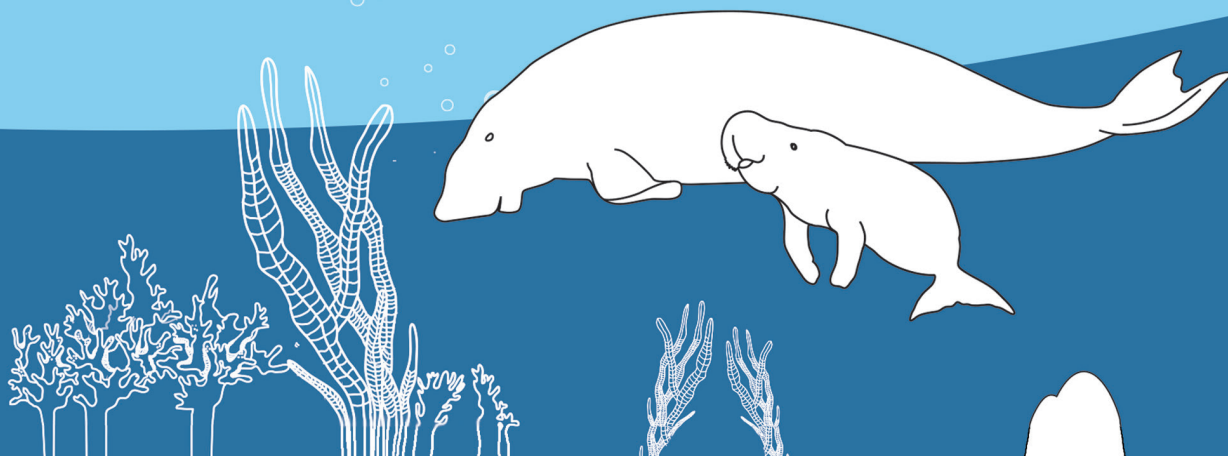
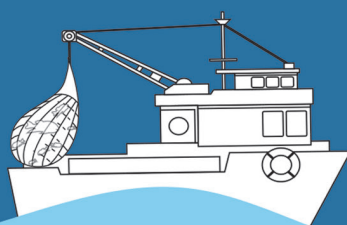
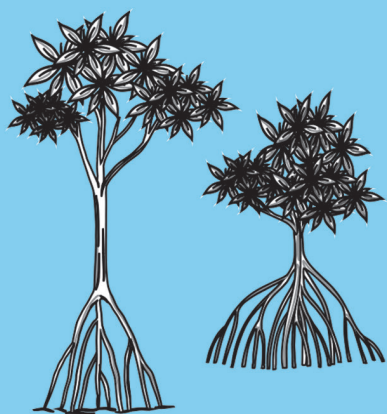


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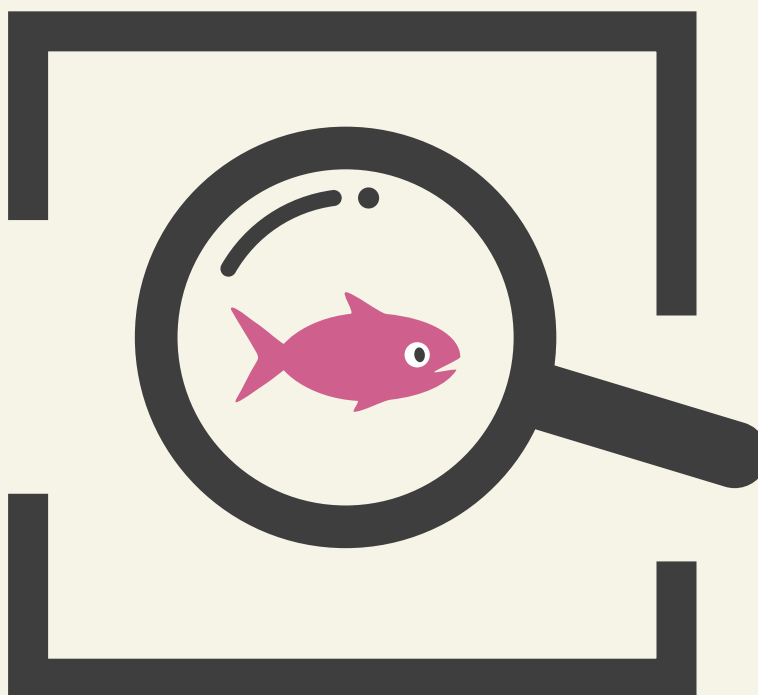
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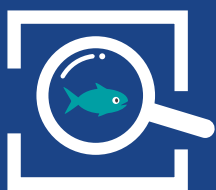
State of Marine and Coastal Resources and Coastal Erosion
Thailand National Report 2020





Executive Summary





EXECUTIVE SUMMARY

State of Marine and Coastal Resources and Coastal Erosion Thailand 2020

In 2020, the status of marine and coastal resources of Thailand is likely to improve. By evaluating the Ocean Health Index, Thailand has a score of 68. The status of marine and coastal resources has improved from the past year due to the COVID-19 situation. The use and pressure of marine and coastal resources is reduced, especially from tourism and fisheries. It is also the result of a national policy for managing marine and coastal resources and the participation of the public sectors in the conservation and restoration of marine and coastal resources.

