

## PART III

# Outlook on Fisheries and Aquaculture of the Southeast Asian Region

### 1. Growing Demand for Fish and Fishery Products

In Southeast Asia, fish and fishery products are among the major sources of protein uptake of its people consuming fish at a regional average per capita of 39.4 kg/person/year as of 2017, almost double that of the world's average per capita consumption of 20.3 kg/person/year (FAO, 2020). The role of fisheries in the region has no doubt, formed part of people's livelihood, food and nutritional security, income, as well as of national economic development through domestic and international trade. During the past decade, however, the fisheries sector had been confronted with challenges in sustaining its fish supply to fulfill the heightened demand for fish and fishery products by the increasing population not only within the region but also worldwide. The world population is anticipated to continue to increase from 7.8 billion in 2020 to 8.1 billion by 2030 and 9.6 billion by 2050 (Table 1), but with possible slight decline in birth rate as observed in several countries in 2021 resulting from the COVID-19 pandemic. Although the overall COVID-19 situation had gradually improved in several countries/regions in 2021 with most of the people already developing their immunities through the vaccination programs, among others, such a situation during the coming years remains uncertain, and could still

create some impacts on the projected world population and demand for food fish.

During the past 15 years, the overall supply of fish and fishery products from the region continued to show an increasing trend, although at the end of 2019 and 2020 the sector had been largely impacted by the COVID-19 pandemic and ended up generating minimal increases in fish production. In the broader agricultural perspective, OECD-FAO (2021) reported a drop in international agricultural trade during the first few months after the COVID-19 outbreak, but the trade recovered rapidly and continued to grow between 2019 and 2020 but only at the barest minimum average. Results of the study undertaken by SEAFDEC in 2021, noted that the impact of COVID-19 on the sustainability of the fisheries sector was severe at the initial emergence of the disease because of the measures imposed by countries to prevent the spread of disease that resulted in drastic decrease of the market demand and disruption of the supply chain. However, the study also indicated that the sector could still be managed to adapt to the changes, and maintain the supply of fish and fishery products from the aquaculture and capture fisheries sub-sectors. It should therefore be expected that the future supply of fish and fishery products could still be maintained and in fact, could be elevated with continued technological

**Table 79 . Projected population, fish production, per capita production, and GDP of the Southeast Asian countries**

Countries	Population (million)			Fish production (2019) (thousand t)	Average per capita fish consumption (2017) (kg/ person/yr) <sup>c</sup>	GDP (billion) (2019) <sup>e</sup>
	2020 <sup>a</sup>	2030 <sup>b</sup>	2050 <sup>b</sup>			
Brunei Darussalam	0.4	0.5	0.6	14.7	41.2	13.5
Cambodia	16.7	18.0	22.3	969.1	42.7	27.1
Indonesia	273.5	273.2	309.4	22,614.6	44.7	1,121.3
Lao PDR	7.3	7.9	10.3	183.9	25.3	18.8
Malaysia	32.4	35.3	43.6	1,872.8	57.8	364.4
Myanmar	54.4	61.7	70.8	5,931.8	45.9	66.5
Philippines	109.6	120.2	150.1	4,413.1	26.2	377.1
Singapore	5.9	5.8	6.1	7.2	46.6	372.1
Thailand	69.8	72.9	71.0	2,488.8	29.5	544.0
Viet Nam	97.3	100.4	109.3	8,270.2	37.7	261.6
<b>Southeast Asia</b>	<b>667.3</b>	<b>696.3</b>	<b>793.2</b>	<b>46,766.2</b>	<b>39.8<sup>d</sup></b>	<b>3,166.4</b>
<b>World</b>	<b>7,794.8</b>	<b>8,084</b>	<b>9,587</b>	<b>213,700</b>	<b>20.3</b>	<b>87,345.3<sup>e</sup></b>

**Source:**

<sup>a</sup> The 2019 Revision of World Population Prospects (UN, 2021)

<sup>b</sup> World Population Prospectus: The 2015 Revision, Key Finding and Advance Tables (UN, 2015)

<sup>c</sup> FAO Yearbook 2018 (FAO, 2020)

<sup>d</sup> Calculated based on per capita fish consumption and population in 2017 (food supply 25,583,882; population 642,278.6 thousand)

<sup>e</sup> International Monetary Fund Database (IMF, 2021)

developments and appropriate management that would ensure the sustainable utilization of the fishery resources.

