



The South China Sea Fisheries *Refugia* Initiative and the Sustainable Development Goals

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The Sustainable Development Goals (SDGs), officially known as “Transforming our World: the 2030 Agenda for Sustainable Development” are a set of seventeen aspirational “Global Goals” with 169 targets between them. Spearheaded by the United Nations through a deliberative process involving its 194 Member States as well as global civil society, the Goals are contained in Paragraph 54 of the United Nations Resolution A/RES/70/1 of 25 September 2015. The SDGs and associated targets are integrated and indivisible, global in nature and universally applicable, taking into account different national realities, capacities and levels of development and respecting national policies and priorities. Targets are defined as aspirational and global, with each Government setting its own national targets guided by the global level of ambition but taking into account national circumstances. It is anticipated that each Government will also decide on how these aspirational and global targets should be incorporated into national planning processes, policies and strategies.

Sustainable Development Goals and the Promotion of Sustainable Fisheries in Southeast Asia

The Sustainable Development Goals (SDGs) acknowledge that oceans, seas and marine resources are essential to human well-being and social and economic development worldwide. Their conservation and sustainable use are central to achieving the 2030 Agenda. Marine resources are particularly important for people living in coastal communities, who represented 37 per cent of the world’s population in 2010. Oceans provide livelihoods, subsistence and benefits from fisheries, tourism and other sectors. They also help regulate the global ecosystem by absorbing heat and carbon dioxide (CO₂) from the atmosphere. However, the formulation of the 2030 Agenda for Sustainable Development implicitly acknowledged that oceans and coastal areas are extremely vulnerable to environmental degradation, overfishing, climate change and pollution. Accordingly, **Sustainable Development Goal 14** which advocates to ‘conserve and sustainably use the oceans, seas and marine resources for sustainable development’ or

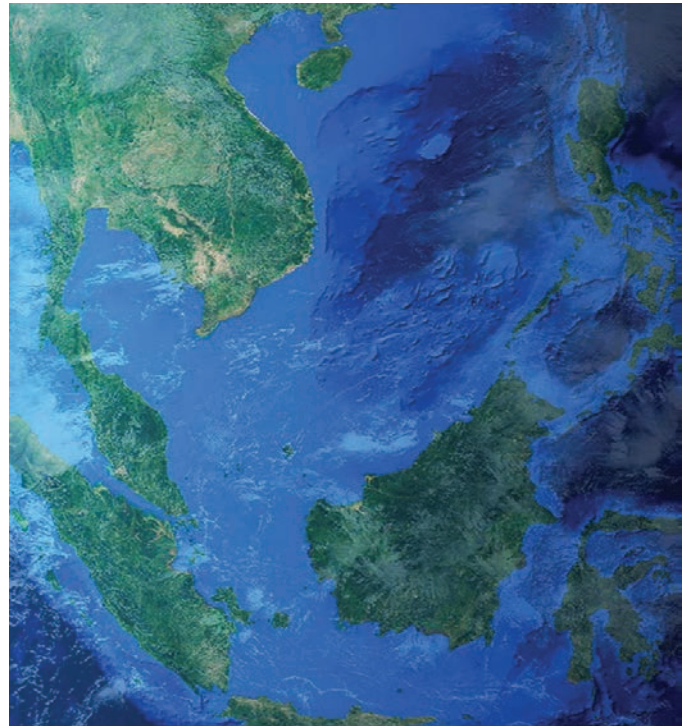
otherwise known as the ‘**Life Below Water**’ goal, was adopted with a set of 10 key result areas comprising seven primary and three supplementary targets (United Nations, 2015).

Regarding the promotion of sustainable fisheries, **Sustainable Development Goal 14** has very specific targets relating to inter alia: the effective regulation of harvesting and ending overfishing; management of illegal, unreported and unregulated fishing and destructive fishing practices; implementation of science-based management plans in order to restore fish stocks in the shortest time feasible; conservation of at least 10 percent of coastal and marine areas; and the prohibition of certain forms of fisheries subsidies which contribute to overcapacity and overfishing including the elimination of subsidies that contribute to illegal, unreported and unregulated (IUU) fishing; improving access for small-scale artisanal fishers to marine resources and markets; and enhancing the conservation and sustainable use of oceans and their resources by implementing international laws as reflected in the 1982 United Nations Convention on the Law of the Sea (UNCLOS). Given the vulnerability of many coastal communities globally to the continued degradation of coastal and marine environments and resources, the global community called for and agreed the timeline for achieving the targets relating to fisheries and the conservation of coastal and marine areas which is by 2020. Such call was aimed at driving accelerated efforts to bring about the transformational change required to fashion more sustainable futures for the world’s fisheries.

While the abovementioned goal and its targets are of high level significance to the work of SEAFDEC and its Member Countries in the promotion of sustainable fisheries, a number of additional SDGs cut across the work of promoting sustainable fisheries in the Southeast Asian context. These are the goals that relate to: No Poverty (**SDG 1**); Zero Hunger (**SDG 2**); Gender Equality (**SDG 5**); Decent Work and Economic Growth (**SDG 8**); Responsible Consumption and Production (**SDG 12**); and Climate Action (**SDG 13**). This paper presents the anticipated contributions of the Global Environment Facility (GEF)-financed, United Nations Environment Programme (UNEP)-implemented, and SEAFDEC-executed project on ‘*Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand*’ (hereinafter referred to as the ‘South China Sea Fisheries Refugia Initiative’) to the Sustainable Development Goals.