For the state of most marine and coastal resources, **coral reef** with an area of 149,025 rai is likely to decrease. The proportion of reef health status 36% are good and very healthy

The total area of **seagrass bed** is 159,829 rai. The monitoring of seagrass bed in 2020 covered 104,778 rai revealed that The proportion of seagrass bed status 27% are good and very healthy

Rare marine animals have been seen frequency and found more netting of green turtle, hawksbill turtle and leatherback turtle from those in the previous year. In 2020, leatherback turtles lay 16 nests, compared to 3 nests of the previous year. However, there was an increased tendency for stranding of rare marine life. Most of the causes were from the entangle to fishing gears and from eating marine litter.

The total area of **mangrove forests** is 1.73 million rai, (around 200,000 rai increase from 1.53 million rai) due to the use of modern satellite technology to assist in the exploration and as a result of the forest reclamation and mangrove restoration policy.

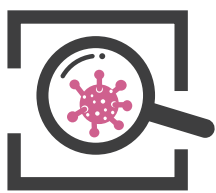
For the state of marine and coastal environment, most of the **sea water quality** was in good condition, except around the main river mouth of the inner Gulf of Thailand. As for **marine debris**, it was found that the amount of waste collected from the river mouth of the five main rivers has decreased. Most of them are plastics. Furthermore, most coastal debris were also plastic bags.

For **coastal erosion** situations, the eroded area has decreased steadily since 2017. In 2019, there was 91 km of erosion distance, a decrease of 64 km from last year. Based on the action of the Department of Marine and Coastal Resources, forecasts in 2021, the erosion coast will be decreased by at least 5 km. For action to solve the problem of coastal erosion, in 2020, the Department of Marine and Coastal Resources appointed a Project Screening Task Force to tackle coastal erosion projects. There is an integration with other relevant agencies, however there is still a lack of integration of local solutions with local government organizations.

The management responses of marine and coastal resources and coastal erosions of the country are as followed;

- Restored 57.50 rai of **coral reefs**;
- Restored 14 rai composed of 22,300 **seagrass** shoots;
- Planted 5,319 rai of **mangrove**, reclaimed 2,770.73 rai of mangrove (113 cases), and demolished 5,034.28 rai of mangrove;
- Constructed the **Endanger Marine Species Rescue Center** in Phuket Province (Phase 2), and organized training course on Endanger Marine Species saving to networks and volunteers;
- Installed 320 **mooring buoys** and coral reef protection buoy lines in 22 zones;
- Installed 9 **artificial reef** sites, (4,710 units);
- Prepared **draft marine protected area** Implementation in 21 areas, in 15 provinces with the total area of 11,029.96 square kilometers. A draft Ministerial Regulation has been proposed for the conservation of mangrove forests in 7 provinces with an area of 178,937 rai, which has been approved by the National Marine and Coastal Resource Management Policy and Planning Commission;
- **Marine patronage** investigated on fishing boats to control Illegal, Unreported and Unregulated Fishing (IUU Fishing);
- **Claimed coral reef damages compensation** for the restoration of the coral reef ecosystem for the case of the Global Standard ship crashed on the Coral Reef at the Ran-Dok Mai island, Chonburi Province. A decision of the Court of Appeal has ordered a total of 63,242,481.89 Baht for compensation.





Lesson learned from COVID 19

In the year 2020, the coronavirus outbreak (COVID 19) has affected the economy, society and environment. It resulted in a halt to the activities of human uses in the marine and coastal areas in term of the number of tourists and boat traffic from tourism activities. Higher number of marine animals were found, such as dugongs were seen at Ban Phe, sea otters around Koh Phayam and Nai Harn beach, Phuket Province, which has not been seen for a long time. The leatherback turtle lays eggs and hatches more than those in the previous years. Since these marine animals are not disturbed, especially the beach area that is a tourist attraction with many hotels, which after the hotel is temporarily closed, more sea turtles have been found spawning. In Samui islands, Surat Thani Province, sea turtles normally lay 6 to 7 eggs every 2 years. However, in 2020, sea turtles were found laying eggs as many as 19 nests, which showed that marine resources are likely to recover naturally with good management. For the status of rare marine animals in the Andaman Sea, there was a big herd of around 5 killer whales found in Mu Ko Surin National Park and Mu Ko Similan National Park from November 2019 to March 2020. Previously, there were no more than 10 sightings reported in this area, however, more than five large crowds have been reported in 2020. A school of approximately 10 guitarfish was found spread in Mu Ko Surin National Park and Mu Ko Similan National Park from November to March as well. Previously, very few guitarfish sightings have been reported. It can be seen frequently at the dive sites in these national park areas. In January, 2020, around 2 - 4 Omura whales were found in December around Similan Islands in Phang Nga Province, and Racha Island, Maiton Island and Hae Island in Phuket province. Mysid was abundance as a natural food source, which previously had not been reported in this areas for many years. It also found that the dugong's stranding statistics which were normally high from December to May, but fewer in 2020.

