

could export its fish and fishery products to the EU. After taking action to address such issues, the yellow card was lifted after few years. Nevertheless, the Philippines continued to improve the working and living conditions onboard its fishing boats by establishing in May 2016 the Rules and Regulation Governing the Working and Living Conditions of Fishers Onboard Fishing Vessels Engaged in Commercial Fishing Operations (Department Order No. 156-Series of 2016). Thailand also got a yellow card from the EU in 2014, and one of the actions undertaken by the country is to improve its national law concerning working and living conditions, and safety at sea of fishing boats. Thailand was also ranked in 2015 with “Tier 3” by the US State Department’s Trafficking in Persons (TIP) Annual Report which rated the country with the worst human-trafficking records. After several improvements of its national laws and regulations, Thailand’s status was upgraded in mid 2016 to the “Tier 2 Watch List.”

Future challenges of the Southeast Asian region would therefore be on whether the countries could accommodate the requirements stipulated in relevant international convention and recommendations in their respective legal frameworks, and actively undertake measures to upgrade or enhance the level of working and living conditions, and safety onboard fishing boats in the future. Close cooperation among countries and thorough understanding of the issues and emerging requirements are among the most important requirements that need to be pursued.

## 9. COMPETITION ON USE OF WATER RESOURCES WITH OTHER SECTORS

Increasing demand for food, water, and energy, owing to the increasing global population and consumption pattern, makes services from aquatic ecosystems either inland or marine, more in demand while aquatic resources undergo more stress from competition and over-utilization. Under such a situation coupled with anticipated impacts of climate change which could be more prominent in the future, the fisheries sector is likely to face higher competition with other sectors sharing the limited water resources.

For inland capture fisheries, the most obvious competition could be seen from the alterations of inland aquatic habitats for urbanization and industrialization purposes. With increasing human population, large areas of floodplains are converted into housing areas, resulting in the shrinkage and disconnectedness of aquatic habitats, exacerbated by road constructions without sufficient underway, threatening the sustainability of inland aquatic biodiversity and the fishery resources. Urbanization and industrialization also create higher demand for water resources for household consumption and at the same time generate large amounts

of wastes that pollute and contaminate the natural bodies of water if not properly disposed of or treated.

As the main priority food producing sector of the Southeast Asian region, agriculture is also the highest water-consuming sector. With human population that continues to increase together with food security requirements, greater demand for water is created to boost production through agricultural intensification. Higher inputs are used by farmers, particularly chemicals in fertilizers and pesticides, to produce higher yields and increase profits. Agricultural intensification also creates impacts on the natural bodies of water, *e.g.* discharge of excess nutrients and chemicals that leads to contamination and eutrophication of the aquatic habitats resulting in degradation of aquatic habitats and resources. Development of irrigation systems to support agricultural intensification also affects the fisheries sector as the natural aquatic habitats and water resources are altered in the process. The anticipated impacts of climate change (*e.g.* longer drought during dry season, heavier rains and floods during rainy season) also have their repercussions on the availability of water supply for irrigation purposes and fishery activities in the future.

To enhance the effective utilization of land and water resources, integrated agriculture-aquaculture could be considered as an option which could also mitigate the conflict between the fisheries and agriculture sectors, *e.g.* fish culture in rice fields (rice-cum-fish) with reduced or restricted use of pesticides and weedicides in rice cultivation and where fish is stocked to gain yield from both rice and fish, integrated fish farming that could make use of wastes from livestock and poultry for primary production of herbivorous fish. Fish from integrated aquaculture, although considered as secondary or complementary production, could contribute to production of nutritionally balanced food for the people.

Along with urbanization, industrialization, and agricultural intensification, cross-river obstacles are also being constructed in several Southeast Asian countries for development purposes, *e.g.* to increase domestic water supply, improve irrigation systems, and enhance hydropower generation. Construction and operation of dams not only create disconnectivity of aquatic habitats but also require sufficient level of water supply to sustain their functions resulting in diversion of water from adjacent catchments creating alterations of the habitats in natural water bodies. While it is well recognized that construction of cross-river obstacles would result in drastic impacts on aquatic biodiversity, fishery resources, and livelihood of people that are dependent on these resources, such impacts are hard to quantify compared with the benefits that could be gained from other sectors, *e.g.* hydropower generation, crop production, among others. Although mitigating

measures have been explored for immediate application, *e.g.* construction of fishways to facilitate upstream-downstream migration of fish, in several countries such measure is not part of the requirements for cross-river construction while the design and operation of dams and fishways has not been properly taken into consideration as part of the requirements in fisheries planning.