South China Sea: A Globally Significant Large Marine Ecosystem

The South China Sea that includes the Gulf of Thailand is a strategic body of water surrounded by nations that are currently at the helm of industrialization and rapid economic growth in the Asia-Pacific region. Bordered by the People’s Republic of China to the north, Republic of the Philippines



The South China Sea

to the east; Malaysia, Republic of Singapore, Republic of Indonesia and the Sultanate of Brunei Darussalam to the south, and the Kingdoms of Thailand and Cambodia, and the Socialist Republic of Viet Nam to the west, the South China Sea has always been central to issues of economic and political stability in Southeast Asia and adjacent regions. Today, it is central to defining environmental sustainability and food security for its coastal nations. The coastal sub-regions of these nations are home to approximately 270,000,000 people or 5 percent of the world’s total population.

The International Hydrographic Organization (IHO) defined South China Sea as a semi-enclosed body of water stretching in a southwest to northeast direction, whose southern border is three degrees south latitude between South Sumatra and Kalimantan (Karimata Straits), and whose northern border is the Strait of Taiwan from the northern tip of Taiwan to the Fukien Coast of China (IHO, 1953). About 122 major rivers drain 2.5x106 km² of catchments and deliver materials, including suspended sediments, nutrients and pollutants, to the South China Sea and Gulf of Thailand. Socio-economically, culturally and aesthetically, the South China Sea, the Gulf of Thailand and regional river basins and bays form part of the common heritage of the people of the Southeast Asian region. The region’s expanding population relies on the South China Sea and Gulf of Thailand for nutrition, livelihoods, recreation and economic pursuits (e.g. tourism), energy (e.g. oil and gas), aquaculture, pharmaceuticals, the ornamental fish trade, construction materials, and ports and shipping. However, recent findings of the Global Environment Facility’s Transboundary Waters Assessment Programme identified that coastal communities bordering the South China Sea and

Gulf of Thailand are among the most at risk globally from continued coastal and marine environmental degradation (IOC-UNESCO and UNEP, 2016).

A Global Center of Tropical Marine Biodiversity

The Indo-West Pacific marine biogeographic province has long been recognized as the global center of marine tropical biodiversity. Forty-five mangrove species out of a global total of 51 (Spalding *et al.*, 2010); 50 of 70 coral genera (Tomascik *et al.*, 1997); 20 of 50 sea grass species (Sudara *et al.*, 1994); and 7 of 9 giant clam species (Tomascik *et al.*, 1997) are found in the nearshore areas of the South China Sea. Like most tropical coastlines worldwide, the dominant coastal ecosystems of the South China Sea and Gulf of Thailand marine basin are mangroves, coral reefs and sea grass meadows. Significant other coastal ecosystems include coastal lagoons, a common coastal landform in Viet Nam, and extensive inter-tidal unvegetated mudflats that are found in many places around the South China Sea (UNEP, 2008).



(Source: Google)

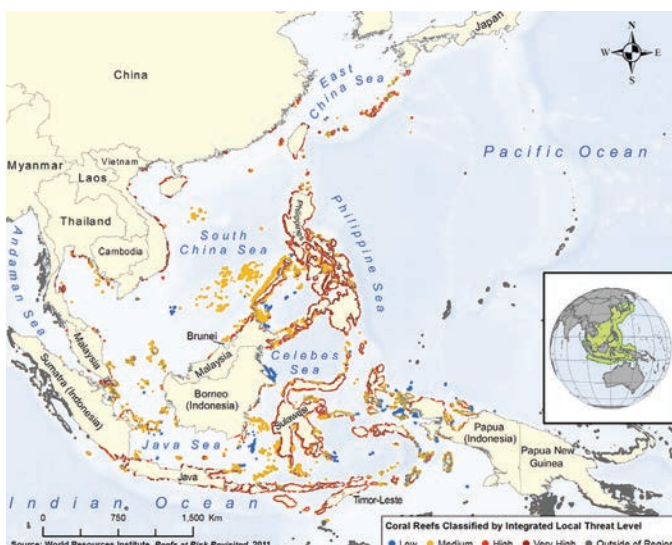
The South China Sea is considered to be one of two global hotspots of mangrove diversity (Polidoro *et al.*, 2010; Vo *et al.*, 2013). According to data generated through the South China Sea project, the largest total area of mangrove on the South China Sea coast is observed in Indonesia (934,000 ha), followed by Malaysia (532,000 ha) and Viet Nam (157,000 ha). The combined area of mangrove observed on the South China Sea coastlines of Cambodia, China, Philippines and Thailand is less than 150,000 ha. The total area of mangrove on the South China Sea coast of all countries combined is estimated to be 1,770,000 ha (UNEP, 2008), representing 11.4% of the world's remaining 15.5 million ha of mangrove forest (Vo *et al.*, 2013).

