoning, site selection and AMAs with special consideration of the carrying capacity of ecosystems.

6.2.5 Planning and managing aquaculture using the EAA should be guided by the followingprinciples: (i) take account of the full range of ecosystem 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; (ii) support the improvement of human well-being with equity for all stakeholders (for example access rights, decent livelihoods and fair share of incomes), in particular for women; (iii) consider the linkages and interactions across freshwater, brackish and marine environments; (iv) take account of other sectors, policies and goals, as appropriate.

6.3 Policy, legal and institutional frameworks

6.3.1 Commercial aquaculture has developed relatively recently, often with no dedicated national legislationor strong support institutions in many countries. Instead, aquaculture relies on laws and regulations fragmented over various institutions and regulatory agencies of sectors such as fisheries, agriculture, water and forestry, labour, social, trade, or environment. As a result, the sector faces multiple and sometimes conflicting regulations over access to land, water, infrastructure and services, environmental requirements, zoning, food safety, health and welfare, and implementation of innovative practices.

6.3.2 The development and implementation of an EAA for aquaculture planning and management require improving existing or developing new national policy, institutional and legalframeworks for fair and transparent regulations on user rights and operations. Such frameworks shouldbe enforced by a competent authority and underpinned by effective and transparent stakeholders' consultations and use of best available knowledge and science.

6.3.3 The institutional framework for planning and managing aquaculture development should clearly identify the competent authorities, their organizational structure, the various roles and responsibilities for enforcement, communication, coordination and cooperation between institutions, tiers of governments, the private sector, and other stakeholders. The roles and responsibilities should be explicit, accountable, and where necessary, supported by a robust legal framework.

6.3.4 Building on existing laws, traditions, and institutional structures, legal and institutional frameworks that support EAA planning and management should be regularly reviewed and updated, to ensure continued relevance and improved effectiveness.

6.3.5 The legal framework and the institutional arrangement for implementation should provide for monitoring, regular evaluation and reporting of relevance and effectiveness, using reliable and cost-effective methods and enabling feed back into the process of policy formulation. It encourages Members to develop systems that link all concerned departments and institutions to ensure better coordination.

6.3.6 The overall policy framework should balance binding rules and regulations of user rights, licensing, zoning, and other non-binding instruments that promote on-farm best practices and product quality. Where feasible, appropriate incentives, fiscal or otherwise, should be considered to promote adherence to rules and regulations and to codes of best practice.

6.3.7 The legal framework should ensure the visibility and representativeness of aquaculture in nationaland local integrated coastal zone management (ICZM) initiatives.

7. Pathway 2: Sustainable resources management

7.1 General considerations

7.1.1 Members and all those engaged in management of terrestrial and aquatic resources relevant to aquaculture should adopt measures for the long-term conservation and sustainable use of these resources. They should promote and implement appropriate management systems, consistent with theirexisting obligations under national and international law and voluntary commitments, including the Code and its supporting instruments, as well as the relevant SDGs that give due recognitionto the requirements and opportunities of aquaculture. Aquaculture is supported by ecosystem services that must be valued and protected to ensure their long-term delivery.

7.1.2 All parties should recognize that rights and responsibilities come together; users' rights are balanced by duties and support required for the long-term conservation and sustainable use of resources and the maintenance of the ecological foundation for aquatic food systems. Aquaculture operators should utilize best practices that minimize harm to the terrestrial and aquatic environment and associated species and support decent livelihoods.

7.1.3 Members should facilitate, train and support aquaculture stakeholders to participate in and take responsibility for the management of the aquatic resources on which they depend for their well-being and livelihoods, with due consideration of their legitimate users' rights and systems. Accordingly, Members should involve all aquaculture dependent communities – with special attention to equitable participation of women, youth, vulnerable and marginalized groups – and other aquaculture stakeholdersin the design, planning and, as appropriate, implementation of aquaculture management measures.

7.1.4 Participatory resources management systems, such as co-management, should be promoted in accordance with national policies within the boundaries of its laws and regulations, takinginto account regional cooperation mechanisms.

7.1.5 Members should ensure that the roles and responsibilities within the context of co-management arrangements of stakeholders are clarified and agreed upon through a participatory, transparent and legally supported process. All parties are responsible for assuming the management roles agreed to.

7.1.6 All stakeholders should encourage and support the role and equitable involvement/engagement ofwomen and men, especially youth, promote Indigenous Peoples' and vulnerable groups' participation in aquaculture, whether engaged in input (seed and feed) production and distribution activities, pre- farming, grow-out or post-harvest operations, in the context of co-management and in the promotion ofsustainable aquaculture, contributing their particular knowledge, perspectives and needs. Where necessary, special measures should be designed to achieve this objective.

7.1.7 Members should establish effective procedures specific to aquaculture to undertake appropriate environmental risk assessment and monitoring with the aim of minimizing adverse environmental impacts and related economic and social consequences resulting from water extraction, land use, discharge of effluents, introduction and production of invasive alien species (IAS), use of veterinary drugs and chemicals.

7.1.8 While it is necessary to consider impacts of individual farms it is also necessary to consider the added synergistic impacts of many farms, even small farms, within the natural boundaries of the ecosystem (e.g. river catchment area), since what matters is the capacity of the entire holding ecosystem to support the farming process and outputs.

7.1.9 Where transboundary and other similar issues exist, for example shared waters and aquatic resources, Members should work together to ensure that the users rights of aquaculture operators areprotected, including rights to claims of damage and to compensation.

7.1.10 Members should promote permanent environmental monitoring of water bodies/watersheds thatsupport aquaculture. Indicators of water quality and ecosystems wellbeing benchmarks should be developed. Such monitoring should also be connected to early warning systems and could generate prevention and mitigation measures.

7.2 Conservation, sustainable use and development of aquatic biodiversity in aquaculture

7.2.1 These guidelines are consistent with the Global Plan of Action for the Conservation, Sustainable Use and Development of Aquatic Genetic Resources for Food and Agriculture, developed by FAO following extensive consultation and adopted by the FAO Council in 2021 which in turn contribute significantly to the achievement of SDG2, Target 2.5 (maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species). They recognize three fundamental needs and challenges for sustainable management of aquatic genetic resources for food and agriculture (AqGR):

a) wild and farmed AqGR will underpin the future role of AqGR in aquatic food systems, and important AqGR under threat must be conserved;

b) it is essential to apply basic principles of genetic management to domesticated AqGR to ensuretheir sustainable use in aquaculture; and

c) genetic improvement in aquaculture lags far behind that in terrestrial agriculture and that accelerated adoption of appropriate genetic improvement can positively affect aquaculture production efficiency and sustainability.

7.2.2 These guidelines also recognize that: (i) Effective management of AqGR is constrained by the shortage of information on their national, regional, and global status; (ii) AqGR are underrepresented in the development and monitoring of the status of global biodiversity within international instruments, due in part to the absence of indicators of their status; (iii) more effective management of AqGR must be underpinned by greater knowledge of the resource and effective monitoring of its status.

7.2.3 Genetic effects may arise from the interaction of farmed types with wild resources, especially from introduced species and developed farmed types. Undesirable genetic effects include contamination of native gene pools through hybridization and introgression, which may render them less fit, and loss of native species, or change in species composition or abundance, through competition, predation, or habitat degradation. Some important aquaculture speciesare at risk of extinction in the wild, including through anthropogenic effects including habitat destruction, illegal catch, poaching and overfishing. Also, some unique farmed types may also be at risk. It is important torecognize and monitor species, wild stocks and farmed types under threat and promote their effective conservation. Risk assessment should also consider current and future impacts of environmental changeincluding climate change.

7.2.4 Members and relevant stakeholders should recognize that at-risk genetic resources should be conserved, prioritizing *in situ* conservation when possible, such as through aquatic protected areas and even fisheries management. *In situ* conservation may be supplemented or, in extreme cases, supplantedby *ex situ* conservation in the form of live gene banks or *in vitro* gene banks such as cryo-conservationof gametes or embryos. Research and development are needed to expand options for *ex situ in vitro* conservation for endangered aquatic species.

7.2.5 Members and relevant stakeholders should undertake efforts to minimize the harmful effects of introducing non-native species and developed farmed types for aquaculture, whether introduction is accidental or deliberate. Introductions should be based on the precautionary principle and based on sound risk assessment and management. Members should, whenever possible, promote steps to minimize adverse genetic, disease and other effects of such introductions on wild stocks. Specific and targeted guidelines using risk-based best practice and existing codes of practice should be developed and widely distributed.

7.2.6 All parties should recognize that due to the relatively recent domestication of most aquaculture species, theygenerally retain high levels of genetic variability, thus retaining great potential for future adaptation anddevelopment. However, lack of attention to principles of genetic management is eroding this variabilityin many important seed supply systems, causing inbreeding and genetic drift. Loss of species purity through inadequately controlled hybridization is also occurring in some species. These practices can have long-term negative impacts on productivity and should be avoided.

7.2.7 All parties should promote application of basic principles of genetic management, especially within major seed supply systems. This should be accompanied by monitoring of the genetic status of stocks at different steps in the seed supply value chain. Affordable and robust tools to support monitoring (such as targeted genetic marker systems) need to be developed, promoted and disseminated to supportthis monitoring.

7.2.8 Genetic improvement in aquatic species lags far behind that in terrestrial agriculture, with the exception of a few species, and uptake is slow, especially for many species cultured in the developing world that are important components of food and nutritional security.Selective breeding has huge potential to improve production efficiency in aquaculture, with genetic gains of 13 percent per generation achievable for many commercially important traits.

7.2.9 Members and other stakeholders should promote and accelerate uptake of appropriate genetic improvement, with a focus on well managed selective breeding programmes as a core technology. Promotion should include awareness raising, capacity building, appropriate research and development and effective engagement of the private sector. Approaches to selective breeding must necessarily takea long-term approach, with consideration of appropriate resourcing and dissemination strategies.