## 2. Issues and Challenges towards Sustainable Utilization of Fishery Resources

In order for fish and fishery products to continue fulfilling the projected demand for food fish by the world's increasing population, the FAO Code of Conduct for Responsible Fisheries (CCRF) adopted in 1995 would continue to provide the principal direction towards ensuring the responsible and sustainable development of the fisheries sector. Moreover, another very important global framework that is also relevant to the fisheries sector is the Sustainable Development Goals (SDGs) adopted by the United Nations in 2015, universally calling for action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The SDGs are at the center of the 2030 Agenda for Sustainable Development, which provides a shared blueprint for harmony and prosperity of people and the planet, now and in the future. There are several SDGs relevant to the fisheries sector, especially the SDG 14 "Life Below Water" which highlights the importance of fisheries and aquatic resources as it sets the ambition to "conserve and sustainably use the oceans, seas and marine resources." Other relevant SDGs include the SDG 1 "No Poverty," SDG 2 "Zero Hunger," SDG 12 "Responsible Production and Consumption," among others. The Convention on Biological Diversity (CBD) is another global framework that could be referred to as it is aimed toward the conservation of biological diversity, sustainable use of the components of biological diversity, and fair and equitable sharing of the benefits arising from the utilization of genetic resources. At this stage, Parties to the CBD are negotiating the post-2020 global biodiversity framework to include a new set of global goals and targets for biodiversity. For its sustainable development, the fisheries sector should exert efforts toward achieving such global goals and targets in the future.

Cognizant of the need to comply with the CCRF and undertaking the initiatives toward achieving the SDGs and other relevant global frameworks and targets, the fisheries sector of the Southeast Asian region had been developed and managed within the framework of the "Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2030" which was adopted in 2020 by the Ministers and Senior Officials responsible for fisheries of the ASEAN-SEAFDEC Member Countries. Furthermore, the ASEAN Member States (AMSs) had also adopted the "Strategic Plan of Action for ASEAN Cooperation on Fisheries (SPA-Fisheries) 2021–2025" to continue the strategic thrust and action programs from those achieved by the previous Strategic Plan (2016–2020). The SPA-Fisheries aims to ensure a competitive, inclusive, resilient, and sustainable fisheries in the AMSs that

contributes to economic growth, poverty alleviation, food security, and nutrition.

In the coming decade, such aforementioned global and regional frameworks would continue to guide the AMSs in ensuring that the development of the fisheries sector (including aquaculture) would be toward sustainability. This implies that the fisheries sector should not only address the need to generate livelihoods, incomes and economic development at the national/regional levels, but also maintain its significant contribution to the world's fish supply and fulfill the increasing demand for fish in the coming years. Nevertheless, a number of emerging and new challenges remains looming in the fisheries horizon that needs to be addressed to ensure the sustainable development of fisheries and aquaculture in the Southeast Asian region.

### Promotion of responsible fisheries and aquaculture technologies and practices

After the CCRF was adopted in 1995, SEAFDEC in collaboration with the AMSs and with funding from the Japanese Trust Fund, regionalized the CCRF and developed a series of Regional Guidelines for Responsible Fisheries in Southeast Asia reflecting the regional specificities and characteristics of the region's fisheries, to make sure that the CCRF would be adopted by the countries at the national as well as regional level. Guided by the CCRF and the Regional Guidelines, a new era of fisheries development ensued, which harmonizes development with the aquatic environment and has been promoted to attain sustainability in fisheries. Along the way and as a consequence of pursuing responsible fisheries and aquaculture development, issues and concerns were encountered thus, R&D efforts had to be strengthened in order to address such concerns.

- *Marine capture fisheries*

The AMSs have been undertaking wide ranging initiatives to improve the effectiveness of fisheries management and ensure sustainable productivity from coastal and marine resources. However, the marine capture fisheries sub-sector continues to be confronted with the pressures from several challenges. SEAFDEC therefore sustains its efforts in addressing such challenges through its R&D endeavors as well as its activities on information dissemination and sharing.