Sand and gravel mining from sandy rivers is another activity that has been undertaken in relation to industrialization. In the Mekong River Basin, sand and gravel mining is carried out for construction purposes (concrete) and for landfills (railways, motorways, land reclamation in flooded areas, and offshore reclamation). Although there is no clear evidence on the morphological changes and environmental impacts of such activity in the Mekong River, faster erosion of the river banks could be observed. Nevertheless, it is also difficult to distinguish whether such change is caused by natural morphological phenomena of the river as a result of climate change or triggered by dredging, thus further study needs to be undertaken on this aspect.

Aquatic habitats also serve as tourist attractions, *e.g.* large inland reservoirs, rivers and their tributary landscapes, coastal seascapes, mangrove forests, coral reefs, whale and dolphin watching sites, and so on. Recreational fishing is an opportunity for indigenous communities to enhance their incomes and their active involvement in the management and conservation of their traditional livelihoods. While tourism activities could bring incomes and economic development opportunities to communities, the activities could also create impacts on the fisheries sector, *e.g.* changes in aquatic habitats from construction of tourism facilities, pollution caused by tourists, among others. Tourism activities should therefore be promoted in an environment-friendly manner, *e.g.* eco-tourism, in order to minimize its impacts on the habitats and aquatic resources.

In addressing concerns on the deterioration of aquatic habitats and fishery resources, initiatives had been undertaken to secure important aquatic habitats, although some could also affect the fisheries sector. Specifically in marine areas, establishment of Marine Protected Areas (MPAs) is one of the classic examples as this concept restricts human activities in such areas. While MPAs could be considered effective tool to maintain fish populations, MPAs in most cases also comprise no-take zones where fishing activities are prohibited. One of the approaches to mitigate such conflicts is the establishment of fisheries *refugia*, where fisheries objectives of protecting the critical life cycle, *e.g.* spawning, nursing, broodstock aggregation, and migratory routes of species targeted for management, could be integrated with establishment of protected areas for conservation purposes.

Petroleum extraction is another important economic activity that utilizes non-living resources from the ocean. Brunei Darussalam, Malaysia, Indonesia, Thailand, and Myanmar are countries that have rich hydrocarbon resources, with several offshore oil rigs and platforms constructed and operated. Construction of such platforms is beneficial to the countries but could conflict with the activities of their respective fisheries sectors. Fishers are prohibited from fishing near these platforms giving them less catch, although such areas could also be considered as a kind of *refugia*, where fishes are protected, thus, rehabilitation of the resources could naturally occur resulting in long-term benefit to the fisheries sector. While the importance of petroleum industry is necessary for energy security and economic development for countries in the region, their oil rig operations also come with associated risks, *e.g.* leakage or oil spills that would impact on the marine environment including aquatic species and habitats, as well as on human health.

Other sectors that share the aquatic resources worth mentioning here include those related to large-scale coastal constructions, *e.g.* land reclamation and construction of deep-sea ports that alter coastal morphological characteristics; water transportation, navigation and trade; communication systems using submarine cables; as well as those related to national security in transboundary areas of countries in the region.

### Recommendations

Considering that several sectors share the water resources and conflict across sectors is anticipated to be more severe in the near future, it is necessary for the fisheries sector to come up with realistic data and information on the benefits that could be gained from using the aquatic habitats and water resources to sustain food security and livelihood of people. Such information would facilitate discussions and decision-making on the need to maximize the benefits gained from the water resources by people in the Southeast Asian region as a whole. With the benefits either direct or indirect that could be gained, the practical methodologies for valuation of aquatic ecosystem services should be explored and developed. Furthermore, awareness on the importance of aquatic resources for sustaining people's food security and livelihood should also be enhanced in order that interest in fisheries would be taken into consideration in decision-making and trading-offs for the sustainability of the fisheries sector in the future.