7.2.10 All parties should develop targeted policies and strategies, nationally and regionally for effective conservation, sustainable use and development of genetic diversity. These policies and strategies should be underpinned by appropriate levels of investment, capacity building and institutions. Equitable accessand benefit sharing measures, which respect the key features of AqGR, should be a core principle in thedevelopment of these strategies and policies.

7.3 Best practices for sustainable aquaculture

7.3.1 Members should promote best practices for sustainable aquaculture in support of rural communities, fish workers, producer organizations, fish farmers and a broad range of other stakeholders.

7.3.2 All the stakeholders involved in aquaculture should make a strong commitment towards developing, disseminating, and implementing codes of best and cost-effective practices for sustainable aquaculture based on the learning from successful and non-successful experiences.

7.3.3 To promote cooperation and self-regulation, Members should support small-scale famers, aquafarmers and the aquaculture industry in general to establish self-help aquafarmer groups and producer associations, with a particular attention to the youth, women, vulnerable and marginalized groups.

7.3.4 Collaboration should be fostered between the aquaculture industry and governments, but also withlocal authorities, regional and international organizations, trade unions, research institutions and other relevant stakeholders involved in the aquaculture value chain, in order to adopt best practices for sustainable aquaculture.

7.3.5 To attract investors and to retain farmers in the sector, Members must develop a realistic and simplified holistic framework for the operation of aquaculture business ventures and determine how theregulatory frameworks can be made operational for the development of the sector.

7.3.6 All commercial farms treated as a business venture must adopt better management practices (BMPs) and be technically, socially, economically, and environmentally sustainable to remain in business over time.

7.3.7 Government should assist farmers to increase access to credit, financial support and risk insuranceto enable them to adopt BMPs, increase production and improve the net income of the farmers.

7.3.8 Members should promote training, capacity building and active participation of fish workers, fishfarmers and aquaculture communities in the development of sustainable aquaculture management practices. Such practices should bear in consideration the rights and access of other users of common ecosystems.

7.3.9 All parties should promote the involvement of aquatic and terrestrial farmers, their organizations, as well as their communities, in setting research priorities and directions, including specific cross-cutting objectives and needs for research projects, and to make research findings accessible to them and applicable in the local and national contexts.

7.3.10 Members should promote efforts that improve selection and use of appropriate feeds, feed ingredients, feed additives and fertilizers, including manures.

7.3.11 Members should conduct research to seek alternative sources of quality plant protein that generates fish growth to replace more expensive sources of animal-based proteins, lower feed costs to increase business profits while being environmentally and socially responsible.

7.3.12 The use of agriculture by-products must be carefully regulated to avoid contamination of the aquaculture products with pathogens, parasites, heavy metals, antimicrobials (antibiotics, parasiticide, antifungal and antiviral drugs) and other substances potentially harmful to humans, aquaculture facilitiesand the surrounding ecosystems.

7.3.13 Members should promote effective on-farm biosecurity strategies and practices favouring hygienic measures and vaccines, and ensure safe, effective, and responsible use of veterinary drugs authorized for aquaculture. These drugs may include hormones, antimicrobials, vaccines, anaesthetics, sedatives, and chemical products applied to the aquatic organisms and not to the aquatic environment.

7.3.14 Members should promote collaboration regarding on-farm biosecurity strategies or practices among farmers, extension specialists, veterinarians, para-veterinarians and other fish and aquaticplants health experts to raise awareness and build capacity for fish and aquatic plants health maintenanceand farm management efficiency.

7.3.15 Members should regulate the use of chemicals and other biological inputs in aquaculture which could be hazardous to human health, aquaculture facilities and the environment. Regulations should consider the carrying and dilution capacity of recipient aquatic ecosystems.

7.3.16 Members should require that the disposal of aquaculture wastes such as offal, sludge, dead or diseased fish, excess veterinary drugs and other hazardous chemical inputs does not constitute a hazardto human health and the environment. Where necessary, Members should require the treatment of suchwaste prior to disposal to protect aquaculture facilities and the environment.

7.3.17 Members should ensure that farming, harvesting, handling, processing, and distribution of aquaculture products are carried out in a manner that will maintain the nutritional value, quality and safety of the products, reduce aquaculture waste and minimize negative impacts on the environment, and, where feasible, ensure their traceability.

7.3.18 Members should promote responsible and sustainable practices of citizens and practitioners for the reduction of loss and waste in aquaculture and proper efficient use of resources, such as water or energy.

7.3.19 Members should develop and enforce standards for chemical and biological inputs for aquaculture operations including use in enhancement, treatment, improvement of water, wastewater, soil and sediment, feeds, culture organism, pre, post and during culture. The standard should require labelling including product information, composition, concentration and content, potential side effects and adverse reactions, source of origin, expiry date, usage and storage instruction, and so on.

7.3.20 To strengthen governance and transparent information on aquaculture activities, Members, should provide an information exchange platform of knowledge, attitudes, values, practices and perceptions of interested parties concerning risks associated with aquaculture production.

7.4 Climate change and disaster risks

7.4.1. Combating climate change, including in the context of promoting sustainable aquaculture development, requires urgent and ambitious action, in accordance with the objectives, principles and provisions of the UNFCCC, taking into account the Paris Agreement on Climate Change, relevant SDGs and targets of SDGs, in particular SDG 13, the FAO strategy for climate change and Blue Transformation.

7.4.2. Members should develop policies and plans to address climate change in aquaculture, in particular strategies for adaptation and mitigation, where applicable, as well as for building resilience, in full and effective consultation with aquaculture stakeholders including indigenous peoples, men and women, paying particular attention to vulnerable and marginalized groups. Special support should be given to small-scale aquaculture farmers living in areas where climate change may have particular implications for food security, nutrition, housing and livelihoods.

7.4.3. There is a need for integrated and holistic approaches, including cross-sectoral collaboration to address climate change and disaster risks in aquaculture. Required steps should be taken to address issues such as pollution, coastal erosion and destruction ofcoastal habitats due to human-induced factors. Such issues tend to increase vulnerability of aquaculture systems to climate change seriously, undermining the livelihoods of aquaculture stakeholders in these areas as well as their ability to adapt to possible impacts of climate change.

7.4.4. The necessary assistance and support should be provided to aquaculture dependent communities affected by climate change or natural and human-induced disasters, including through risk and vulnerability assessment, adaptation, mitigation, recovery and aid plans, where appropriate. In particular, Members should establish, in collaboration with the private sector, brood stock and seed production centers to supply quality seed to disaster-affected areas.

7.4.5. The necessary science and information should be promoted to understand main natural and climate hazards and their impacts on aquaculture, as well as identify opportunities to mitigate the impacts, including through capacity building, awareness raising and extension for resiliency and adaptation, with due attention to gender sensitivity.

7.4.6. All parties should take into account the impact that climate change and disasters may have on the entire aquaculture value chain (AVC), in the form of changes of production systems, farmed species and farmed types and quantities, fish quality and shelf life, and implications with regard to infrastructure and market outlets. Aquaculture stakeholders should have access to support with regard to adjustment measures in order to reduce negative impacts. When new technologies are introduced, they need to be flexible and adaptive to future changes in species, products a climatic variability.

7.4.7. There should be a good understanding of how emergency response and disaster preparedness are related and coordinated in aquaculture sector and how to apply the concept of the relief- development continuum. Longer-term development objectives need to be considered throughout the emergency sequence, that is, the immediate relief phase, rehabilitation, reconstruction and recovery phases, including actions to reduce vulnerabilities to potential future threats. The concept of 'building back better' should be applied in disaster response and rehabilitation.

7.4.8. The role of better planning and management should be emphasized as the first essential stepsto reduce risks in the face of many hazards. All parties should promote the role of sustainable aquaculturein efforts related to climate change and should encourage and support energy efficiency in the subsector and throughout the whole AVC. Members should consider making available to all aquaculture stakeholders, with a particular focuson small- and medium-scale farmers, transparent and equal access to adaptation funds, facilities and appropriate technologies for climate change adaptation, as appropriate.

8. Pathway 3: Social responsibility and gender equality

8.1 Social responsibility

8.1.1 Integrated, ecosystem and holistic approaches to aquaculture planning and management should take into consideration the livelihoods of aquaculture workers, farmers and other aquaculture stakeholders. Due attention to social and economic development should include all relevant stakeholders in discussions related to aquaculture use of space and water; facilitation mechanisms of social dialogues, benefits and opportunities should be sought especially for local populations.

8.1.2 All parties should improve social responsibility of the aquaculture sector with respect to other sectors that share common ecosystems and care for the use and conservation of natural resources, to improve aquaculture public perception and social acceptability. This is particularly relevant in areas, and regions where aquaculture is a new enterprise.

8.1.3 Members should promote investment in human resource development services such as social protection and health, education and training, literacy, digital inclusion and other skills of a technical nature that generate added value to the conservation and use of aquaculture resources as well as awareness raising, achieving non-discrimination and ensuring equitable distribution of benefits.

8.1.4 Members should promote social security protection and decent working conditions for workers along the entire aquaculture value chain, considering the characteristics of farmers and aquaculture dependent communities, and recognize or formalize family-based engagement as a mechanism to allowfor access to social security

8.1.5 Members should support the development of and access to other services that are appropriate for aquaculture stakeholders, for example, savings, credit and insurance schemes, extension, animal health,with special emphasis on ensuring the access of women, persons with disabilities, vulnerable and marginalized groups, to such services.

8.1.6 Members should recognize as economic and professional operations the full range of activities along the aquaculture value chain – both pre- and post-harvest; whether in an aquatic environment or onland; undertaken by men or by women. All activities should be considered whether part-time, occasional, commercial and/or for subsistence. Professional and organizational development opportunities should be promoted, including for vulnerable groups working within the aquaculture valuechain.