Southeast Asia is also recognised as the global center of coral reefs, both in terms of areal extent and species diversity. An estimated 1/3 of the Earth's coral reefs (91,700 km² of 284,000 km²) are located in the seas of Southeast Asia (Burke *et al.*, 2002). Fringing reefs are well developed away from the major river estuaries, particularly in the Philippines and the central and southern areas of the South China Sea. All major reef types from fringing, patch or platform reefs and atolls occur in the South China Sea. Based on data compiled by members

of the Regional Working Group on Coral Reefs (RWG-CR) (UNEP, 2007), approximately 750,000 ha of coral reef has been identified in the South China Sea coastal waters of the following six countries: Cambodia (2807 ha), Indonesia (39,300 ha), Malaysia (43,400 ha), Philippines (464,000 ha), Thailand (90,000 ha), and Viet Nam (110,000 ha).

In terms of species richness, the southern and eastern coastlines of the South China Sea fall within the so-called coral triangle and within the isopangeneric contour of 70 coral genera (Veron, 1995). Comparative analysis of the distribution of maximum marine biodiversity for various taxonomic groups has been reviewed by Hoeksema (2007) who noted that different authors have defined different 'triangles' and applied different names to this 'center' of marine biodiversity. Some of these triangles only include the eastern side of the South China Sea, while others encompass the southern half of the South China Sea.

As a consequence of more recent surveys in Viet Nam (Vo *et al.*, 2013), it has been recommended that this contour be expanded westwards to cover the south-central waters of Viet Nam thus corresponding more closely to the coral triangle delimited by Briggs (2005a, b). The recent finding of the hard coral *Leptoseris kalayaanensis* in Nha Trang (westernmost location in the South China Sea), the Northeast Investigator Shoal (Kalayaan Islands) and North Danger Reefs complex indicate that little is known about the coral fauna of the South China Sea relevant to the positioning of the northwestern boundary of the center of maximum coral species richness, the 'so-called' Coral Triangle (Hoeksema *et al.*, 2010). In terms of diversity at individual localities, hotspots of coral species richness occur at Nha Trang (Viet Nam) with 351 species (Vo *et al.*, 2002), El Nido (Palawan, Philippines) with 305 species (UNEP, 2007), and Bolinao (Philippines) with 322 species (Licuanan, 2009). Records of more than 200 species occur at a number of sites in Viet Nam, Indonesia and Philippines



(Source: Adapted from World Resources Institute)

Reefs at Risk in Southeast Asia

(UNEP, 2007), and Malaysia. Verde Island passage (between the islands of Mindoro and Luzon in the Philippines), for example, is considered a globally significant hotspot of coral reef associated species.

The largest areas of sea grass meadows identified in the South China Sea to date are in the coastal waters of Kampot Province in Cambodia (25,200 ha), Cape Bolinao in the Philippines (22,400 ha), Phu Quoc and neighbouring islands in Viet Nam (12,500 ha), and East Bintan in Indonesia (2,000 ha) (UNEP, 2008; Vo, 2010). The transboundary water area between Cambodia and Viet Nam, including the large connected sea grass meadows of Kampot and Phu Quoc, contain possibly the largest sea grass bed in the South China Sea (37,000 ha) and play a globally significant role as critical fisheries *refugia* for fish stocks of significance to regional food security (Paterson *et al.*, 2013). The record of 10 species of sea grasses and a dugong population (Tu Thi Lan Huong *et al.*, 2002) at this locality also indicates the importance of these transboundary waters to regional biodiversity conservation.

Supporting Globally Significant Fisheries and Aquaculture Production

The South China Sea also supports a significant world fishery that is important to the food security of, and as a source of export income for, Southeast Asian countries. Landings from this area contribute approximately 10 percent of reported global fisheries production per annum and make significant contributions to the economies of countries bordering the Gulf of Thailand and the South China Sea. This is significant considering that marine capture fisheries production of Southeast Asia, including landings from both Indian and Pacific Oceans, ranges between 14 and 16 million metric tons per annum, representing more than 19 percent of marine capture fisheries production worldwide (Table 1).

Moreover, Indonesia, Viet Nam, Myanmar, Philippines, and Thailand are the top five producing countries of marine capture fishery products (Fig. 1), while Thailand, Viet Nam,

and Indonesia are among the top five exporting countries in the Asia-Pacific region, and the riparian countries of the South China Sea marine basin produce 23 percent of the world tuna catch and almost three-quarters of the world's canned tuna. Majority of the Southeast Asian region's fisheries are small-scale in nature, and fish are landed in a large number of decentralised locations for distribution through complex marketing networks at the community level.

Majority of the Southeast Asian countries are among the top 20 marine capture fisheries producing countries in the world (Fig. 2), with some experiencing annual increases in production of up to 5 percent. Pelagic fishes dominate landings by volume and value, as most demersal fisheries are over-exploited. It is well accepted, however, that regional fisheries statistics rarely reflect: (a) production from small-scale coastal fisheries, (b) the high level participation of coastal communities in fishing, or (c) the social and economic importance of artisanal and subsistence fishing to coastal communities. Fish stocks of this basin are subject to high levels of fishing effort, such that stocks of most economically important species are considered to be fully fished or overexploited.