Therefore, it is better to accelerate the lessons learned in sustainable marine and coastal resource management. In particular, the long-term monitoring of marine and coastal resources using modern tools such as using drones to help explore coral reefs and rare marine animals in the tourist areas for continuous analysis and reporting as well the evaluation of data to determine the carrying capacity of tourists. Various measures for the control of wastewater and solid waste should be established, especially the tourist areas around Koh Samui and Koh Phi Phi. By the way, the COVID situation can also have a negative impact on the marine environment. For marine litter, due to the COVID situation, the amount of plastic waste has skyrocketed more than 60 percent, most of which is plastic from food delivery and a protection mask.

Policy Recommendations

1 Year Urgent Measures

1. Driving Integrated solutions to the problem of coastal erosion
2. Strengthening the issue solving based on Ocean health Index (OHI) following the national strategies.
3. Driving the marine spatial planning at the national level and pilot sites
4. Establish a monitoring and warning system for reporting marine environmental problems
5. Drive the expansion of marine protected areas to 10 percent of the sea area
6. Driving the management of marine and coastal resources
7. Building social and ecological resilience to the impact of climate change
8. Create knowledge and innovation for the use of marine and coastal resources
9. Build a mechanism for participation in the management of marine and coastal resources

Measures and Management Plans

Long-term (3 years)

1. Increase knowledge from research and monitoring of marine and coastal resources
2. Strengthening the participation of communities and private sectors
3. Protecting and patrolling of marine and coastal resources for sustainable uses
4. Marine and coastal resources rehabilitation
5. Reduce impact from mainland and island into the sea
6. Established Mangrove Conservation Areas and Marine and Coastal Protected Areas
7. Implement laws and regulations
8. International collaboration and agreement



National Issues

that need to be solved urgently

Urgent issues need an urgent policy drives are coastal erosion, stranding of rare marine life and marine litter. These issues occur in all coastal provinces and need to be emphasized in formulating an appropriate policy. The marine debris is a national issue that spans upstream, midstream and downstream, which the Ministry of Natural Resources and Environment is already working on an integrated program. Therefore, there are two urgent issues that need to be solved urgently, which are **coastal erosion** and the stranding of **rare marine species**.



The DPSIR assessment framework (Drivers – Pressures – States – Impacts – Responses)

was used to identify drivers at different levels, pressures caused by various activities, state of marine and coastal resources and coastal erosion and their impacts, and responses to the problems.

1. Drivers: D

Drivers consists of policy-driven factors and the direction of economic, social and cultural development, which increases or decreases the pressures on the environment, both at the global, regional and national level as well as climate change and natural disasters. Global drivers include the Sustainable Development Goals (SDGs), the BLUE Economy, the Circular Economy, Climate Change, and Situation of the coronavirus disease 2019 (COVID 19).

The most important drivers at national level are 20 - Year National Strategy (2018 - 2037), the 12th National Economic and Social Development Plan (2017-2021) and National Maritime Security Plan (2015 – 2021). The important goals are for economic development and Thailand's competitiveness, such as industrial development, agricultural development and tourism development. Important spatial developments include the Eastern Economic Corridor Project (EEC) and the Southern Economic Corridor Development Project (SEC).

2. Pressures: P

Pressures arise from human activities resulting from the development of the country in various dimensions such as urbanization, coastal development, transportation, marine and coastal tourism, fisheries, aquaculture, and utilization of both living and non-living resources, etc. These activities affected on marine and coastal resources in various areas, including habitat loss and resource degradation.

3. States: S

3.1 Status of Marine and Coastal Resources

3.2 State of Marine and Coastal Environment

3.3 Coastal erosion

3.1 Status of Marine and Coastal Resources

Coral Reef

Overall, Thailand has a total of about 149,025 rai of coral reefs, 75,660 rai in the Gulf of Thailand and 73,365 rai on the Andaman coast (1 square kilometer equals 625 rai).

When comparing the data between 2019 and 2020, it was found that the **reef status tends to deteriorate slightly**. (The province with the most coral reefs is Surat Thani Province, 36,170 rai, followed by Phang Nga Province 26,126 rai).

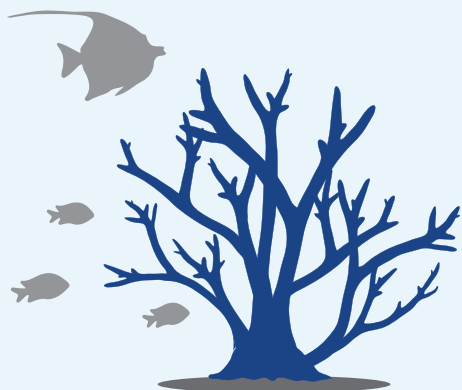
In **the Andaman coast**, the coral reefs were in

- 33.4% of the coral reefs were in good and healthy status.
- 34.6% were in moderate health.
- 32.2% were severely damaged.