8.1.7 Members should promote decent work for all aquaculture workers, including both the formal andinformal sectors and create the appropriate conditions to ensure that aquaculture activities in both the formal and informal sectors contribute to the local and national economies and the sustainability of aquaculture sector in accordance with national law.

8.1.8 Members should create an enabling environment for sustainable development of aquaculture sectorand its stakeholders, pursue inclusive, non-discriminatory, and sound economic policies for the use of marine, freshwater and land areas to permit aquaculture stakeholders, particularly women, youth, indigenous Peoples' and vulnerable groups to earn a fair return from their labour, investment, skills andmanagement, and encourage conservation and sustainable management of natural resources.

8.1.9 Members and other stakeholders should support already existing, or the development of complementary and alternative income-generating opportunities – in addition to earnings from aquaculture-related activities – for small scale holders, as required and in support of sustainable use of natural resources and livelihood diversification. The role of aquaculture in local economies and its link to the wider economy need to be recognized and benefited from. Aquaculture dependent communities and workers should equitably benefit from developments such as aquaculture community-based tourism.

8.1.10 All parties should create conditions for men and women in aquaculture to work in an environmentfree from crime, violence, organized crime activities, piracy, theft, sexual exploitation, corruption, and abuse of authority. All parties should take steps to institute measures that aim to eliminate gender-based violence and to protect anyone exposed to such violence in aquaculture workplace and communities. Members should ensure access to justice for victims of inter alia violence and abuse.

8.1.11 Members and aquaculture actors, including traditional and customary authorities, should understand, recognize and respect the role of migrant workers in aquaculture. Members and aquacultureactors should cooperate to create the appropriate frameworks for the protection of human and labour rights, either under statutory or customary law, for fair and adequate integration of migrants who engage in aquaculture operations and who do not undermine local community-based governance and development in aquaculture in accordance with national law. Members should recognize the importance of coordination among their respective national governments regarding migration of aquaculture workers across national borders. Policies and management measures should be determinedin consultation with fisheries and aquaculture organizations and institutions.

8.1.12 Members should address occupational health and safety issues and unfair working conditions of all aquaculture workers, especially the youth, women, vulnerable and marginalized groups, by ensuringthat the necessary legislation is in place and is implemented in accordance with international standards,conventions and instruments into their national legislation to which a Member is a contracting party, such as the relevant recommendations, guidelines and conventions of the International Labour Organization (ILO). All parties should strive to ensure decent working conditions, and that occupationalhealth and safety is essential and an integral part of aquaculture management and developmentinitiatives.

8.1.13 Members should eliminate any sort of illegal practices, such as forced labour, prevent debt-bondage, child labour, among others, especially with migrant workers, women, children, and other people in vulnerable situations. The adoption of effective measures to protect aquaculture operators andworkers in the aquaculture sector is needed.

8.1.14 Members should provide and enable access to schools and education facilities that meet the needsof aquaculture dependent communities and that facilitate gainful and decent employment of youth, respecting their career choices and providing equal opportunities for youth, men and women as well asIndigenous Peoples' and vulnerable groups.

8.2 Gender equity and equality

8.2.1 All parties should recognize the role of women in aquaculture activities. Achieving gender equityand equality requires concerted efforts by all and gender mainstreaming should be an integral part of all aquaculture development strategies. These strategies require different approaches in different cultural contexts to achieve gender equity and equality and should challenge practices that are discriminatory against women.

8.2.2 Members should comply with their obligations under international human rights law and implement the relevant instruments, in particular the CEDAW, the Beijing Declaration and Platform foraction, promoting gender equity and equality to which they are party.

8.2.3 Members should endeavour to secure women's equal voice and participation in decision-making processes for policies directed towards aquaculture. Members should adopt specific measures to address discrimination against women, while creating space for CSOs, for women workers and their organizations, to participate in monitoring their implementation. Women should be encouraged to participate in aquaculture organizations, and relevant organizational development support should be provided.

8.2.4 Members should propound policies and legislation to promote gender equity as a means of achieving the objective of gender equality and, as appropriate, revise to adapt legislation, policies and measures that are not compatible with gender equity and equality, considering social, economic, historical and cultural aspects, which perpetuate the subjugation of women.

8.2.5 Members should be at the forefront of implementing actions for achieving gender equity and equality by, inter alia, recruiting more women as extension staff and ensuring that both men and women have equal access to extension and technical services, and legal support, related to aquaculture that take into account their different constraints, needs and priorities.

8.2.6 All parties should collaborate to develop monitoring and evaluation indicators and systems to assess the impact of legislation, policies, and actions for improving women's status and achieving gender equality.

8.2.7 All parties should encourage the development of technologies that are gender transformative, and appropriateto support women's work in aquaculture, but also accessible to them.

9. Pathway 4: Value chains, market access and trade

9.1 Equitable aquaculture value chain

9.1.1. As aquaculture has developed into a major commercial food system,providing the majority of aquatic food protein worldwide, aquaculture value chain (AVC) analysis, development and governance have emerged as valuable and complementary approaches to promote sustainable aquaculture. They aim to analyse and understand the dynamics at value chain nodes, involvingkey players, costs and benefits, value addition and value creation, and to inform the development of policy options and suitable market instruments for the promotion of sustainable aquaculture in international food trade.

9.1.2. The interaction and synergies amongst the AVC actors and between themand their business and policy environment should be analysed to assess how access and entry barriers are created, the role and influence of the different AVC actors and how benefits and risks can be distributedequitably.

9.1.3. Members are encouraged to use AVC analysis to develop a holistic understanding of how a specificAVC performs economically, socially and environmentally. They should develop a vision shared by government institutions, private actors and other stakeholders on how to improve the AVC performance and competitiveness such as through policy interventions, public investment and capacity building opportunities, fiscal and economic incentives, monitoring and corrective measures, public-private partnerships (PPPs).

9.1.4. All parties should ensure that AVC actors are part of decision-making processes, recognizing that sometimes unequal power relationships between value chain actors exist and that vulnerable and marginalizedgroups may require special attention and support.

9.1.5. All parties should recognize the role women often play along the value chain, and support improvements to facilitate women's participation in such work. Members should ensure that amenitiesand services appropriate for women are available as required in order to enable women to retain and enhance their livelihoods along the aquaculture value chain.

9.1.6. All parties should prevent food loss and waste along the AVC and seek ways to create and add valueto aquaculture products, building also on existing traditional and local cost-efficient, gender-sensitive and climate smart technologies, local innovations and culturally appropriate technology transfers. Environmentally sustainable practices within an ecosystem approach should be promoted, deterring, forexample, waste of inputs (water, fuel, feed and so on) along the AVC operations.

9.2 International trade and market access

9.2.1. Members should facilitate equal access to local, national, regional and international markets and promote equitable and non-discriminatory trade of aquaculture products. Members should work together to introduce trade regulations and procedures that support regional and international responsible trade in aquaculture products and taking into account the agreements under the World Trade Organization (WTO), bearing in mind the rights and obligations of WTO members where appropriate.

9.2.2. Members should give due consideration to the impact of international fish trade and associated restructuring of the AVC on local small-scale farmers, workers and their communities. Members should ensure that promotion of international trade of aquaculture products does not adversely affect the nutritional needs of people for whom fish is critical to a nutritious diet, their health and well-being and for whom other comparable sources of food are not readily available or affordable. They should ensure that benefits from international trade are equitably distributed.

9.2.3. Members should enable access to relevant market and trade information and services for stakeholders in the AVC. In particular small-scale aquaculture farmers and other operators must be able to access timely and accurate market information and services to help them adjust to changing market conditions. Capacity building is also required so that all aquaculture actors and especially women, youth, Indigenous Peoples' and vulnerable groups can adapt to, and benefit equitably from, opportunities of global market trends and local situations while minimizing any potential negative impacts.

9.2.4. Members should ensure that market entry rules are consistent with the Agreements of the WTO, inparticular the Sanitary and Phytosanitary Measures (SPS) Agreement and the Technical Barriers to Trade (TBT) Agreement, in particular for setting standards and technical regulations. These standards and technical regulations should be fit for the purpose of protecting the environment, consumers, animal health and welfare and social integrity. They should not be used as disguised obstacles to trade.

9.2.5. Members should promote the harmonization of technical regulations and standards for aquaculture products using internationally recognized norms such as those of the Codex Alimentarius Commission (CAC) for food safety and quality, the World Organisation for Animal Health (OIE) for animal health, 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 such as the CBD Protocols: The Nagoya Protocol on Access and Benefit-sharing, The Cartagena Protocol on Biosafety, and The Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety.

9.2.6. Members should facilitate trade and market entry by promoting Mutual Recognition Agreements (MRA), 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.

9.2.7. All parties should promote voluntary standards for aquaculture sustainability that are cost effective, predictable, and meet the minimum substantive criteria of the FAO technical guidelines on aquaculture certification.

9.2.8. All parties and actors should promote and adopt traceability norms and standards in view of building trust and increasing transparency in aquaculture value chains and international trade.

C – Enablers for promoting sustainable aquaculture

10. Funding and financing sustainable aquaculture

10.1 Aquaculture intensification and expansion requires adequate investment and funding to increase production andimprove productivity, with significant impact on economic development, food security and poverty alleviation.

10.2 Private funding and investment in sustainable aquaculture, including foreign direct investments, offers significant potential and opportunities to complement national public resources. Countries with reasonably functioning, predictable and transparent markets can derive significant benefits from it in terms of better access to capital, technology, skills and markets, generation of employment and productivity increases.

10.3 Members and financial institutions should promote investment, funding and insurance in the aquaculture sector, including from foreign direct investments, that recognizes and respects the rights of access to land, water and natural resources, whether statutory or customary, owned by individuals or communities.