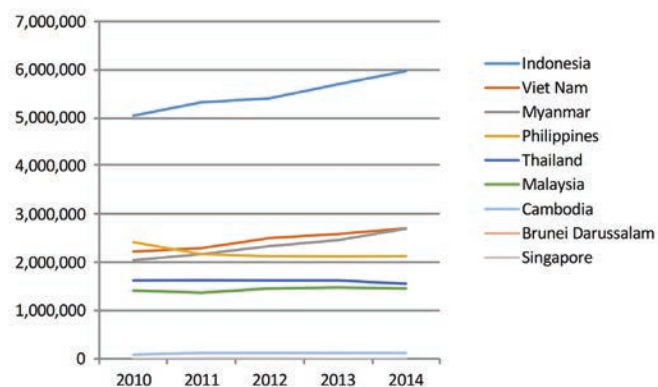


Fig. 1. Production of Southeast Asian countries from marine capture fisheries in 2010-2014

(Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2017))

Table 1. Fishery production of Southeast Asian countries by sub-sector from 2010-2014 (in million metric tons)

	2010	2011	2012	2013	2014
World's Total	78,910	83,696	80,836	82,246	82,756
Africa	5,152	5,049	5,704	5,546	5,799
America	17,445	22,441	18,392	18,817	16,858
Asia**	26,488	26,665	26,960	27,134	28,452
SE Asia***	14,874	15,095	15,591	16,152	16,655
Europe	13,756	13,271	12,919	13,387	13,660
Oceania	1,195	1,175	1,270	1,210	1,332

* Source of main data: FAO Fisheries and Aquaculture Information and Statistics Service

** Excludes Southeast Asia

*** Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2017)

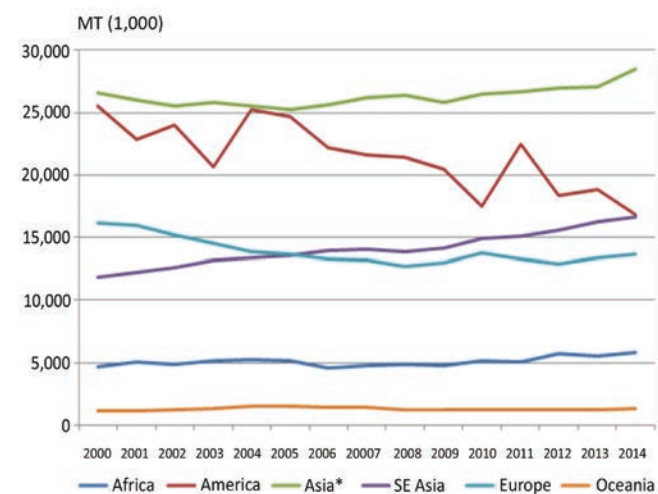


Fig. 2. Global trend in marine capture fishery production (Asia* excludes Southeast Asia)

Increasing global demand for fisheries products and the dependence of coastal communities on fish for food and income had resulted in continued increases in fishing effort, and led to an increasing dependence of the artisanal sector on small pelagic species due to declining availability of demersal species. Overall, the total fisheries production of Southeast Asia has been contributing more than 20 percent to the world's total fisheries production (**Table 2**).

Table 2. Total fishery production by continent (2010-2014)*, in million metric tons

	2010	2011	2012	2013	2014
World's Total	177.6	177.3	182.4	191.1	195.7
Africa	9.2	9.3	10.1	10.1	10.5
America	25.7	25.7	21.9	22.4	20.8
Asia**	91.1	91.1	93.2	100.4	103.8
SE Asia***	33.5	33.5	39.6	40.2	42.2
Europe	16.7	16.3	16.1	16.6	16.9
Oceania	1.4	1.4	1.5	1.4	1.5

* Source of main data: FAO Fisheries and Aquaculture Information and Statistics Service

** Excludes Southeast Asia

*** Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2017)

Declining fish availability, coupled with over-capacity and the dependence of the small-scale fisheries sector on coastal fisheries for income generation, has led to the adoption of destructive fishing practices by some fishers in order to maintain incomes and food production in the short-term. Fisheries trends suggest that production from capture fisheries will decline over coming years unless total fishing effort and capacity are reduced. The obvious problem in the reduction of fishing capacity is that most fisheries are small-scale with the majority of participants (and their families) being highly dependent on fisheries for income, food and well-being.

China (41 million metric tons), Viet Nam (3 million metric tons), Indonesia (3 million metric tons), and Thailand (1.2 million metric tons) are among the top ten aquaculture producers by volume worldwide, and in the top ten aquaculture producing states by value (FAO, 2014). In Southeast Asia, highly priced crustaceans account for 47 percent of total aquaculture production by value. Four of the five top shrimp producers in the world are states bordering the South China Sea (China, first; Thailand, second; Viet Nam, third; and Indonesia, fourth, whereas the Philippines is among the world's top ten shrimp producing countries (FAO, 2014). Giant tiger shrimp (*Penaeus monodon*) is the top produced species, although this position is being challenged by increased production of the white leg shrimp (*Penaeus vannamei*) by all countries, except Cambodia. The high dependence of the aquaculture sector on marine shrimp production has, and continues to contribute, to the loss of habitats bordering the South China Sea. Shrimp pond construction and the release of waste water from shrimp farms also contribute to localised coastal water

quality problems, particularly in areas of south-central Viet Nam and the western Gulf of Thailand (UNEP, 2008).