Illegal, unreported and unregulated (IUU) fishing is one of the major contributors to the depletion of the coastal and marine resources. While the "ASEAN Guidelines for Preventing the Entry of Fish and Fishery Products from IUU Fishing Activities into the Supply Chain" adopted by the ASEAN Ministers in 2015 provided the overall framework for the AMSs to take actions to combat IUU fishing, other mechanisms had also been established

under the ASEAN framework, particularly the ASEAN Network for Combating IUU Fishing (AN-IUU); and the ASEAN Roadmap on Combating Illegal, Unreported and Unregulated Fishing (2020–2025). Initiatives at the national and regional levels as well as collaboration with relevant organizations have been strengthened to support the capacity of the AMSs in fulfilling their responsibilities as coastal State, flag State, and port State, and thereby contribute to the efforts in addressing the issues related to IUU fishing.

Another major challenge faced by the AMSs is the imposition of measures by importing countries to ensure that exported fish and fishery products are derived from sustainable means and sources. This includes compliance with the standards and schemes developed and applied by the private sector, *e.g.* ecolabeling, while several importing countries such as the United States of America and European Union also issued measures preventing the entry of fish and fishery products from IUU fishing into their markets. Future measures from importing countries could be more stringent requiring the exporting countries (including the major exporting AMSs) to comply with. This implies the need to strengthen the implementation of ongoing initiatives for combating IUU fishing, *e.g.* promotion of MCS, application of traceability of fish and fishery products (including those produced by small-scale fisheries), complying with port State measures, carrying out observers onboard programs. Moreover, the application of appropriate equipment and technologies should also be enhanced to reduce the use of excessive human resources in fishing operations, *e.g.* use of modern electronic systems and databases that could be linked and shared with relevant agencies, conduct of risk analysis, use of Artificial Intelligence or AI in analyzing large amount of data to track illegal activities, as the results could contribute to the solutions of some of the possible root causes of illegal and unregulated fishing.

The continued promotion of responsible fishing technologies and practices has remained an important issue for Southeast Asia. While efforts had been made to minimize the impacts of fishing on the fishery resources and their habitats, calls had been made for the reduction of fuel consumption and greenhouse gas (GHG) emission from fishing operations, the development of technologies on fishing gears that reduce the incidental catch of endangered and threatened species, and enhanced compliance with upcoming trade-related measures, *e.g.* the U.S. Marine Mammal Protection Act to be put into practice in January 2023, among others. Moreover, incidences related to abandoned, lost or otherwise discarded fishing gear (ALDFG) should be investigated as it causes mortality not only to fish but other aquatic animals, such as marine turtles and marine mammals. This implies the need to develop and promote some measures such as the adoption of gear marking following the

relevant provisions in the FAO Voluntary Guidelines for the Marking of Fishing Gear (VGMFG). Furthermore, the impacts of marine debris and microplastic (from fisheries and non-fisheries sectors) on fish and their habitats, especially the possible contamination in fish that would impact on food safety, has also become an important concern that need to be investigated.

Another significant challenge for the sustainable management of marine capture fisheries in Southeast Asia is the difficulties in obtaining knowledge on the status of the fishery resources and stocks, especially for transboundary species that require regional or sub-regional cooperation to be able to undertake research studies and data collection. While several stock assessment models had been adopted to conduct stock and risk assessments of some neritic tunas and tuna-like species in the region, the future challenge is on how to put the recommendations derived from such stock and risk assessment efforts into practice. Furthermore, there is also a need to develop appropriate target reference points for evaluating the current resource status and the projected capacity level to determine the maximum sustainable yield, allowable biological catch, or allowable effort for marine fisheries. Such information is crucial for the management of fishing capacity to commensurate with the available resources and fish stocks. Moreover, considering the high cost of undertaking conventional stock assessment, the application of innovative and modern technologies could also be explored and applied in monitoring of the fish stocks, *e.g.* genetics study, use of acoustic technologies.

Shortage of fish workers onboard fishing vessels would also continue to be an important challenge for marine capture fisheries of several large fishing nations. While it is necessary to secure workers needed for the industry, there is also a need for vessel operators to comply with relevant international requirements, especially the International Labour Organization (ILO) Convention No. 188 or “Work in Fishing Convention” (C188), the ILO Protocol to the Forced Labour Convention, 1930 (P 29), among others, although most countries in the region have not yet ratified these instruments. Novel technologies to reduce the labor onboard fishing vessels should therefore be promoted, while educational and skills development programs should be initiated for new crew members and workers entering the industry to mitigate the problems related to shortage of fishing crew in the longer term.