10.4 All parties should ensure that funding and investments in aquaculture should strengthen food security and should not jeopardize it through adverse effects on any aspect of food security in terms of availability, access, utilization or stability.

10.5 Members should ensure that rules and processes relating to funding and investment in aquaculture are transparent, verifiable, allowing accountability of investors and other stakeholders, within a proper business, legal, and regulatory environment.

10.6 Members should ensure that investors and other stakeholders respect the rule of law, reflect the industry best practice, are viable economically, and result in durable and equitable shared prosperity andvalues.

10.7 Members should ensure that funding and investment in aquaculture projects requires studies to quantify social and environmental impacts and identify implementable measures for sustainable natural resources use,by mitigating and minimizing the risk and magnitude of negative impacts of the aquaculture project. Such studies may be funded through public resources if so required, by undertaking Strategic Environmental Assessment (SEA).

10.8 Members should fund and promote investment in aquaculture research and innovation, appropriate to national and local needs. Models of research and innovation that link and strengthen collaboration amongst stakeholders and relevant parties to improve production should be promoted.

10.9 Members should provide financial investment support for farmers who are not normally able to access financing from financial institutions and lower the risk of borrowing for the financial institutions.

10.10 Members should organize, facilitate and provide funds and loans to modify and restructure crowded intensive farming areas that lack inlet, outlet, reservoir, treatment facilities, which are necessary to implement BMPs.

11. Policy coherence, stakeholder's involvement, institutional coordination, and collaboration

11.1 Members should recognize the need for and work towards policy coherence with regard to legislation arrangements and mechanisms for developing policies to address sustainable and efficient use of natural resources and energy, education,health ; environmental protection; food security and nutrition; labour and employment; trade; disaster risk management and climate change adaptation; access arrangements; and other aquaculture related plans, actions and investments in order to promote sustainable aquaculture, with special attention to gender equity and equality.

11.2 Members should, as appropriate, develop and use spatial planning approaches, including inland and marine spatial planning, which take due account of the aquaculture stakeholders' interests and rolein integrated coastal zone management. Through consultation, participation and publicity, gender- sensitive policies and laws on regulated spatial planning should be developed as appropriate. Where appropriate, formal planning systems should consider methods of planning and territorial development used by aquaculture systems, aquaculture dependent communities and other communities with customary tenure systems, and decision-making processes within those communities.

11.3 Members should ensure that aquaculture policy provides a long-term vision for sustainable aquaculture to support the eradication of hunger and poverty, using an ecosystem approach. The overallpolicy framework for aquaculture should be coherent with the long-term vision and policy framework for aquaculture in support of the aquaculture relevant SDGs and targets.

11.4 Members should establish and promote the institutional structures and linkages – including local–national–regional–global linkages and networks – necessary for achieving policy coherence, cross- sectoral collaboration and the implementation of holistic and inclusive ecosystem approaches in the aquaculture sector. At the same time, there is a need for inclusion of active stakeholder participation mechanism within institutional structure, clear responsibilities and well-defined focal points in government authorities and agencies for aquaculture stakeholders.

11.5 Aquaculture stakeholders should promote collaboration among their professional associations, including cooperatives, clusters, NGOs and CSOs. They should establish networks and platforms for the exchange of experiences and information to facilitate their involvement in policy- and decision- making processes relevant to sustainable aquaculture sector development.

11.6 Members should recognize, and promote as appropriate, that local governance structures may contribute to an effective and sustainable management of aquaculture, taking into account the EAA in accordance with national legal frameworks.

11.7 Members should promote enhanced international, regional and subregional cooperation in achieving sustainable aquaculture. Members, as well as international, regional and subregional organizations, should support capacity development to enhance the understanding of aquaculture and assist the sector in matters that require subregional, regional or international collaboration, includingappropriate and mutually agreed technology transfer, capacity building and information sharing.

12. Science, innovation and communication

12.1 Members should establish and harmonize systems of collecting and disseminating aquaculture data,including bioecological, social, cultural and economic data relevant for decision-making and investmentin sustainable management of aquaculture with a view to ensuring sustainability of land and aquatic ecosystems, in a transparent manner. Efforts should also be made to produce gender-

disaggregated data in official statistics, as well as data supporting improved understanding and visibility of the importance of sustainable aquaculture and its different value chain components, including environmental and socioeconomic aspects.

12.2 Members should develop simple, effective and easily understandable educational packages for aquaculture that explain BMPs from operational and economic perspectives, and distribute to stakeholders, investors and extension personnel.

12.3 Members should establish systems of data collection that enable them to assess the contribution ofaquaculture to the SDGs targeting the reduction of food insecurity, poverty alleviation, natural resources' conservation (including genetic resource management), and economic development.

12.4 All aquaculture stakeholders and communities should recognize the importance of communication and information, which are necessary for effective decision-making. This should include mechanisms and tool for effective information and outreach of farmers, aquaculture workers, investors, their organizations and other concerned aquaculture value chain stakeholders.

12.5 Members and other stakeholders should promote citizen science initiatives that recognize the roleof aquaculture stakeholders in collecting and disseminating reliable information and knowledge, including through the use of information technology and digital platforms.

12.6 All parties should recognize aquaculture stakeholders, in particular small-scale ones, women, youth and vulnerable groups as holders, providers and receivers of information and knowledge. It is particularly important to understand the need for access to appropriate information by small-scale farmers and their organizations in order to help them cope with existing problems and empower them to improve their operations and livelihoods, leaving no one behind.These information requirements depend on current issues facing communities and concern the biological, ecological, legal, economic, social and cultural aspects of aquaculture and livelihoods, disaster risks and climate change.

12.7 All parties should ensure that the knowledge, culture, traditions and practices of aquaculture dependent communities are recognized and as appropriate, supported, and that they inform responsible local governance and sustainable development processes. The specific knowledge of women farmers and workers must be recognized and supported. Members should investigate and document traditional aquaculture knowledge and technologies in order to assess their application to sustainable aquaculture,management, development and conservation of living aquatic resources.

12.8. All parties should promote the availability, flow and exchange of reliable information, including information on aquatic transboundary resources and health status of shared/transboundary aquatic stocks, through the establishment or use of appropriate existing platforms and networks at community, national, subregional and regional levels, including both horizontal and vertical two-way information flows. Taking into account the social and cultural dimensions, appropriate approaches, tools and media should be used for communication with aquaculture stakeholders and their capacity development.

12.9. Members and other parties should integrate research findings into their decision-making processes to ensure that funds are available for aquaculture collaborative and participatory data collection, analyses and research.

12.10 Research organizations and institutions should support aquaculturestakeholders to participate in research and in the utilization of research findings. Research priorities should be agreed upon through a consultative process focusing on the role of aquaculture in sustainable resource utilization, food security and nutrition, poverty eradication, and equitable development, including disaster risk management and climate change adaptation considerations.

12.11 Members and other relevant parties should promote research into the conditions of work in aquaculture, including systematic collection and analysis of sex-disaggregated data in the context of gender relations, in order to inform strategies for ensuring equitable benefits for men and women in aquaculture. Efforts to mainstream gender considerations in sustainable aquaculture development shouldundertake a gender analysis in the design phase of policies, programmes and projects in order to designgender-sensitive interventions. Gender-sensitive indicators should be used to monitor and address gender inequalities and to assess how interventions have contributed towards social change and gendermainstreaming.

12.12 Recognizing the role of sustainable aquaculture in providing healthy and nutritious aquatic foods, Members and other parties should promote the image of aquaculture products within consumer education programmes in order to improve public perception, increase awareness of the nutritional benefits of eating aquatic foods and impart knowledge on how to assess the quality of aquaculture products.

13. Capacity development

13.1 Members and other parties should enhance the capacity of aquaculture stakeholders, in particular small-scale farmers, to enable them to participate in decision-making processes and to implement best practices. To this effect, it should be ensured that the range and diversity of the aquaculture systems andspecies along the entire value chain is appropriately represented through the creation of legitimate, democratic and representative structures, ensuring equitable participation of women, vulnerable and marginalized groups, in such structures. Where appropriate and necessary, separate spaces and mechanisms should also be provided to enable women to organize autonomously at various levels on issues of particular relevance to them.

13.2 Members and other stakeholders should build capacity, for example through development programmes, to allow farmers and aquaculture dependent communities to benefit from improved efficiency, innovations, and market opportunities. In this case, development andimplementation of demonstration units that feature sustainable commercial practices with economic, operational and environmental aspects should be considered and delivered.

13.3 All parties should recognize that capacity development should build on existing knowledge and skills and be a two-way process of knowledge transfer, providing for flexible and suitable learning pathways to meet the needs of individuals, including both men and women and vulnerable and marginalized groups. Moreover, capacity development should include building the resilience and adaptive capacity of aquaculture dependent communities in relation to disaster risk management and climate change adaptation. Capacity development should include relevant government institutions at all levels.

13.4 Government authorities and agencies at all levels should work together to develop knowledge and skills to support sustainable aquaculture development and successful co-management arrangements, as appropriate. Particular attention should be given to decentralized and local government structures directly involved in governance and development processes together with aquaculture dependent communities, including the area of research and extension.

D – Adoption, implementation and monitoring

14. Component 1: actions for mainstreaming sustainableaquaculture to support the 2030 agenda for sustainable development

14.1 Mainstream expansion and intensification of aquaculture into global initiatives and align with the 2030 Agenda for Sustainable Development

14.1.1. Policies and actions to sustainably expand and intensify aquaculture and upgrade aquaculture value chains should build on the wide range of instruments and initiatives that have proven useful during the last decades, drawing on lessons learned from their implementation to forge ahead the future of sustainable aquaculture in the 21st millennium. Of high relevance are the FAO CCRF, BT and their supporting FAO policy instruments and technical guidelines to promote responsible aquaculture, best practices and responsible utilization and trade of fish and aquatic plants. These instruments are a key reference for national, regional and international policies and efforts to support sustainable production and harvesting of aquatic living resources in harmony with the environment.