Threats to Dominant Coastal Habitats

Degradation of mangrove habitats as a consequence of chronic pollution from shrimp and fish farming operations is now considered a key contemporary threat to mangroves, while charcoal production continues to degrade mangroves in Cambodia, Indonesia and the Philippines despite legislation banning all harvesting of mangroves in Cambodia and the Philippines (UNEP, 2008). At regional level, the following are seen as the current anthropogenic threats to mangrove systems bordering the South China Sea: reclamation and infrastructure development; pollution from shrimp farming; and conversion to industrial uses. On a smaller scale, trade in charcoal derived from mangroves in Cambodia to Thailand was, until very recently, a major cause of mangrove loss in the areas of Cambodia close to the Thai border.

This market appears to have declined somewhat over recent years under the influence of more widespread use of cheap and convenient liquefied natural gas in Thailand (UNEP, 2008). The functions of coastal vegetation, particularly mangroves, in terms of providing vital services with measurable economic benefits as protection against hurricane damage and marine-based flooding is becoming better appreciated in national and provincial development planning in the region.

Not only are the coral reefs of Southeast Asia the most biologically diverse and productive reef ecosystems in the world but they are also the most threatened and damaged with unprecedented rates of destruction from anthropogenic pressures that have accelerated over recent decades. The primary regionally significant threats to coral reefs in the South China Sea having been identified in order of significance are: over-fishing, use of destructive fishing techniques, pollution (mainly eutrophication), and increased sedimentation. Indirect causes of these threats are unsustainable practices in



More than 11 percent of the world's remaining mangroves border the South China Sea



Overfishing and destructive fishing practices are the leading causes of coral reef degradation in the region

the fisheries sector, coastal development, deforestation, and unsustainable tourism. Coral bleaching is also considered a serious threat to coral reefs in the region.

Additionally, the loss of sea grass from the basin is occurring at alarming rates. Indonesia has lost about 30-40% of its sea grass beds with as much as 60% being destroyed around Java. In Singapore, the patchy sea grass habitats have suffered severe damage largely through burial under landfill operations. In Thailand, losses of sea grass beds amount to about 20-30% and in the Philippines it is about 30-50%. The primary threats to sea grass include: the use of destructive fishing gears such as push nets and demersal trawl nets; increased sedimentation from coastal development; waste water effluent discharges; nutrient discharges and runoff; coastal construction; and over-fishing.

Population growth and urbanization of the coastal fringe combined with rapid economic growth in the South China Sea region place tremendous pressure on the coastal wetland ecosystems. Major threats to the coastal wetlands bordering the South China Sea can be grouped as follows: loss of wetland areas through conversion for agriculture, aquaculture, port and



The rate of loss of critical fisheries habitats such as sea grass has been estimated to be as high as 30 percent per decade

harbor development, human settlement, tourist development, urbanization, and industrialization. Wetland ecosystems are also highly degraded as a result of over-exploitation of living resources, use of inappropriate fishing techniques and gear, pollution, deforestation in upland area, introduction of invasive species, global trends and natural episodic events such as sea-level rise, typhoons and tsunami. In Indonesia, the conversion of wetland areas for palm oil plantations presents a high threat to coastal wetlands bordering the South China Sea. Overall it has been estimated that around 30% of coastal wetlands are lost in Southeast Asia each decade giving an approximate annual loss in value of 3% per annum.

Threats from Land-based Pollution

Excessive nutrient loads and suspended solids are among the most common problems arising from land-based pollution in the coastal waters of countries bordering the South China Sea. High concentrations of suspended solids largely result from poor land-use practices, including logging activities and conversion of forests in upland areas. On the other hand, high nutrient loads mainly resulting from untreated domestic wastes, and waste from intensive animal husbandry are directly discharged into the receiving water bodies. Both types of contaminant impact the ecological functioning of coastal ecosystems. In addition, heavy metals such as mercury (Hg), Arsenic (As) and lead (Pb), have tended to increase in both biota and sediments in coastal waters of the South China Sea during the last decade.

The contaminants entering the marine environment have a number of impacts in terms of living resource and ecosystem degradation and potential impacts on aquaculture, food quality of export products, and human health. It must however be pointed out that almost all these pollutants are localized. Modeling of the spread of nutrients (UNEP, 2007i) strongly suggests that the present and projected nutrient pollution rates will have minimal effects on the South China Sea and Gulf of Thailand as a whole.



Effluent discharges from fish and shrimp aquaculture is one of contemporary causes of mangrove degradation

Threats from Fishing

Over-capacity in commercial and small-scale fisheries, and the combined problem of over-exploitation, is an enduring issue facing regional fisheries. The impacts of over-capitalization and over-exploitation are magnified by the use of subsidies and the dependence of coastal communities on fish resources for income, as well as food and nutritional security. For example, the Phu Quoc Island District of Viet Nam is significant in terms of its coral reef and sea grass ecosystems, overall employment in its marine capture fisheries, fisheries production and related export earnings, and tourism (both domestic and international). However, over-capitalization and over-exploitation are issues that not only threaten the sustainability of fisheries in the area, but also the coral reef and sea grass habitats upon which fisheries and other sectors (e.g. tourism) depend.