For **the Gulf of Thailand**, the coral reefs were in

- 32.4% of the coral reefs were in good health - very healthy.
- Coral reefs in good health status increased to 39.8%.
- 27.8% were in damaged conditions.

One of the largest coral reefs in the country was the Adang - Ravi islands. The damaged coral reefs were located in Phang Nga and Trat provinces.

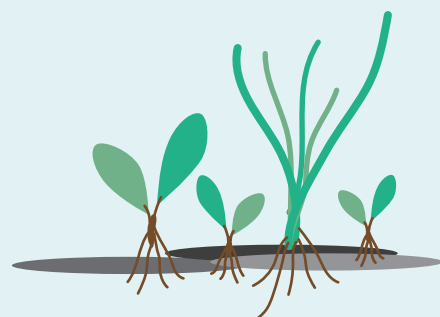


Seagrass

In 2020, sea grass had a total area of 104,778 rai, accounting for 65.5% of the potential area of sea grass (159,829 rai) which were 15.9% increase of the reported seagrass area in 2019 (90,397 rai).

This result was from the summary of the survey and monitoring of the status of sea grass sources in the latest survey round (2019 - 2020). Comparing the spatial area and the percentage of cover for each seagrass source with the year 2019 data, which determined from 34 seagrass beds that were vulnerable seagrass sources from various human threats in the representing of the seagrass beds in 19 provinces. The study found that **70.6% of the seagrass beds from annual monitoring stations had a stable state**.

- Twelve seagrass beds, or 35%, showed a short-term change in the better direction. More than 33% of the most recently reported seagrass were found increasing in aerial cover.
- Twelve seagrass beds, or 38%, were stable or little spatial changes.
- On the other hand, nine seagrass sites have changed in a direction of deterioration. Most of them were caused by seasonal changes, except Pattani Bay, Seagrass beds have deteriorated due to sediments from dredging.



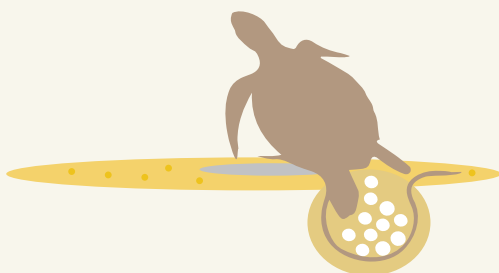
3.1 Status of Marine and Coastal Resources (cont.)

Rare and endangered marine species : Sea turtles, Dugongs, Dolphins and Whales

Nesting of Sea Turtle

In the fiscal year 2018, there were 413 nesting of sea turtles, 246 green turtle nests and 167 hawksbill turtle nests. There was no Olive Ridley turtle nor leatherback turtles nesting. In fiscal year 2019, there were 434 nesting of sea turtles, 226 green turtle nests, 203 hawksbill turtle nesting, 2 Olive Ridley turtle nests, 3 leatherback turtle nests. As of fiscal year 2020, there were 491 nesting of sea turtles, 240 green turtle nests, 234 hawksbill turtle nesting, 1 Olive Ridley turtle nests, 16 leatherback turtle nests.

In conclusion, it was found that **the number of green turtle egg laying times was stable, the hawksbill turtle nests was increased. The number of nests of Olive Ridley turtle has decreased. While the leatherback turtles were found to increase.** Especially in the year 2020, there have been a significant increase in the laying of 16 leatherback sea turtle nests. The spawning area of the Olive Ridley sea turtle and leatherback sea turtles can be found nesting only on the sandy beach of the Andaman coast. Green turtles and Hawksbill turtle lay their eggs on the mainland's beach and on the beaches of islands in both the Gulf of Thailand and the Andaman Sea.



Dugongs

Only one species of Dugong (*Dugong dugon*) was found in the sea grass area on both the Gulf of Thailand and the Andaman coast. In 2018, a total of about 250 dugongs were reported, with approximately 19 in the Gulf of Thailand and 231 on the Andaman coast. In the fiscal year 2019, a total of 261 dugongs were surveyed and found that **Trang Province is the largest dugong population in Thailand. A total of 24 were stranded**, which only stranded the Andaman coast. In the fiscal year 2020, **a total of 255 dugongs were surveyed.** However, considering the aerial surveys in Trang, the largest dugong population in Thailand. The survey found fewer dugongs in 2019, (185 and 165 in 2019 and 2020, respectively since the aerial survey could not proceed as planned due to the coronavirus outbreak situation 2019 (Covid 19).