14.1.2. To align policies and strategies of sustainable aquaculture sector development to the SDGs and relevanttargets of the ASD, countries may need to balance priorities across development sectors and within the aquaculture sector. In doing so, Members should ensure:

- Creating an enabling environment for sustainable aquaculture sector development.
- Equitable use rights and access to natural resources.
- Environmental sustainability and efficiency of resource use.
- Equitable access and benefit-sharing of aquatic genetic resources for food and agriculture.
- Equitable access to services and infrastructure.
- Adoption of climate smart aquaculture practices to mitigate the impact of climate change.

14.1.3. Mainstreaming sustainable aquaculture into national development strategies and action plans to supportachieving the ASD requires setting up a process and a functioning institutional structure. The United Nations Development Group (UNDG) Reference Guide on Mainstreaming the ASD, which offers a common platform for SDG work at country level, recommends a process in three steps:

- **Building political momentum**: mobilize key players, engage sustainable aquaculture sector within the national agriculture policy and broader SDG processes, and raise awareness of the SDGs and their implications and connection with sustainable aquaculture.
- **Building a joint vision and action plan**: consult broadly to remove contentious issues and buildconsensus, engage stakeholders in cross-sectoral and multidisciplinary dialogue on SDGs, develop an action plan towards sustainable aquaculture, develop a joint vision on sustainable aquaculture within the framework of the broader vision for food and agriculture.
- **Translating the vision into action to accelerate change**: Mobilize private sector and civil societyand enhance partnerships; integrate SDGs in policies, programmes and action plans; strengthen statistical capacity on data related to SDGs and sustainable aquaculture; amend budget and mobilize funding for implementation; build capacity and take action at all levels.

14.2. Address trade-offs between Sustainable Development Goals through spatial and time scales

14.2.1. Countries and aquaculture stakeholders need to address challenges on how to deal with trade-offs between different SDGs and bring coherence between various sustainability instruments and

requirements. These trade-offs entail the need for (i) integrating aquaculture priorities in relation to the priorities of other sectors such as agriculture, fisheries, forestry, water, energy, environment or tourism, and (ii) prioritizing among different aquaculture systems, based on a good balance between economic profitability, social responsibility and environmental protection.

14.2.2. In the first case, key considerations relate to licensing or prioritizing access to land, water and use of infrastructure, services and aquatic resources, especially around lakes, rivers, freshwater and marine basins. Integrated coastal zone management (ICZM) is an approach promoted to coordinate the varioususers of coastal areas. At the national or local level, these considerations can relate to decisions about national or local level policy promoting and/or incentivizing investments in aquaculture, fisheries, agriculture or other sectors such as coastal tourism. At the regional and international level, the trade-offs relate to decisions about regional integration of priorities, transboundary waters, incentives to promoteexport (fiscal incentives, infrastructure and technical support services, insurances schemes and so on), trade-agreements defining specific tariffs and market access requirements.

14.2.3. In the second case, understanding trade-offs across SDGs for different aquaculture types poses a great challenge because of the need for highly detailed information about a system's general performance, but also because of the need for local knowledge and capacity, support services, infrastructure, technical experience, perspectives and markets.

14.2.4. Understanding the wide diversity of both the species and the aquaculture systems is crucial for assessing the sector's present and future contributions to the different SDGs. Having a broader aquaculture value-chain (AVC) perspective is imperative for gaining deeper insights about its overall contribution and for outcomes from investments and transformation efforts. An understanding of "farming conditions" and the role of "contexts" in which sustainable aquaculture development will be embedded, is also needed to realize how aquaculture can deliver on the SDGs.

14.3. Promote the role, visibility and integration of aquaculture in agri-food systems

14.3.1. It is important to recognize the role of aquaculture and promote its importance within national agri-foodsystems, with a focus on its specificities and the complexities of the life cycles of aquatic organisms (aquatic animals, seaweeds and aquatic plants), the diversity of aquaculture systems, sites, practices and ecosystem services.

14.3.2. Promoting a holistic agri-food systems perspective, integrating the development of sustainable aquaculture can transcend the narrow focus of fragmented production issues, value chains and sectoral policies and contribute to achieving sustainable development. It will enable strengthening aquaculture amidst numerous other activities and users of land and water (including in both rural, urban and peri-urban areas) to develop joint objectives and strengthen guidance in key cross-cutting areas; and promote more integrated actions in aquaculture and across agriculture, forestry, fisheries and other economic sectors, that balance the different dimensions of sustainability, as well as marine spatial planning, integrated coastal zone management and integrated watershed management.

14.3.3. Therefore, it is highly recommended to identify common issues/concerns among food producing sectors and stakeholders as starting points for dialogue and coordinated/coherent action on aquaculture development, as well as create inclusive dialogue platforms that lead to shared understanding and negotiated solutions across sectors and across the dimensions of sustainability and tools to transform these solutions into changes in practices to be developed. Positioning aquaculture within existing policy platforms also is key to enhance its legitimacy.

14.4. Promote the contribution of aquaculture to provide healthy, nutritious and sustainable aquatic food

14.4.1. Strategies for promoting nutrition and health should recognize that aquatic food as a key dietary component in many countries, poor or wealthy. Recognition should be given to the strong potential of aquaculture to sustain future demand for aquatic food, with a focus on African countries and SIDS where the potential exists but is not exploited.

14.4.2. Nutrition-sensitive approaches should consider and promote the nutrient content of farmed aquatic foods, with a particular focus on its potential and role in combatting all forms of malnutrition, especiallyfor pregnant women and children. Such approaches can include promoting safe aquatic foods in nationalfood-based dietary guidelines, school feeding programmes, and other food and nutrition strategies. This requires transforming/adapting supply chains, production, processing, trade and consumption of aquaculture food products as part of agri-food systems to make them more sustainable, resilient, ethicaland inclusive, including using e-commerce and internet distribution platforms.

15. Component 2: actions to create an enabling environment for sustainable aquaculture development

15.1. Promote coherent and coordinated governance across agri-food systems

15.1.1. Adequate governance of agri-food systems calls for a national policy dialogue, coherence and coordination, where aquaculture is duly recognized and integrated. How sectoral policies interact with the targets and larger objectives of the SDGs should be analysed and prioritized in national or subnational planning.

15.1.2. Agri-food systems must take an integrated approach to sustainability that includes taking stock of the relevant sectoral policies, mapping and analysing synergies and trade-offs between the economic, socialand environmental spheres, assessing the state of the sustainability of these systems and identifying keyissues, their causes and drivers. Also, efforts should integrate or adjust aquaculture developmentto environmental preservation and conservation objectives.

15.1.3. Strategic partnerships that work within established governance frameworks should be promoted to strengthen the capacity to coordinate state and non-state actors in order to mobilize resources and capacity. This requires institutional structures that allow exchange of information and opinion, division of roles and responsibilities, and mechanisms for tracking results.

15.1.4. To enhance policy dialogue, the government’s leadership and convening power is important to mobilizekey stakeholders, create decision opportunities and consultations for public investment. This includes facilitating innovative and flexible approaches to service provision and allowing for non-public spaces for private bargaining among stakeholders.

15.2. Promote sustainable aquaculture governance

15.2.1. Effective aquaculture governance mechanisms should promote public policies and legal frameworks, risk management approaches, planning and adequate monitoring mechanisms. They requirestrengthened capacities and cooperation of public and private sector institutions and other relevant stakeholders at all levels, through realistic and implementable public-private partnerships (PPPs).

15.2.2. Aquaculture governance should aspire for democratization, decentralization, territorial development approaches and public sector management reforms, as well as inclusive and incremental institutional development to foster a long-term approach with sustainable impact. Inclusiveness requires recognitionof key actors' interests and conflicts, while creating mechanisms through which various actors can consult to articulate perspectives and demands.

15.2.3. Policy dialogue should create a space to engage with entrepreneurs and tap into the potential of the private sector, including farmer organizations, cooperatives, small and medium-sized enterprises, in addition to large, export-oriented enterprises. The diversity of actors from the private sector, producer organizations and civil society requires a changing role of the state from sole provider of services to that of regulator, coordinator and facilitator.

15.2.4. The voice and representability of producers, especially small ones, should be heard. Producer organizations can help small producers access an array of services, including improved market information, extension and collective bargaining power. They are also an effective means to empower small producers, in particular women and youth, Indigenous People and vulnerable groups.

15.3. Promote aquaculture planning, investment, support services and management

15.3.1. Spatial planning and management to allocate suitable farming areas and farm sites and management frameworks should:

- Secure access to land and water while preventing conflicts with other users (fisheries, agriculture, forestry, tourism, conservation and so on) of inland and coastal zone resources.
- Provide access to infrastructure (roads, electricity, post-harvest and marketing infrastructures).
- Meet the specific biological needs of the aquatic species groups.
- Enable economic profitability.
- Minimize stress and disease.
- Recognize carrying capacity of the ecosystem for production (spatial integration will be important)
- Support resilience to climatic variability, climate change and other external threats and disasters.
- Improve public perception about potential social and environmental impacts of aquaculturethrough transparent and efficient information sharing.

15.3.2. Creating the conditions for inclusive transformation and expansion of aquaculture requires investing inbasic infrastructure: roads, electricity, markets, land and water transportation, hatcheries, feed and food,processing facilities, quality control and food safety laboratories, telecommunications, ice production facilities and storage capacity, waste collection and disposal among others.

15.3.3. Integrating the expansion of aquaculture into public policies for agri-food systems development enablesbetter access to and the use of public funds for investment in basic infrastructure. This enables better planning of public investment across sectors to promote economy of scale that minimizes investment and running costs, optimizes multi users' services and facilitates efficient maintenance. This is the casefor example for extension services, aquatic organism health support services, food markets, feed and food quality and safety control laboratories. In these and other areas, integrated facilities can service different agri-food systems efficiently and at minimum costs, both for infrastructure investment, operations and maintenance.