The number of fishing vessels and total engine capacity (hp) in the area has increased rapidly over recent decades, and although there has been a general increase in landings throughout this period, catch per unit of effort (CPUE) has declined significantly. The use of destructive and unselective fishing gear and practices is prevalent across a range of fisheries and habitat types in the South China Sea. For example, destructive and/or unsustainable fishing gear and practices have been identified as key threats to fish stocks and their habitats in the mangrove areas at Trat in Thailand and at Batu Ampur in Indonesia, the extensive sea grass areas of Bolinao in the Philippines and Kampot in Cambodia, and at the regionally significant coral reef areas at Belitung in Indonesia, Masinloc in the Philippines, and Phu Quoc in Vietnam.

Push netting and inshore trawl fishing cause habitat impacts and selectivity issues. Catches of these gear types from inshore waters are largely composed of juveniles, and at high fishing effort levels are thought to contribute to the growth of over-fishing in South China Sea basin. Such a situation hinders fisheries management efforts which largely focus on



Balancing the dependence of small scale fisherfolk on fish for food and income with commercial interests remains a key barrier to the reduction of fishing capacity in the South China Sea

development of sustainable livelihoods, and is a key threat in inshore where push nets are used extensively over sea grass beds to take the juveniles of economically important species. Digging and gleaning of sea grass beds and mangrove forests is an area of concern at a majority of the priority *refugia* sites in the South China Sea. Growing demand for seafood in local markets has resulted in a marked increase over recent years in the number of people digging for sipunculid worms, gastropods, and crustaceans in sea grass beds, leading to damage of sea grass plants, de-stabilization of sediments (and subsequent erosion), and the over-exploitation of benthic organisms. Intensive digging and grazing in some mangrove areas is considered to be contributing to the occurrence of dwarf, low-density mangrove stands at several sites due to disturbance of mangrove roots and seedlings.

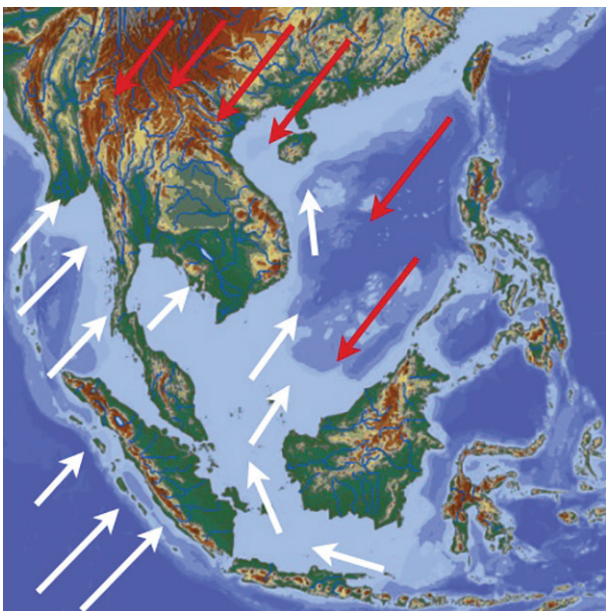


Small-scale fisherfolk are becoming increasingly dependent on small pelagic species as a result of the overexploitation of coral reef associated and demersal species

Blast fishing, and use of poisons and unselective fishing gears and practices are well-known and documented threats to fisheries and habitats in nearly all areas of the South China Sea. These fishing practices often result in mortalities of wide range of size-classes of target and non-target species, contributing to both growth and recruitment overfishing. The effects of blasting on the physical structure of coral communities is of particular concern, and the occurrence of blast fishing “craters” on heavily blasted reefs has a major impact on coral reef-associated fish assemblages. Non-selective fishing gears, such as trammel nets, are utilized in most fished coral reef areas along the South China Sea coast. The growing need to minimize the impacts of such practices on critical habitats necessitates the development of best practices in the management of these problems.

Threats Associated with Climate Variability and Change

The uncertainty and extremes of climate variability compound and exacerbate the social and economic challenges faced by coastal communities of East Asia. Large-scale features such as the Inter-tropical Convergence Zone and the West Pacific Monsoon drive the seasonal variations in rainfall experienced in the Western Pacific Ocean, including wet and dry seasons. Together, they influence rainfall, winds, tropical cyclones, ocean currents and other aspects of the weather and climate. While these features drive the wet and dry seasons experienced annually in most of the riparian countries of the South China Sea, the single greatest factor affecting climate variability from year to year is the El Niño/La Niña Southern Oscillation or ENSO. This cycle of warming and cooling of sea surface temperatures of the Western Pacific has a profound effect on the hydrological cycle of East Asian countries, driving periods of drought and elevated rainfall across the region. The effects of the ENSO cycle are not restricted to drought. It is also a driver of periods of elevated rainfall and rainfall intensity, and plays a significant role in both suppressing and stimulating the propagation and severity of tropical cyclones, all of which have significant impacts on the people and economies of coastal communities. However, while regional understanding of climate variability and change has improved considerably over the past years, this improvement has not translated into a corresponding increase in community resilience.