Dolphins and Whales

The 27 species of dolphins and whales found in Thai waters, divided into two groups: near shore and remote migration. In the fiscal year 2018, 2,420 dolphins and whales were found in Thai waters. As of fiscal year 2020, **there were 3,025 dolphins and whales. The largest group of dolphins was Irrawaddy dolphins**, followed by finless porpoise, hunchback dolphins, Stenella dolphins, bottlenose dolphins, killer whales and Bryde's whales respectively.

3.1 Status of Marine and Coastal Resources (cont.)

Stranded Marine Species

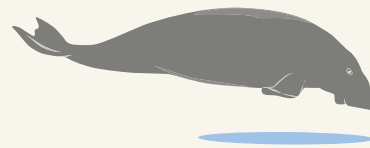
Ten Years Statistics

The statistics of stranded marine species during the ten fiscal years (October 2010 - July 2020) found that a total of 5,293 rare marine species were stranded, representing an annual average of 481 ± 236 . It was found that **from 2010 to 2020 there was a tendency to be stranded more**. The highest number of stranding was found in 2019 (850 times), followed by 2020 (845 times), based on data from 1 October 2019 - 31 July 2020. These included 2,996 sea turtles (58%), 1,989 dolphins and whales (39%) and 157 dugongs (3%). In the future, **it is expected that there is a tendency for annually rare marine species to strand more due to environmental quality degradation including risk factors that occur naturally and human activities**. By the way, due to the advances in communication, it is convenient to inform the stranding information more quickly and a growing awareness of coastal communities.

Most of the rare marine species found to have been stranded in fiscal year 2020 would have died when the strand was notified, especially in the group of dugongs, dolphins and whales with a fatal stranded ratio of 95% and 94%, respectively. However, sea turtles had a similar proportion of live and vulnerable stranding at 49% and 51%, respectively.

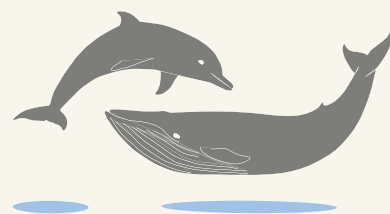
Stranded Dugongs

Most of the dugongs, 33% of them were sick, causing them to be stranded. Most of them were caused by disorders of the digestive tract and respiratory system. It was also caused by being hit by a blunt object, entangle to fishing nets, eat marine litter such as fishing lines in equal proportions. Furthermore, a juvenile dugong was lost from its mother. When compared with the stranding of the dugong in 2019, it was found that the rate of fishing and marine litter impact tends to rise. On the other hand, the cause of illness, separation from mother and being hit by blunt things tends to decrease.



Stranded Dolphins and Whales

Most of the dolphins and whales' dead were caused by natural illness and fishing gear, 45% and 28%, respectively. It was also caused by natural disasters such as shark bites, misdirected and marine debris, etc. The cause of stranding had no trend of change compared to those of the fiscal year 2019.



3.1 Status of Marine and Coastal Resources (cont.)

Rare and endangered marine species:
Sea turtles, Dugongs, Dolphins and Whales

Stranded Marine Species (cont.)

Stranded Dolphins and Whales

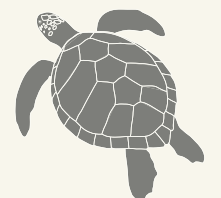
Irrawaddy dolphins in Songkhla Lake is the only species of dolphin in Thailand that lives in freshwater, which is 1 in 5 in the world. It is found in the upper Songkhla Lake area. From the 2020 survey, there were about 14 of them. According to the 2017-2020 population survey, **the population trend to be decreased**. The stranding of Irrawaddy dolphins in Songkhla Lake was caused by two main factors, entangled of fishing gear such as the giant catfish net, sea bass net, and the physical and biological factors such as the shallower lake, water pollution and reduction in aquatic life.

Since the limited population of Irrawaddy dolphins in Songkhla Lake, and unable to migrate, move, exchange genetic diversity with other Irrawaddy dolphins, it will be the cause of inbreeding within its family. In fiscal year 2020, two Irrawaddy dolphins were found stranded, one adult dolphin and one newborn dolphin. **From the 30 Years statistics of the stranded Irrawaddy dolphins in Songkhla Lake, it is found that there is a slight increase in its stranding.**



Stranded Sea Turtles

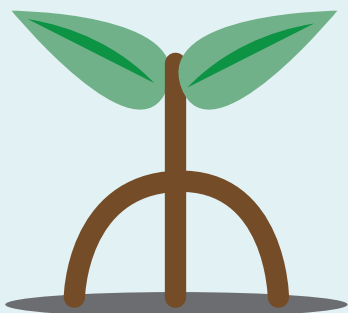
For the sea turtles, the main causes of sea turtles stranded in fiscal year 2020 were marine debris and fishing gear at 38% and 35%, respectively. Most of them arise from the entangle to the fishing nets. The sick sea turtles were found stranded at 11% weakness, drowning and malnutrition. In addition, other causes were found, such as being misdirected, being hit by a boat or a ship's propeller, a shark bite, etc. A comparison of the stranded with the fiscal year 2019, it was found that the proportion of stranded causes was similar.