15.3.4. Key services to fish farmers, in particular small-scale farmers, require access to sustainable feed, the strengthening of broodstock,seed production and distribution systems for the conservation and sustainable use of improved aquatic genetic resources and enhancing the extension and application of select farmed types and their wild relatives. Promotion of decentralized and reliable supply of sustainable feed, and healthy seed to farmers, particularly small-scale farmers has proven beneficial.

15.3.5. To prevent and mitigate health risks to aquatic organism requires:

- Promoting aquatic biosecurity protocols and management agreements, including prevention ofdisease and integrated disease and pest management, and encourage measures to improve organism health and welfare.
- Promoting control, prevention and management of transboundary aquatic organism diseases ofrelevance for aquaculture.
- Harmonizing aquatic animal and seaweed/plant health management approaches and measures and effective cooperation at national, regional and inter-regional levels in order to maximize theeffectiveness of limited resources.
- Depending on the national legal context or ratification status, adhering to relevant internationalinstruments related to the responsible use of antimicrobials, chemicals and veterinary drugs, including the FAO Action Plan on Antimicrobial Resistance (AMR) and principles of One Health, as appropriate.
- Addressing the risks of antimicrobial resistance and the impact of veterinary medicines and other chemicals in the environment associated with aquaculture.

15.3.6. While the quality and safety of feed and seed can be assessed by private laboratories, including laboratories attached to large aquaculture farms, environmental monitoring programs and food safety assurance are the responsibility of aquatic organism health and food safety authorities. PPPs should be explored as they have proven useful in many countries where they provided reliable and cost-effective laboratory services to aquaculture.

15.3.7. Building support for policies that promote expansion of aquaculture requires making the case for how funding and investment in aquaculture can materially contribute to broader national objectives. This requires the development of an investment strategy to attract and incentivize investors and financial institutions. Thestrategy should be focused, comprehensive and at sufficient scale. It should target infrastructure, new technologies, research, development and innovation to unlock the full potential of sustainable aquaculture, including increased production and economic profitability while addressing other issues such as poverty reduction, nutrition, employment, gender equality, inclusion, preserving ecosystems andbiodiversity, adaptation to and mitigation of the impacts of climate change and aquatic organism healthimpacts.

15.3.8. This requires an enabling environment, competent authorities, strengthened partnerships and multistakeholder innovation platforms. Development assistance and financial institutions should pay particular attention to policy advice, human and institutional capacity development and monitoring and evaluation of progress, ensuring a level playing field between smallholders and larger investors is important for both equity and economic efficiency. Investment in aquaculture expansion, including from foreign sources, should recognize the rights of access to land, water and natural resources, whether statutory or customary, owned by individuals or communities.

15.3.9. Building on successful experiences in other areas such as agriculture or fisheries, the strategy should explore and exploit new opportunities for inclusive aquaculture and rural finance to ease liquidity constraints faced by farmers. Different innovative approaches to rural finance and forms of investmenthave proven successful in different countries. They include agricultural investment funds, investment promotion, guarantee funds and information and communications technology (ICT), blended financingand philanthropies crowding, to increase the level of financing while lowering the risks to investors. Interventions to improve access to credit should also promote financial literacy and management skills,in addition to producer organisations or community-based savings and loan groups,

which allow for better risk management and improved access to finance from the formal banking sector. Different incentives can be used at various stages to address short- and long-term changes. Positive incentives include training, direct payments and compensation for land/ponds set aside or improved market access.

15.4. Strengthen information, research and innovations

15.4.1. Sound public and private investment in research and development and advisory services should be inclusive, encourage innovation that benefits smallholders and address issues like improving sustainability and resilience, raising incomes and reducing risks, including creating new market opportunities and encouraging diversification, and reducing natural resource depletion and degradation.

15.4.2. It should go hand in hand with investment in capacity development and better provision of information to smallholder family farmers about innovations, both in the form of improved technological products and processes, and social practices and organization to promote simple, practical solutions, and make services and products available that might otherwise be unaffordable to small-scale farmers. This kind of innovation can take advantage of new technologies such as the use of mobile phones and social networks to aid extension and create new markets in areas where there is a lack of infrastructure and services or a lack of experience in logistics and distribution.

15.4.3. An important area for investment in global research and development is on the utilization of cultured seaweeds and aquatic plants for direct human consumption and as feed ingredients for aquaculture andterrestrial livestock and, to reduce the pressure on fish stocks and agricultural land, reduce methane emission from livestock, and exploit a new source of food and feed.

15.4.4. This requires improvement of data collection and information systems paying attention not only to production but also to social indicators (consumption, employment), environmental performance indicators and economic indicators through the aquaculture value chain, making use of internationally accepted indicators of social, economic and environmental impacts. The global reporting system can benefit greatly by strengthening transparency and outreach of the biannual Code survey and progress reporting on sustainable aquaculture in FAO's Committee on Fisheries, and its Sub-Committees on Aquaculture and Fish Trade.

15.5. Promote networking, exchange and dissemination of innovations and know-how

15.5.1. At the local, national and regional levels, the development of multistakeholder platforms should be encouraged and promoted to accelerate collaborative actions among industry, research, academic and other stakeholders to develop strategic research and innovation agendas for sustainable aquaculture development.

15.5.2. Partnerships should be strengthened to benefit from the reinvigoration of global cooperation and networking for aquaculture development among existing and planned centers of excellence, supported by financial, technological and capacity-building assistance through strategic North-South and South-South cooperation. Inclusive dialogue platforms, creating and improving information systems and data collection, and facilitating flows of information enable better understanding of aquaculture's contribution to sustainable development, including through the monitoring and evaluation of the sector. Modernizing traditional aquaculture with innovative approaches, digital technologies, capacity development programmes, and education and extension activities will unlock employment opportunities.

15.5.3. In terms of land use, aquaculture is more efficient than terrestrialanimal production, but water use remains a challenge, and more attention should be given to water recycling in land-based systems, reducing water consumption and facilitating nutrient recovery and re-use. Integration of aquaculture

into local nutrition-sensitive, circular and sustainable food systems withreduced carbon intensity, can become a major driver for future aquaculture expansion. This requiresactions for:

- Conserving, protecting, enhancing, and restoring aquatic ecosystems, their services and their biodiversity, including aquatic genetic resources, water and soil resources, and at the same timeprevent water pollution and reduce greenhouse gas emissions.
- Taking action to decrease aquaculture environmental footprint, from production to consumption, including all the side industries associated with aquaculture, such as processing, transportation, storage and feed manufacture. This requires developing methods and parameters to value ecosystem services provided by aquaculture.
- Applying the concepts of physical, ecological and social carrying capacity in aquaculture planning, use of environmental impact assessments, environmental assessment and monitoring of aquaculture operations to prevent and minimize environmental risks generated by aquaculture and also risks for aquaculture from other activities and hazards.
- Recognizing the advantages and promoting the use of extractive aquaculture species, includingtheir provision of ecosystem services such as water quality improvement, habitat enhancement, carbon/nitrogen/phosphorus "sequestration", coastal deacidification and considering their lowerimpact on surrounding ecosystems.
- Promoting aquaculture systems, where appropriate, for their ability to provide habitat and refugefor both terrestrial and aquatic biodiversity.
- Addressing the risks of antimicrobial resistance and the impact of veterinary medicines and other chemicals in the environment associated with their use in aquaculture.
- Promoting and incentivizing the use of clean and renewable energies and re-circulation of waterand co-products in the feeding process.

15.6. Prepare to address impacts from global crises, such as climate change, natural disasters, pollution and pandemics

15.6.1. Expanding aquaculture in support of achieving the relevant SDGs and targets requires climate-smart approaches, providing greater access to resources, technologies, education, information and credit for investment toadapt the production systems and practices. This requires:

- Ensuring risk based spatial planning and management of aquaculture to improve resiliency including against diseases and other hazards, which can also be enhanced by climate change.
- Ensuring that National Adaptation Plans (NAPs) include and support aquaculture adaptation needs and that aquaculture is included in nature-based opportunities and solutions in the Nationally Determined Contributions (NDCs).
- Embracing and expanding climate resilient aquaculture using appropriate planning and management to understand and act on where and how aquaculture can address climate change and other external impacts to the agri-food system. This requires: (i) identifying the sector's vulnerabilities to the impacts of climate change (for example, acidification, temperature changes, extreme weather events) and other external impacts specific to each area and developing disaster preparedness, risk mitigation and climate change adaptation strategies; (ii) implementing risk reduction strategies, including through contingency planning for droughts, floods, diseases, harmful algal blooms, and the adoption of more diversified and resilient production systems associated with effective safety nets, (iii) taking action to prepare for and adjust to both the current effects of climate change and the predicted impacts in the future, (iv) Enhancing and/or developing environmental monitoring systems to strengthen aquaculture resilience and improve early warning.
- Utilizing proven traditional and modern genetic technologies responsibly to develop aquatic farmed types adapted to changing environmental conditions caused by climate change, such as acidification, salinization and temperature and precipitation changes; diversifying aquaculture production, improving farming practices, promoting integrated farming systems and enhancing the capacity of farmers to respond to climate risks;

recognizing that the changing global climate could provide new opportunities for aquaculture due to the diversity of farmed types and culturesystems available to the farmer and proactively promote these opportunities. Where options exist, using a variety of species and production technologies that have lower carbon and environmental footprint than terrestrial species.