- ***Inland capture fisheries***

Inland capture fisheries would continue to be an important sub-sector that contributes to food security and livelihood of people, especially those in the remote rural areas. The sub-sector has been challenged by the multi-users that compete with fisheries on the utilization of water resources. Another important future challenge is on how

to enhance data collection on inland fisheries in order that such data could provide justifications on the importance of inland fisheries in the respective countries' national economic development. The application of technologies such as GIS and Remote Sensing should be explored and promoted together with the development of applications using mobile phones as these could also facilitate data collection in remote rural areas. It should be made clear that awareness on the importance of the inland fisheries could be raised with appropriate data collection, analysis, and interpretation.

Another important threat to inland fishery resources that need to be mitigated is the disconnectivity of inland aquatic habitats, due to large infrastructure construction by the other sectors, *e.g.* dams and irrigation weirs that obstruct longitudinal migration of fishes, as well as other construction such as water gates and roads that obstruct movement of fish and larval drift. Such threat could be mitigated through construction of appropriate fish passages, the design of which need to consider the specificity of the localities including the species that are vulnerable to the disconnectivity of their habitats. Inter-agency coordination should then be strengthened to enhance the awareness of concerned stakeholders on the impacts as well as solutions for mitigating the impacts.

Illegal and unregulated fishing practices in inland waters could include the use of unfriendly fishing methods such as fishing with toxic chemical substances, explosive materials, and prohibited gears and ways such as electro-fishing; fishing without license or quota for certain species; catching undersized fish or fish that are otherwise protected by regulations; and fishing in closed areas or during closed seasons, among others. Management measures such as the imposition of closed season or prohibition of the use of certain fishing gears as promoted in the marine fisheries sub-sector could be adapted for inland fisheries. Moreover, the attention on depletion of fishery resources that focused predominately on marine fish stocks should also include the freshwater aquatic species as these are of great importance to rural communities. Through such efforts, inland fisheries could be well appreciated and valued in government resource planning and decision-making.

A substantial challenge in the sustainable development of inland capture fisheries is on the collection and reporting of reliable data on wild-caught freshwater fish. Considering the limited port landing sites for inland capture fisheries and most of the harvested fish is consumed in households without entering the market chain, the data on inland fish catch are scattered and not well documented by government authorities. The recent initiatives on improving the collection of data on inland fisheries should therefore be promoted, and in some instances and where possible, the methods of collecting

inland fisheries data could be patterned after those of the marine capture fisheries.

- ***Aquaculture***

In an effort to increase productivity from aquaculture, many Southeast Asian countries have intensified their aquaculture practices and expanded their aquaculture areas. Meanwhile, national policies have provided the enabling business environment to encourage efficiency and technological advancements in the manufacture of aquaculture feeds, R&D on genetics and breeding, disease management, product processing, and marketing and distribution. All these are meant to support the growth of the aquaculture sub-sector to meet the increasing demand for food fish.

Development and promotion of responsible aquaculture technologies and practices in the region should therefore be continued and intensified, especially the technologies that minimize impacts of aquaculture practices on the environment, *e.g.* use of recirculation and recycling systems, moving towards zero-waste in aquaculture production, adoption of the integrated multi-tropic aquaculture (IMTA) system, enhancement of carbon sequestration. The problems on high cost of aquafeeds should be addressed by using feed formulations that small-scale fish farmers can adopt, exploring appropriate alternative plant-based products as feed ingredients, alternative feeding for commercially significant fish species, among others.

In order to support responsible aquaculture practices, the existing policy frameworks could be adopted, *e.g.* the ASEAN Good Aquaculture Practices for Food Fish and ASEAN Shrimp Good Aquaculture Practices certification and accreditation system; the ASEAN Guidelines for the Use of Chemical in Aquaculture and Measures to Eliminate the Use of Harmful Chemical, the Regional Guidelines on Traceability System for Aquaculture Products in the ASEAN Region, among others. The adoption of good aquaculture practices not only helps in ensuring safe aquaculture products for human consumption, but also in making sure that aquaculture productions are in compliance with various requirements, *e.g.* environmentally friendly, social responsibility, food safety, bio-security, traceability, thus, enhancing the competitiveness of aquaculture products in the international fish market.