3.1 Status of Marine and Coastal Resources (cont.)

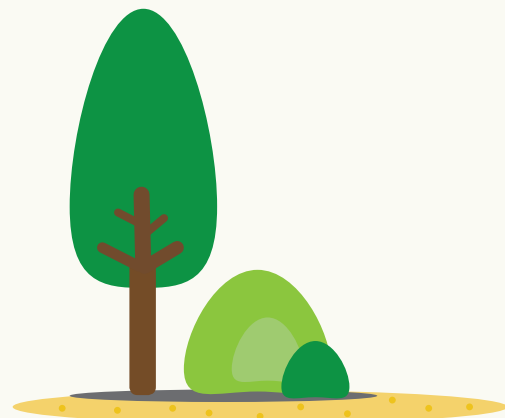
Mangrove

In the past, mangrove forest has been changed to various kind of development. During 53 years from 1961 – 2014, mangrove areas decreased from 2,299,375 Rai in 1961 to 1,534,585 Rai in 2014. However, from 2004 – 2014, mangrove areas increased dramatically from the national policy on mangrove conservation including the totally ban on mangrove concession areas in 2003. Interpretation of high resolution satellite imagery by the Department of Marine and Coastal Resources together, with the Geo-Informatics and Space Technology Development Agency (Public Organization) or GISTDA in 2020, was found that **Thailand currently has a total area of 1,737,019.74 rai of preserved mangrove forests.** There is an increase of 202,435.01 rai of mangrove areas from those in 2014.



Beach Forest

Data on the condition of the forest area in 2020 found that Thailand had 40,233.64 rai of beach forest areas under the responsibility of the Department of Marine and Coastal Resources, scattered in 18 coastal provinces. **The province with the most beach forest area is Phang Nga Province with a number of beach forest areas, 9,961.46 rai,** followed by Krabi province of 3,712.47 rai. Most of the beach forests in Thailand have been destroyed to small patches, since there are few species of plants that are economically valuable. There was little interest in conservation. In addition, most of the beach forests located near the sea, therefore, it has been changed to the establishment of a community, piers, accommodation and tourist development. Information on the condition of forest areas in 2020 shows that Thailand had 32,989.42 rai of peat swamp in 12 coastal provinces under the responsibility of Department of Marine and Coastal Resources. **The province with the highest swamp area was Songkhla Province with an area of 12,814.98 rai of peat forest,** followed by Narathiwat with an area of 8,650.15 rai.



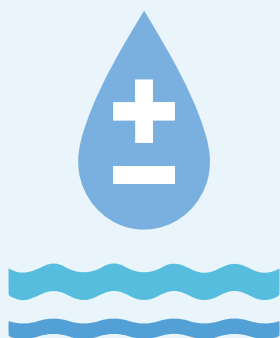
3.2 State of Marine and Coastal Environment

Sea Water Quality, Oil Spill, Red Tide, and Poisonous Jellyfish

Sea Water Quality

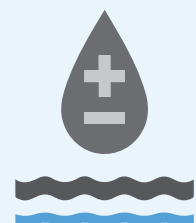
In fiscal year 2020, most sea water quality indexes were in good condition (71%) fair (19.6%), very good (4.7%) and poor condition (4.7%) without very poor degradation. Some degraded areas include the mouth of the Rayong River (Rayong Province) mouth of Khlong Tam Ru, the mouth of the Chao Phraya River (Samut Prakan Province), Tha Chin River mouth and the mouth of the Thachin (Samut Sakhon Province) Mae Klong River mouth (Samut Songkhram Province) and Ban Laem coastline (Phetchaburi Province). It can be seen that the coastal water quality of the upper Gulf of Thailand was in degraded status. This is because of the high density of coastal communities and Industrial plants along the coast.

Considering the situation of sea water quality since the fiscal year 2014 – 2020, most of the sea water quality was in good condition, followed by fair condition, very good condition and very poor condition, respectively. In the fiscal year 2020, the sea water quality was not found in the very poor conditions.



Oil Spill

In the fiscal year 2004 - 2019, the Department of Marine and Coastal Resources has monitored and found 54 oil spills and oil deposits along the coastline. In fiscal year 2019, there were nine oil spills on the coast of the Gulf of Thailand and one of the Andaman times. Instead, they found tar balls on the Gulf Coast of Thailand 10 times and Andaman 11 times. In the fiscal year 2020 (October 2019 - July 2020), the DMCR have been notified and encountered an oil spill and tar balls along the coast. There were 10 oil spills on the Gulf of Thailand, 4 times in Rayong Province (Had Saeng Chan, Nong Phab Beach, Suchada Beach and Laem Mae Phim Beach), 1 time in Samut Prakan Province (Chao Phraya River mouth), 1 time in Prachuap Khiri Khan Province (Ban Nong Samet Beach), 2 times in Songkhla Province (Ban Pakterra beach and beaches in Sathing Phra District to Ranot District), 1 time in Nakhon Si Thammarat Province (Ban Phraek Mueang Beach) and 1 time in Pattani Province (Wasukri Beach - Patatimo). A total of 26 times of tar balls were found, 2 times in Chonburi Province, 9 times in Rayong Province, 2 times in Chanthaburi Province, 2 times in Trat Province, 3 times in Phetchaburi Province, 2 times in Chumphon Province, 3 times in Prachuap Khiri Khan Province, 1 time in Surat Thani Province, 2 times in Nakhon Si Thammarat Province and 2 times in Phuket Province.