- Supporting and promoting the development and expansion of climate-smart and more resilient forms of aquaculture which balance between increasing productivity and incomes; adapting andbuilding resilience to climate change; and reducing (GHG) emissions.
- Integrating climate-proofing innovations that increase adaptation and resilience of the sector, including innovations in institutions, emissions reductions and renewable energy systems such as co-locating aquaculture with wind turbines or photovoltaic power generation or using renewable energy heating and cooling systems and water pumps.
- Strengthening preparedness should involve contingency plans, coordination arrangements, public information and training. It should include: (i) understanding and applying risk analysis for aquaculture planning and management (pathogen, food safety and human health, genetic, environmental, climate, ecological, financial and social risks); (ii) investing in early warning systems that can trigger action before disasters strike and help governments and organizations mobilize and act rapidly to prevent and minimize disasters impacts; (iii) maintaining reserves of seeds and feeds or spare parts and the constitution of emergency funds; (iv) capacity building to institutions at national and local levels to strengthen their ability to support aquaculture resiliency and climate smart practices.

16. Component 3: Actions for adopting, implementing and monitoring

16.1. Strengthen access to and facilitate adoption of Best Aquaculture Practices

16.1.1. Sharing knowledge, building capacities and investing in innovative technology are all part of the transformation to sustainable expansion of aquaculture in support of achieving the SGDs. In supporting efficient know how and technology transfers in aquaculture, including producer organizations that provide services and give a voice to farmers' concerns, extension services need to play a greater role as coordinator, facilitator and regulator to ensure that services offered by the increasing number of actors are feasible, technically sound and balanced in addressing economic profitability, environmental resilience, access to markets and social inclusiveness.

16.1.2. The transfer of know how should be targeted, demand-driven, engage women and youth, and address the specific needs of different categories of producers. It should reach equitably all actors, including the most marginalised, bringing farmers' knowledge together through cooperatives and clusters and providing youth with training and education on sustainable socio-economic entrepreneurship, including human skills and linking agriculture to industry and services. Building the entrepreneurial and business skills and capacities of youth and smallholders will be fundamental for full market participation and taking advantage of new opportunities.

16.2. Enhance sustainable resource management

16.2.1. National strategies for sustainable use of water, land, genetic resources and energy should integrate the needs and challenges of the aquaculture sector. These strategies should include significant financial incentives andtraining activities to the farmers and the other aquaculture actors along the entire value chain.

16.2.2. Practical and up-to-date guidance that address best practices for the management and use of aquacultureresources should be developed and widely disseminated by extension services. It should be supported by regular and targeted training for optimal use of water, land, energy, seed and feed.

16.2.3. Sustainability of natural resources requires moving away, in particular by small scale fish farmers, from using trash fish/low-value fish as a feed source to use of formulated feeds, thereby increasing the availability of fish for human consumption. Likewise, the use of wild marine fishery resources as feed inputs, includinglower-value fish as a direct feed, and fishmeal and fish oil sourced from over exploited and/or non- sustainably managed fisheries should be avoided.

16.2.4. The future of fed aquaculture expansion requires:

- Engaging with the feed industry to encourage the development and utilization of diversified andimproved feeds that are precisely formulated to meet the nutritional needs of farmed types based on life cycle stage, genotype, environment and immune status, have high digestibility and low environmental footprint.
- Reducing dependency on wild caught fish as sources for aquafeeds, increasing the use of fisheryprocessing wastes as raw material for fishmeal and fish oil, and promoting the use of alternativeand sustainable feed ingredients (such as algae, insect meals, single cell proteins, or aquaculture and fisheries by- products), which are safe for the cultured organisms and the environment.
- Exercising care to eliminate the use of non-approved feed additives, including antibiotics, hormones, antioxidants, binders, medicants, pigments, and possible adulterants. This will ensurethat the safety, nutritional profile and potential health benefits of farmed organisms can be enhanced through dietary fortification prior to harvest.

16.3. Promote conservation of biodiversity and genetic resources

16.3.1. Mainstreaming conservation and effective management of biodiversity in agriculture, including aquaculture, requires implementing a series of initiatives established in the UN Decade (2011–2020) on Biodiversity, the Aichi targets and global action plans adopted by the Commission on Genetic Resources for Food and Agriculture. These require greater investment to ensure that conservation of biodiversity and the genetic resources for food and agriculture are mainstreamed across all sectors contributing to sustainable development, food security and nutrition by: (i) strengthening national institutions and creating legislation to manage genetic resources; (ii) monitoring the biodiversity of aquatic organisms to identify genetic resources and farmed types at risk of extinction and adopt measures to mitigate the risks; (iii) preventing the degradation of natural habitats, in particular in freshwater and coastal environments, by creating conservation areas; and (iv) exploring incentives for valuing ecosystem services applied to biodiversity conservation. The Global Plan of Action for Conservation, Sustainable Use and Development of Aquatic Genetic Resources for Food and Agriculture (AqGR), adopted by the FAO Council in December 2021 identifies and adapts these priorities to the specific properties and characteristics of AqGR, for example in promoting the wider adoption of genetic improvement for AqGR in aquaculture, where the sector lags far behind terrestrial agriculture. This global plan of action provides a valuable framework for Members to develop strategies for improved management of aquatic biodiversity. FAO is developing a global information system for AqGR known as AquaGRIS, with a prototype being released in May 2022 and a fully-fledged version anticipated for release in 2023. AquaGRIS can be a key resource for members to record information on of their AqGR, including wild relatives, and can be used for monitoring the implementation of the global plan of action and to monitor the status of their AqGR.

16.3.2. Countries' broodstock and seed production and distribution systems should be strengthened for the conservation and sustainable use of farmed types of aquatic genetic resources and promote the appropriate development (with a focus on selective breeding), extension and application of improved farmed types. Recognizing the largely untapped potential of appropriate genetic technologies (both traditional breeding and modern biotechnology) to improve aquaculture production and production efficiency, risk assessment should be conducted prior to application, upscaling and dissemination of these technologies, to ensure that they are appropriate and adapted to local conditions.

16.4. Promote gender equality and women's empowerment in aquaculture

16.4.1. Striving for gender equality through gender mainstreaming in the aquaculture sector should be prioritised to make aquaculture value chains more equitable and maximising their contribution to food systems by redressing the gendered division of labour and provide women opportunities for accessing the most remunerative activities of the aquaculture value chain, not only being relegated to the post-production activities.

16.4.2. Improved technologies, knowledge and aquaculture management practices should be introduced, aiming to meet the specific needs of men and women and thus be coupled with awareness raising and capacity building activities. These activities should be designed through a gender-transformative approach to tackle the root causes of gender inequality, thus enabling both individuals and communities to equitably access assets and resources without exacerbating existing gender-based constraints or issues.

16.4.3. Sex-disaggregated data should be collected and adequately used to shed light on women's contribution to the aquaculture sector, but also to drive informed decision-making at policy level. The development of gender-specific indicators for the aquaculture sector shall be a priority that needs support of all key national stakeholders in order to set up more efficient data collection systems through the allocation of financial resources supporting technical capacities of statistics bureaux, enhancement of infrastructures used for the collection and the elaboration of data and building of technical capacities to produce homogeneous and consistent sex-disaggregated data across the sector.

16.4.4. Participatory approaches should be fostered to increase productivity through the development of more equitable and improved aquaculture techniques. Engaging value chain actors at individual, household and community level is crucial to tackle social norms that constrain women's empowerment and decision-making power, thus exposing them to vulnerability and poverty, especially when it comes to intra-household dynamics where women are much more exposed to biases and lack of agency making their work invisible and their voice unheard.

16.4.5. Gender-blind aquaculture laws, policies and institutions, should be revamped through a gender lens as these frameworks are to some extent hampering gender equality and limiting the contribution of women and other marginalised groups to the aquaculture value chain. By taking up approaches without a strong gender component, legal frameworks are often either directly or indirectly restricting women's ownership of assets (like, for example, access to land) and overlooking their vulnerability by designing gender-blind social protection schemes and financial support as well as impacting formal/informal employment figures.

16.5. Strengthen sustainable aquaculture value chains, transparent and predictable trade

16.5.1. Expansion of sustainable aquaculture can be catalyzed by access for farmers to domestic and international markets with higher efficiency, transparency and competitiveness. These markets can offer important opportunities to generate employment, greater income and technological improvements. They also carry risks associated with longer food value chains in which external factors such as non-tariff measures (NTMs) can play an important role and smallholder farmers have less control over input and output prices and markets.

16.5.2. Access to lucrative market and trade information and services should be facilitated to promote value creation and value addition. In particular, small-scale aquaculture farmers and operators must be able to access timely and accurate market information and services to help them adjust to changing market conditions, enhancing traceability and market competitiveness, inter alia by using digital and organizational innovations. Timely capacity development is key for enabling aquaculture actors to adapt to and benefit equitably from opportunities of global market trends and local situations while minimizing any potential negative impacts.

16.5.3. Promotion of international trade and export of aquaculture products should not adversely affect the nutritional needs of people for whom fish is critical to a nutritious diet, their health and well-being andfor whom other comparable sources of food are not readily available or affordable.

16.5.4. Promotion of a constant dialogue within the industry and with government institutions and organizing vulnerable groups in associations, cooperatives, and unions can facilitate equitable distribution of benefits to producers and workers, including overcoming international trade barriers and fostering suitable working conditions in the sector. Producer organizations can help smallholders access an arrayof services, including improved market information and food safety programmes, as well as services focusing onvalue-added production and marketing.

16.6. Reduce food loss and waste and promote sustainable consumption

16.6.1. All actors in the aquaculture value chain, from farm to fork, can and must play a role in reducing food loss and waste, reusing, recycling and promoting more sustainable consumption patterns. Often, it is necessary to perform a situation assessment, beginning with quantifying the main causes of food lossesand wastes, proposing different solutions and comparing their respective technical and economic feasibility, and impacts on food quality and safety, social and environmental acceptability.