Aquatic animal disease outbreaks if not properly contained, would continue to be an impediment in the sustainability of the aquaculture sub-sector. While the issue on improved fish health management including disease prevention and control needs to be addressed, the development of early warning system for aquatic animals with well-defined contingency plan should also be considered a priority in order to prevent further spread of aquatic diseases that

could cause massive losses to the aquaculture industry. In this regard, there are two important regional guidelines that should be referred to: the Regional Technical Guidelines on Early Warning System for Aquatic Animal Health Emergencies, and the Standard Operating Procedures for Responsible Movement of Live Aquatic Animals for ASEAN. Furthermore, since the use of antimicrobials in aquaculture which is relevant to aquatic diseases, should also be addressed, adoption of relevant regional guidelines, *e.g.* Regional Guidelines on Performing Risk Analysis for Antimicrobial Resistance (AMR), Regional Guidelines for Prudent Use of Antimicrobials in Aquaculture, and the Regional Plan of Action on AMR in Aquaculture, should therefore be promoted.

### **Promotion of sustainable fisheries management**

Due to the nature of fisheries in the region that comprise large number of small-scale fishers, management approaches that enhance the participation of concerned communities, such as community-based management and co-management which has long been adopted by several countries in the region, would continue to be important and should therefore be further promoted. While the development of management plans and rules/regulations on utilization of fishery resources with the enhanced involvement of local communities would contribute to sustainable resources utilization, this would also contribute to addressing the other cross-cutting issues, such as securing sustainable small-scale fisheries (in line with the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication or the VGSSF Guidelines), enhancing gender integration and gender equity in the fisheries sector, and improving livelihoods and socioeconomies of the communities.

The Ecosystem Approach to Fisheries Management or EAFM (as well as the Ecosystem to Aquaculture or EAA) is another approach that should be sustained as agencies responsible for fisheries of the AMSs have already enhanced their knowledge and their capacity in the implementation of the EAFM concept. In Southeast Asia, several sites had been selected to pilot test the application of the EAFM concept with support from relevant international and regional organizations. Therefore, the respective AMSs should continue to expand the adoption of the EAFM nationwide in their countries.

### **Fishery resources and habitats protection**

The concept of fisheries *refugia* has been considered important in the conservation and management of major critical coastal habitats, *e.g.* mangroves, coral reefs and sea grass beds, in accordance with the “Regional Guidelines on the Use of Fisheries *Refugia* for Capture

Fisheries Management in Southeast Asia” adopted in 2006. Applying the concept of fisheries *refugia* would complement the existing conservation and management measures, including the integration of fisheries with habitats management. While countries in the region have on-going programs on establishment and operation of fisheries *refugia*, these should be enhanced and expanded to also support the concept of “other effective area-based conservation measures” (OECM) promoted under the CBD framework. This is considering that the concept of OECM is being incorporated in the target of the post-2020 global biodiversity framework which would be finalized at the 15<sup>th</sup> Meeting of the Conference of the Parties (COP) to the CBD scheduled in October 2021 and April-May 2022 (CBD, 2020).

### **Promotion of responsible utilization of fish and fishery products**

In the future, food security will remain a key concern in Southeast Asia. Hence, feeding more people with less by maximizing the utilization of fishery resources while reducing food losses and wastes would be important areas to look into. As the economies in the AMSs had improved, demands for high quality seafood also grew, leading the countries toward facilitating and encouraging more bilateral trade. This had enhanced the importation of goods between and among countries, even if such goods have to be transported through thousands of miles before reaching the domestic market. Considering that fish and seafood are temperature sensitive and are highly perishable, deterioration occurs due to microbiological metabolism, oxidative reactions and enzymatic activities, processes that could be heightened under poor temperature control. This highlights the need for better food quality preservation during transportation, which also contributes toward ensuring food safety of fishery products. In order to address these concerns, the region would need to implement changes across the fishery supply chain, from processing and packaging to cold chain management.

- ***Processing***

Appropriate processing technologies throughout the post-harvest stage could be utilized to minimize fish losses and wastes, and improve the quality of fish, *e.g.* use of improved and more selective equipment to improve water quality and prevent diseases; use of raised drying racks, ice machines, insulated boxes, refrigerated vehicles, improved fish smoking kilns, mechanical dryers; enhance preservation methods such as smoking, salting, freezing and packaging methods; use of mobile apps to undertake efficient transactions, distributions and marketing; acquire equipment to be used for underutilized species; adopt novel flesh bone separation technology to remove fish meat from by-products such as fish frames.