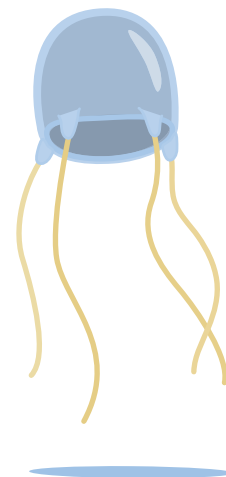
3.2 State of Marine and Coastal Environment (cont.)

Red Tide

For the phytoplankton bloom phenomena, in the fiscal year 2020, there were 10 times of phytoplankton blooms, 9 times in the Gulf of Thailand, found at Rayong Province 3 times in April and June 2020. For the Andaman coast, there was 1 phytoplankton bloom in Patong beach, Phuket Province in January 2020

Poisonous Jellyfish

According to the statistics of severe injuries and deaths from box jellyfish of the Epidemiological Division, Department of Disease Control, Ministry of Public Health, between 1999 and 2020, there were 9 cases dead and 36 cases of serious injuries were reported. In addition, there were two more severe injuries but unspecified locations. In fiscal year 2020, there was 1 death in the area of Rayong Province and 1 serious injury in the area of Chumphon Province. Therefore, areas with a history of severe injury or death from exposure to poisonous jellyfish should be classified as a risky area and must be protected from poisonous jellyfish, consisting of 8 provinces: Trat Province, Rayong Province, Phetchaburi Province, Chumphon Province, Surat Thani Province, Phuket Province, Krabi Province and Satun Province.



3.2 State of Marine and Coastal Environment (cont.)

Marine Debris

According to the monitoring of the amount of floating marine debris flowing into the Gulf of Thailand from 5 main rivers (Chao Phraya, Tha Chin, Bang Pakong, Mae Klong and Bang Taboon) by the Department of Marine and Coastal Resources between 2017 and 2020, **there was a significant decrease in the amount of floating marine debris from 3,357 tons in the year 2017 to 2,569 2,226 and 2,178 tons in 2018, 2019 and 2020, respectively.** (the number of pieces, from 173 million pieces in 2017, reduced to 109, 73 and 71 million pieces in 2018, 2019 and 2020, respectively). Especially around the mouth of the Chao Phraya River, the amount of floating debris decreased significantly over the four years compared to other estuaries. Part of the factor is the result of the clear campaign of the government to reduce the use of plastic bags. In addition, the agencies involved in the management of onshore waste had concrete and efficient action plans and plans for waste management.

However, in 2020, many river mouths such as Bang Pakong, Tha Chin and Mae Klong found more floating debris than during 2019. This may be due to the situation of the coronavirus infection epidemic (COVID 19). An announcement of lockdown measures asking for cooperation for people to limit their travel Including the emphasis on working at home (Work from Home) and the use of food delivery services. As a result, there is a huge increase in the production of plastic packaging.



3.3 Coastal Erosion

Coastal Erosion

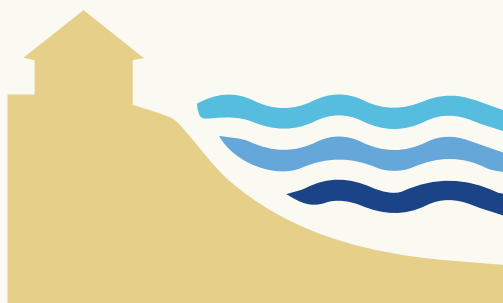
Thailand has a total of coastlines of 3,151.13 kilometers. There are 2,039.78 kilometers in the Gulf of Thailand and 1,111.35 kilometers in the Andaman coast. An intensive field surveys and monitoring of coastlines change from satellite images indicated that;

1. **The total length of coastal erosion (CE)** was 794.37 km., which can be classified as;

- 1.1 **Coastline facing erosion which have not yet been mitigated (Non - Defence Structure: NDS)** was 91.69 km.

- Severe Erosion (SV) 12.87 km.
- Moderate Erosion (ME) 28.64 km.
- Less Erosion (LE) 50.18 km.

- 1.2 **Coastline facing erosion which have been mitigated (Defence Structure: DS)** was 702.68 km.