(Source: Google)

Southeast Asian monsoon: Northeast (November-March) and Southwest (May-September)

Overall, beaches of the South China Sea coasts with stable beach plan forms which currently receive sediments inputs via longshore drift will, under increased sea level receive lower inputs of sediments resulting in consequent beach erosion and shoreline retreat. The extent of this retreat will

depend on the profile of the terrestrial-marine interface and the current importance of sediments derived from longshore drift. Depending on the rate of sediment input into the coastal system from riverine sources, the system can be expected to stabilize only if sea level itself stabilizes, and only following filling of the transitory sinks in the system (estuarine and beach sinks). In areas of reduced rainfall, riverine sediment inputs may be reduced further exacerbating coastal erosion. In areas of higher rainfall, riverine sediment inputs may not be significantly increased depending on the nature of the vegetation cover. Additionally, beach plan forms will be changed by changing wave patterns resulting from modification of regional and sub-regional wind patterns. Such changes will be of significance for coastal ecological communities, particularly sea grass meadows, coral flats and algal beds.

In estuarine areas, an inland extension of the tidal prism may be expected. In coastal plains, saltwater contamination of the groundwater may have profound effects on both the suitability of areas for human occupation and the nature of the vegetation. A rise in sea level will also cause a rise in the water table which may have important consequences for freshwater lenses which currently float on saline water bodies. Such influences are also linked to compression of the marine-terrestrial transition, particularly in areas currently having flat coastal plain, where changes in coastal vegetation following sea level rise and inundation may be dramatic. Zonation is likely to be compressed, particularly in mangrove areas, resulting not only in an overall reduction in the extent of such transitional habitats but also extensive reduction in the seaward sides. Such coastal habitat reduction will result in important changes to the distribution and abundance of species of subsistence and economic importance, and a general loss of estuarine and mangrove species. In general, declines in both individual species abundance and species richness are anticipated. Increased turbidity, linked to more intense or frequent rainfall, will also likely affect shallow water primary producers, including corals, sea grass and macro-algae.

SDG 14 and the Management of Threats to Fish Life-Cycle and Critical Habitat Linkages

Although action aimed at reducing the rate of loss of coastal habitats has been implemented by countries bordering the South China Sea, the decadal rate of loss of such habitats remains high, e.g. sea grass beds (30 percent), mangroves (16 percent), live coral reef cover (16 percent), and wetlands (30 percent) (UNEP, 2008). This continued decline in the total area of habitats critical to the life cycles of most aquatic species, combined with the high levels of coastal community dependence on fish, has raised serious concerns for the long-term sustainability of small-scale fisheries in the region. This situation of high small-scale fishing pressure and declining fisheries resources has contributed to the adoption of unsustainable fishing methods to maintain catch and

increase incomes in the short-term. These include the use of destructive fishing gear and practices, such as the operation of demersal trawls and push nets in sea grass areas, and illegal fishing practices such as dynamite fishing and release of fish poisons in coral reef areas. Small-scale inshore fishing pressure has therefore been identified as a significant cause of the degradation and loss of coastal habitats in the South China Sea (UNEP, 2008).

With fish production being intrinsically linked to the quality and area of habitats and the heightened dependence of coastal communities on fish, a need exists to improve the integration of fish habitat considerations and fisheries management in the region. The dilemma for the fisheries and environment sectors is that conservation of habitat does not necessarily result in increased fish stock while lowering fishing effort does not necessarily result in the improvement of habitats. Therefore, given the complexity of the key threats to fish stocks, fish habitats and associated biodiversity in Southeast Asia, it is imperative that mechanisms for effective cross-sectorial consultation and coordination be established, particularly in terms of the identification and designation of priority ‘places’ (sensu Pauly, 1997) for management. The South China Sea

Box 1. Related end-of-project targets of the Strategic Action Programme for the South China Sea

- By 2020, to have established a regional system of a minimum of fourteen *refugia* for the management of priority transboundary, fish stocks and endangered species
- By 2020, to have prepared and implemented fisheries management systems in the identified priority *refugia* based on and consistent with, the ASEAN SEAFDEC Regional Guidelines for Responsible Fisheries in Southeast Asia

Fisheries *Refugia* Initiative was developed to meet this need via implementation of the fisheries component of the Strategic Action Programme for the South China Sea.

The longer-term goals of this project are to contribute to: improved integration of habitat and biodiversity conservation considerations in the management of fisheries in the South China Sea and Gulf of Thailand; improved national management of the threats to fish stock and critical habitat linkages within fisheries *refugia*; and enhanced uptake of good practice in integrating fisheries management and biodiversity conservation in the design and implementation of regional and national fisheries management systems. The medium-term objectives align with those of the fisheries component

Box 2. Anticipated outcomes aligning with several targets of SDG 14 ‘Life Under Water’

SDG Target 14.2 ‘By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans’

The internationally agreed indicator for progress against this target is the ‘Proportion of national exclusive economic zones managed using ecosystem-based approaches’. The South China Sea Fisheries *Refugia* Initiative is working to support this by strengthening the enabling environments for formal designation and operational management of *refugia* in the six participating countries. Key activities include legal reviews to identify, inter alia: legal terminology for describing *refugia*; formal procedures for demarcating boundaries of spatial management areas such as *refugia*, including requirements for assessing the socio-economic impacts of management measures and stakeholder consultations; and provisions for decentralizing *refugia* management to the community level via development of co-management and rights-based approaches. This is aimed at facilitating the drafting of required policy and legislative amendments for adoption by competent authorities. This component will also build the national and site-level science and information base required to enhance the monitoring and evaluation of the effectiveness of individual *refugia* and the regional network of sites.