Technologies on their own will not guarantee that fish losses and wastes would be reduced as frequent maintenance, proper usage and the right knowledge and skills are necessary for such technologies to be adopted effectively. Supportive government policies, enforcement of laws, the media, non-government organizations, and pressures from public to minimize losses and wastes are equally important. The introduction of by-product utilization training, post-harvest facilities assistance, use of efficient technologies, implementation of traceability systems, certification programs such as GMP and HACCP and guidelines would also contribute towards ensuring the quality and safety of chilled fish and seafood, as well as reducing food losses and wastes.

- **Packaging**

Packaging maintains product safety and quality, offers protection, and facilitates movement of goods and handling. For example, freshwater fish should be packaged in insulated containers such as high-density polyethylene with lids for short distance transportation, while for longer distances the containers should be aerated and cooled by portable devices.

Modifying the packaging process can help extend the shelf life of chilled fish, such as placing in modified atmosphere or making use of vacuum packaging. Chilled and frozen seafood should be stored in other types of packaging materials, such as thermoplastic and other packaging varieties that are thermoformed into the required size before packing, *e.g.* Modified Atmosphere Packaging (MAP). The characteristics of MAP usually require two different films: a relatively rigid lower film that can be thermoformed into a tray, and a flexible film lid which closes the tray and maintains the quality and freshness of the fish under modified atmosphere. Both materials – the upper and lower films – must have high barrier properties but could be reliably combined with one another. Intelligent MAP trays are also fitted with absorbent pads that soak up any liquid from the fish fillet and at the same time release CO<sub>2</sub> that inhibits the development of harmful bacteria and prevents enzymatic spoilage processes. This can often extend the shelf life of the products by several days.

- **Cold Chain Management**

The Codex Alimentarius Commission (2008) defines Cold Chain as “a term embracing the continuity of successively employed means to maintain the temperatures of foods, as appropriate, from receiving through processing, transport, storage, and retailing.” The fisheries industry relies heavily on proper cold chain management practices to ensure quality, safety and commercial viability of its fish and seafood. It is extremely important to ensure that there is no breakage of the cold chain from the production of

cultured commodities or wild catch, post-harvest handling, receiving, processing, packaging, transporting to retail markets, to maintaining the high quality and safety of fish and seafood. Cold chain management practices such as the utilization of ice, refrigerated seawater, storage in refrigerated facilities, chilling or freezing, are regulated under the cold chain throughout the supply chain. Additionally, these low temperature conditions must be supported by good and hygienic handling practices to delay the onset of spoilage of the fish and seafood (SEAFDEC, 2019b).

Incorporating training and awareness as an integral part of commercial operations, as well as upgrading the skills and knowledge of concerned technical persons to keep them abreast with the changes in legislation and standards are also important for minimizing fish losses and wastes. Encouraging consumers through various platforms such as campaigns, to accept products that are nutritionally beneficial and meet the food safety standards but may appear visually different from the fresh ones, is also an important way to reduce wastes at the retail market level. It is also crucial to increase the consumers’ awareness of food preservation, preparation, and waste avoidance (FAO, 2021).

### **Enhancement of international fish trade**

In order to enhance trade in fish and fishery products, not only for domestic but also for the international markets, the capacity of countries that could not yet comply with the requirements of importing countries should be improved. This is true for the various aspects that had remained to be importantly challenged, *e.g.* analysis of contaminants including chemicals, antibiotics, biotoxins; implementation of quarantine and inspection/sampling procedures, and the Sanitary and Phytosanitary (SPS) measures, strengthening their fish quality and safety management systems in accordance with the global standards, *e.g.* ISO22000: Food Safety Management System.

During the past decades, several trade-related measures have been developed and imposed to ensure that fish and fishery products are produced and harvested (or cultured) in sustainable and responsible manner. These measures include the various requirements from certification schemes for capture fisheries and aquaculture. Adoption of good fishing technologies and good aquaculture practices would therefore enable the fish and fishery products from the region to enter in the international trade. Moreover, considering that several importing countries, *e.g.* the U.S. and EU, had been imposing more stringent requirements to ensure that fish and fishery products from IUU fishing could not enter into the supply chain of their countries, compliance with the requirements for combating IUU fishing therefore remains another challenge for the

countries in the region to enable their fish and fishery products to enter the international trade.