16.6.2. Awareness raising, education and incentives are necessary to promote resilient and sustainable production and consumption, so consumers and producers are aware of environmental and social impacts when making decisions. These actions should be supported by policies and interventions to regulate production and distribution, traceability, to provide nutrition education to incentivize the general public to shift to nutritious and safe diets with a lower environmental footprint and energy use. Disseminating knowledge and technologies to reduce post-harvest losses can improve significantly the efficiency of food systems. Greater commitments to a circular economy in aquaculture, as an alternative to a traditional linear economy of producing, using and disposing, can optimize the use of natural resources, ensuring products, co-products and wastes are recovered and regenerated from production lines and across subsectors.

16.6.3. Recirculating water in aquaculture reduces water use and helps farmers to circumvent upstream diseaseoutbreaks or water shortages and reduces the use of antibiotics and therapeutants. Continuous removal of solids (fish faeces and uneaten feed) prior to discharge reduces the discharge of particulate organic matter and phosphorus considerably, benefitting the recipient environment and improving internal water quality. Finally, developing profitable business models, education and training are imperative if these technologies are to contribute significantlyto sustainable production of healthy aquatic foods in the future.

16.6.4. Traditional and cost-efficient technologies for fish preservation, such as solar drying, fish smoking or salting, should be improved and scaled up to promote environmentally sustainable practices that minimize the use of resources, such as water, wood for fish smoking, energy and ensure that final products are of good quality and safe for consumption.

16.7. Strengthen social responsibility of the aquaculture industry and markets

16.7.1. Aquaculture farmers and workers are important contributors to the world's agri-food systems and the management of natural resources, in particular land, water and living resources. Attributing a fair valueto their work as part of a sustainable food system is central to addressing inequality and attaining multiple objectives of the ASD. This requires removing structural constraints and providing smallholderand family farmers with the tools and capacities to build resilient livelihoods.

16.7.2. Improving social responsibility and decent livelihoods work conditions in the aquaculture sector requires: (i) supporting, actors of the aquaculture value chain and at all scales, engagement and involvement with aquaculture organizations, including those representing the interests of women, youth, vulnerable and indigenous people, (ii) protecting and improving rural livelihoods via the design and access to effective social protection schemes, (iii) adhering to relevant international instruments, including the provisions of the ASD related to social protection and decent work, (iv) working with the private sector and certification bodies to promote and enshrine fair and equitable treatment of aquaculture actors and workers in market access instruments and mechanisms, (v) developing training and skills building opportunities for youth and women, vulnerable groups and indigenous people, including capacity building programs aimed at the professionalization and (self-) regulation of farmers and decision-making government personnel and the industry, throughout the aquaculture value chain and at all levels, (vi) bridging the rural divide and empowering youth and women to access information, services, technology, finances and markets, taking a gender-transformative approach.

16.7.3. Future workforce for aquaculture expansion needs a set of competencies with strong information technology skills, which are attractive to the young. Extension agents and users can benefit from learning digital tools and using them effectively in daily farm practices.

16.7.4. Improving aquaculture social responsibility with other sectors that share common ecosystems and or care for the use and conservation of natural resources is essential to increase perception and acceptance of the sector. This is particularly relevant in areas, regions where aquaculture is new. Therefore, efforts should be made to include all relevant stakeholders in discussions related to aquaculture use of space and water and facilitation mechanisms of social dialogues should be sought. Such efforts will provide the opportunity to show and share aquaculture potential benefits and opportunities, especially for local populations.

16.7.5. Understanding the effect of trade restrictions and distortions in aquaculture markets are key to forming healthy, sustainable and well-functioning national and international aquafood markets, and taking advantage of the opportunities that trade offers. While reduced tariffs have been a facilitating factor in trade-driven development, much of the focus is on the role of NTMs in regulating and determining trade flows, by ensuring that imports meet domestic standards. NTMs regulations must be enacted in line with WTO principles of transparency, based on relevant international standardsor other scientific justification, non-discriminatory, and not more trade-restrictive than necessary.

16.7.6. Promoting a more enabling market environment for smallholders can help to provide fair and transparent prices that adequately remunerate smallholders' work and investments. Producers and trading firms should implement corporate social responsibilities that address environmental impacts, decent employment and working conditions in aquaculture, including eliminating child labor. They should promote predictable, transparent and reliable market instruments for certification.

16.8. Develop integrated agriculture-aquaculture food systems

16.8.1. Integrated agriculture – aquaculture systems should be promoted through proper policies and institutional framework to create incentives, promote research and development and multi-stakeholders' partnerships to attract investment and develop markets.

16.8.2. Aquatic food production can also be expanded through culture-based fisheries in the numerous seasonalwater bodies scattered throughout the world. Fish farming can be enhanced, contributing to food security and improving rural livelihoods. The potential contribution to global fish production from culture-based fisheries is estimated at 10.7 million tonnes per year in Asia alone.

16.8.3. Implementation of integrated multi trophic aquaculture in open coastal and marine systems is a challenge because nutrients and co- products dilute and move beyond the limits of individual farm concessions. Therefore, a landscape ecosystem integration is required and aquaculture management areas under the EAA become a necessity.To implement it, however, requires relevant changes in national and international (as appropriate) normsand legislations moving beyond from individual farms and focusing on management at the ecosystem scale with special attention to the ecosystems carrying capacities.

16.9. Promote information and communication technology, artificial intelligence and digitalization in aquaculture

16.9.1. Responsible use of ICT, AI, IoT, robotics, remote sensing, GIS, blockchain technology and other toolsshould be promoted to make aquaculture systems more precise, intelligent, climate resilient and sustainable. Digitalization and rapid adoption of these technologies by a country depend on the quality of digital connectivity available, the availability of reliable communications networks, the existence ofonline platforms and services, and the digital literacy of the population.

16.9.2. Policies should be put in place to break barriers, address the adverse effects of the digital divide, not least for small-scale fish farmers and low-income households, and build trust and confidence in online business. These policies should protect against unfair trade practices, product safety and cybersecurity concerns, which have been amplified in the COVID-19 pandemic context.

16.9.3. Consumers increasingly require a safer online commerce environment and companies to adjust and provide more transparency and cybersecurity. Likewise, technologies that improve safety at work and generate efficiency gains are likely to be retained beyond the COVID-19 crisis. Countries and companies prepared to deploy these innovations and technologies would gain competitive advantage and market access.

16.9.4. Directing stimulus investments to accelerate adoption of smart aquaculture technologies can support science and improve observation and understanding of the aquatic eco-systems more efficiently and effectively. New digital programmes collecting and interpreting data using satellites and enhanced drones can support, replace or expand traditional programs that collect scientific data for management and enforcement of regulations. Promotion of citizen science using mobile phones to collect and disseminate data on aquaculture operations and aquatic environment can prove cost-effective and enable participatory approaches.

16.10. Monitoring, data collecting, data analysing and reporting

16.10.1. Aquaculture expansion in support of SDGs requires the design and implementation of a robust indicatorframework to monitor and report progress and build accountability. Indicators must be selected carefullyto ensure ease and cost-effectiveness in their collection, analysis and dissemination. Overly

complex data collection and analysis protocols might be prohibitive technically and financially. Data disaggregation by gender and other specific needs can be instrumental in targeting interventions of aquaculture expansion to specific groups, leaving no one behind.

16.10.2. Several countries have been involved in the Voluntary National Review (VNR) reporting on SDGs. Some have been able to report on fisheries and aquaculture. These experiences should be shared and upscaled through FAO support to ensure that aquaculture is well included.

16.10.3. FAO has a long tradition and experience reporting through COFI and its two Subcommittees on aquaculture and trade on the implementation of the Code by FAO Members. Digitalization of the reporting forms has improved significantly reporting rates and the quality of the information reported, including in relation to the reporting on the contribution of fisheries and aquaculture to achieving SDGs. The Blue Transformation framework has developed further the monitoring and reporting methodology to track achievements of its three pillars against specific targets and indicators and relate them toSDGs targets and indicators.

17. Final considerations

17.1. All parties are encouraged to implement these Guidelines for Sustainable Aquaculture in accordance with national priorities and circumstances. This requires that Members and other parties promote financial and technical aid' effectiveness and responsible use of technical and financial resources. Development partners, specialized Agencies of theUnited Nations, and regional organizations are encouraged to support efforts by Members to implementthese Guidelines, including through South–South cooperation. Such support could include 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.

17.2. Members and all other parties should work together to create awareness of the Guidelines for Sustainable Aquaculture, including by disseminating simplified and translated versions.

17.3. Members should recognize the importance of monitoring and reporting systems that allow their institutions to assess progress towards implementation of the objectives and recommendations in these Guidelines for Sustainable Aquaculture. Mechanisms allowing the results of monitoring to feed back into policy formulation and implementation should be included. Gender should be taken into consideration in monitoring and reporting by using gender-sensitive approaches, indicators and data. Members and all parties should elaborate participatory assessment methodologies that support a better understanding and documentation of the true contribution of aquaculture to sustainable resource management for food security and poverty eradication, including both men and women.

17.4. Members should facilitate the formation of national-level platforms, with cross-sectoral representation, to oversee implementation of the Guidelines for Sustainable Aquaculture, as appropriate. Legitimate representatives of aquaculture dependent communities and related stakeholders should be involved both in the development and implementation strategies and in monitoring and reporting on the implementation of the Guidelines for Sustainable Aquaculture.

17.5. FAO should lead efforts to develop and promote a Global Umbrella Programme to support the dissemination and implementation of these Guidelines for Sustainable Aquaculture in support of achieving the ASD.

17.6. The FAO-led Global Umbrella Programme, should support, in collaboration with technical and financial institutions, NGOs, CSOs and industry representatives, the development and implementation of local, national, regional and international strategies and plans of actions to support the implementation of these Guidelines for Sustainable Aquaculture in support of achieving the ASD.

Annex 1: Description of terms as presented in these GSA