SDG Target 14.4 ‘By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics’

Progress towards the achievement of this target will be measured on the basis of the ‘Proportion of fish stocks within biologically sustainable levels’. While many fisheries management arrangements focus on achieving maximum sustainable exploitation of resources it is also important to acknowledge the inherent complexity in fisheries system and that Southeast Asian is a region with relatively scarce information and data relating to stock status and fishing pressure. Accordingly, it is inevitable that fisheries management will continue to take place in situations where there is irreducible uncertainty due to the massive and difficult information problems associated with describing and understanding most fisheries. This is especially true in the case of the Gulf of Thailand, where fisheries management must balance the interests of multiple jurisdictions, coastal community dependence on fisheries for food security, the problem of overfishing, destructive fishing practices, and the inherently complex nature of the tropical multispecies fisheries of the region. This initiative will support efforts to sustainably manage fish stocks within their biological limits by reducing growth and recruitment overfishing via targeted actions to safeguard fish stock and critical habitat linkages at times and within locations where there are high abundances of (a) stock in spawning condition or (b) juveniles and pre-recruits.

SDG Target 14.5 ‘By 2020, conserve at least 10 percent of coastal and marine areas, consistent with national and international law and based on the best available scientific information’

Progress against this target will be measured in terms of the total hectares of managed areas. The South China Sea Fisheries *Refugia* Initiative will contribute to this through the establishment of operational management at 14 priority fisheries *refugia* with a total area of approximately 270,000 hectares. This will be supported by consultative processes to facilitate agreement among stakeholders on the boundaries of fisheries *refugia*, identification of key threats to *refugia* sites, recording of fishing community views regarding appropriate fisheries and habitat management measures, and eliciting stakeholder inputs to management plan development and review. *Refugia* management plans will provide rules inter alia on operating requirements for the use of particular classes of fishing vessels or fishing gear within *refugia*, procedures for adjusting management measures over time, and mechanisms for enforcement. Specific direction is given to drafting of regulations and ordinances required in support of plan implementation.

of the Strategic Action Programme for the South China Sea which are to: build the resilience of Southeast Asian fisheries to the effects of high and increasing levels of fishing effort; improve the understanding among stakeholders including fisherfolk, scientists, policy-makers, and fisheries managers of ecosystem and fishery linkages as a basis for integrated fisheries and ecosystem and habitat management; and build the capacity of fisheries departments or ministries to engage in meaningful dialogue with the environment sector regarding the improvement of fisheries and management of interactions between fisheries and critical marine habitats. The related end-of-project targets are shown in **Box 1**.

While **SDG 14** ‘Life Below Water’ is of high level significance to the work of SEAFDEC and its Member Countries in the promotion of sustainable fisheries, activities of the South China Sea Fisheries *Refugia* Initiative will have a number of additional impacts towards the achievement of SDGs which cut across the work of promoting sustainable fisheries in the Southeast Asian context. These include the goals that relate to: No Poverty (**Goal 1**); Zero Hunger (**Goal 2**); Gender Equality (**Goal 5**); Decent Work and Economic Growth (**Goal 8**); Responsible Consumption and Production (**Goal 12**); and Climate Action (**Goal 13**). For example, the focus of the Initiative on securing sustainable livelihoods and nutritional security will contribute to the achievement of **SDG Target 2.1** that ‘By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round’. Similarly, efforts to promote gender equality in the execution of the initiative will contribute towards the achievement of **SDG Target 5.a**: ‘Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws’. The anticipated outcomes align with several targets of **SDG 14** ‘Life Under Water’ and are shown in **Box 2**.



The fisheries *refugia* initiative is part of broader SEAFDEC initiatives to foster sustainable fisheries in Southeast Asia

Conclusion

The SDGs are widely acknowledged as ‘aspirational’ global goals for sustainable development. The goal and targets relating to ‘Life Below Water’ are of high level of significance to the 270,000,000 people residing in coastal areas of the South China Sea marine basin and have been identified as being at the highest risk globally from continued coastal and marine environmental degradation. However, with this large population come a number of threats to coastal and marine biodiversity, dominant coastal habitats, and the sustainability of fisheries. For example, the rate of loss of critical fisheries habitats from the basin is high and increasing and is an issue of high regional concern from the perspective of food security and livelihoods. However, turning this scenario around within the 2020 timeline for the **SDG 14** targets relating to sustainable fisheries must be acknowledged as being highly ambitious given the range of challenges the region’s fisheries face. These include difficulties associated with the management of fishing capacity, IUU fishing practices, and high-level of dependence of the small-scale fishing sector on fish for food and incomes.

While the South China Sea Fisheries *Refugia* Initiative will make contributions towards the achievement of several of the **SDG 14** targets and other goals, it will be necessary for this initiative to be effectively coordinated with the broad range of efforts of SEAFDEC, its Member Countries, and other development partners in the promotion of sustainable fisheries in Southeast Asia. Such coordination and partnership will be essential in realizing the full range of benefits possible.

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