Moreover, trade-related measures have also been used to ensure that fishing activities are properly regulated and would not impact on the existence of endangered and threatened aquatic species. Adhering to important international agreements, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) that aims to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species, is also of utmost importance. In the past sessions of CoP–CITES, several commercially-exploited aquatic species, such as certain species of sharks and rays, tunas, seahorses, sea cucumbers, anguillid eels, among others, have already been listed in the Appendices of the CITES. Nevertheless, as listing of species into the CITES Appendices could pose trade difficulties not only for the listed species but also for their look-alikes and their products in various forms, countries in the region should therefore strengthen their collaboration in the collection of relevant data, and sustain the discussions and development of common and coordinated positions on the listings of additional species which could be raised during the up-coming sessions of CoP–CITES. This way, it could be assured that the listings would be undertaken based on the available scientific evidences.

The recent COVID-19 pandemic also brings another challenge for the frozen food exporters, considering that suspension could be enforced by importers for certain period of time for the exporting countries, when their samples are tested positive of the virus. However, such challenge could be only temporary when the pandemic issue is considered threatening. Nevertheless, countries in the region may need to consider establishing systems or certification issuance procedures to ensure that their products are free from any contaminations.

Another regulation that is expected to be put into force by the United States of America is the U.S. Marine Mammal Protection Act or the MMPA, which intends to impose provisions for managing fisheries interactions with marine mammals. Considering that the MMPA would be put into force starting January 2023, it becomes necessary for countries in the region to submit comparative findings in order that products from fisheries where comparability findings is available could be exported to the U.S. It is also necessary for countries in the region to enhance their capacity, especially in data collection on the status of marine mammal species and their bycatch in fishing activities, as well as in their adoption of mitigation technologies to minimize marine mammal bycatch, as this would ensure that products from their fisheries would be able to enter the U.S. market in the future.

The ongoing discussion at the World Trade Organization (WTO) on fisheries subsidies is another important development with a view to discipline subsidies that contribute overcapacity, overfishing, and IUU fishing. Although the final text on fisheries subsidies is still subject to finalization, several challenges could be anticipated once the text is finalized and countries in the region would have to comply with, especially considering that majority of fishers are small-scale catching multispecies and using multigears that result in difficulties in providing catch data by species and in coming up with stock assessment results, as well as difficulties in determining IUU fishing activities especially in overlapping areas. Collaboration among countries in the region to address such challenges is therefore necessary.

### **Mitigation of the impacts of climate change**

An important regional platform that directly supports climate change adaptation, policy making, capacity building, and information exchange among the countries, is the ASEAN Ad-hoc Steering Committee on Climate Change and Food Security. Under such platform, the respective AMSs have engaged in various dialogues to develop effective measures for the fisheries and aquaculture to adapt to climate change impacts and to develop regional guidelines on the use of climate change indicators for fisheries and aquaculture planning. In the coming decade, climate change would remain to be a big challenge not only to the fisheries sector but also to all human activities and the global ecosystems. Therefore, measures and support programs are necessary to mitigate the impacts of climate change to the fisheries sector as well as to enhance the resilience of people that are vulnerable to the impacts, including the development of climate-smart fisheries and aquaculture initiatives.

### **Putting the policy frameworks and guidelines into practice**

While noting that several fisheries-related policy frameworks and guidelines have been developed and adopted at the global and regional levels with a view to guiding the national implementation toward sustainable utilization of fishery resources, several impediments could still be anticipated in putting such policy frameworks into practice in some countries, especially if the existing legal frameworks are insufficient to support the implementation by relevant agencies. It is therefore necessary for the respective countries to review their relevant national legal frameworks to identify the gaps for implementation, and if possible, to amend such frameworks accordingly. In addition, as it is recognized that several issues and required actions involve not only the fisheries but also other relevant sectors, while actions could not be effectively undertaken solely by the agencies responsible to fisheries,

it is therefore necessary to establish mechanisms and supporting tools that enable inter-agency coordination in various context and sub-sectors.

Moreover, it is also deemed necessary to strengthen the cooperation between and among countries in the region with relevant international/regional organizations and institutions, especially to facilitate the understanding of the issues and support the countries' capacity building in the implementation of the global and regional policy frameworks, as well as in establishing the tools that support the implementation at the regional and national levels. Involvement of the private sector in the adoption of good practices that comply with provisions of relevant global frameworks and requirements of importing countries is therefore crucial in assuring that fish and fishery products in the region are derived from responsible and sustainable practices. This would also ensure that the fishery resources would be utilized in the manner that would continue to contribute to the well-being of peoples not only those living at present but also the future generations and beyond.