Coastlines which has no erosion

(Coastal Non-Erosion: CN)

was 2,356.76 km., which can be classified as;

- 2.1 **Equilibrium (EQ)** 1,612.28 km.
- 2.2 **Cliff Coast (CC)** 488.33 km.
- 2.3 **Accumulate Sediment (AS)** 31.50 km.
- 2.4 **Coastal Invasion (CI)** 70.90 km.
- 2.5 **River Mount (RM)** 153.76 km.

There are three types of **causes of coastal erosion**,

1. **The destruction of natural coastal protection** such as mangrove, sandy beach and coral reef,
2. **The consequences of current coastal protection structures** such as Jetty, breakwater, seawalls, revetment and port.
3. **Other causes** such as change of boat channel from dredging and the change of coastline to the new equilibrium which is the natural phenomena of coastal morpho - dynamics and storm surge.



The DPSIR assessment framework (Drivers – Pressures – States – Impacts – Responses)

4. DPSIR analysis for Marine and Coastal Resources

The current state of marine and coastal resources and coastal erosion in 24 coastal provinces indicated the trend of degraded marine and coastal resources caused mainly by human activities. The human activities such as coastal development, tourisms, industries, communities, agricultures, aquacultures fisheries and marine transportation affected coastal water qualities, marine litters, sedimentation and the degradation of marine and coastal resources. The driving factor coming from the effort of the government sector that aims to develop the livelihoods and well-being of the people of the nation through government policies, strategies, plans, projects and activities that focus on the achievement of indicators under the responsibility of each agency. It is linked with numbers that reflect economic and social growth.

If the situation continues, it could be to a point where marine and coastal resources can no longer support marine activities. This will lead to a major turning point in economic growth. The marine sector and reflects the mistakes of making policies, strategies, plans, programs and activities by various government agencies, especially in the marine sector.

Therefore, it is imperative that a response to the situation should be concerned in order to correct and prevent further escalating issues. There are many levels of response such as responding to driving factors, which are mainly due to domestic policy, responding to pressures, most of which are pressures created by human activities with the following suggestions.

5. Policy responses to marine and coastal resources

5.1 Policy recommendations (1 year urgent measures)

5.2 Long - term (3 years) measures and management plans

5.1 Policy Recommendations (1 Year Urgent Measures)

Policy Recommendations

(1 Year Urgent Measure)

1. Drive integrated solutions to the problem of coastal erosion

Push for the solid integration among agencies, projects and budget as related to the issue of coastal erosion for the entire country.

2. Strengthening the issue solving based on Ocean health Index (OHI) following the national strategies

Thailand should put in place measures and prepare to collect data related to Ocean Health Index. The output and outcome of working on OHI would accelerate us to the creation of processes that more directly resolve the problems.

3. Driving the marine spatial planning at the national level and pilot sites

Determining the zonings on the use of various activities while maintaining the ecosystem integrity or ecosystem bases management within appropriate boundaries (national, regional, provincial or others). The establishment of a subcommittee or a multi-sectoral working group is first required, to generating a framework and plan for the pilot areas.



4. Establish a monitoring and warning system for reporting marine environmental problems

Provide a competent system to support for monitoring, and alerting environmental problems including marine debris, wastewater, oil stain, and others. As marine pollution are more likely to increase with regard to the expansion of various development activities. Competent monitoring system can contribute to construct measures that help to reduce the severe impacts in the coastal ecosystems and communities accordingly.

5. Drive the expansion of marine protected areas to 10 percent of the sea area

Increasing marine protected areas to 10 percent of the marine area by 2030 in line with the goals set out in the Sustainable Development Goal 14 (Conserve at least 10 percent of marine and coastal areas in accordance with international and internal laws, based on the country scientifically data available).

6. Driving the management of marine and coastal resources

Coral reef, seagrass and mangrove are important sources providing ecosystem services, such as tourisms, fisheries, uptake greenhouse gases and etc. To meet the target set under the 20-year National Strategy (coral reefs are damaged no more than 50% of the entire nation's reef within five years, and less than 20 % within 20 years; maintain mangrove forests for not less than 1.75 million rai; and maintain seagrass resources for not less than 1.6 hundred thousand rai).

5.1 Policy Recommendations (1 Year Urgent Measures) (cont.)

Policy Recommendations

(1 Year Urgent Measure)

7. Building social ecological resilience to the impact of climate change

Preparing for social and ecological system to cope and adapt when dealing with any changes or undesirable conditions they may face. Creating adaptive governance, and building community adaptive capacity can help to support social-ecological resilient. For instance, governance with participatory processes that allow community members to learn and participate in natural resources planning and decision-making also influence community or individual adaptive capacity.

8. Create knowledge and innovation for the use of marine and coastal resources

Gather and develop knowledge to create innovations that promote the use of marine and coastal resources, which are environmentally friendly in diverse forms.

9. Build a mechanism for participation in the management of marine and coastal resources

Encourage communities to take part in managing marine and coastal resource, with a transparent and fair support mechanism.



5.2 Long-term (3 years) measures and management plans

Long-term (3 years) Measures and Management Plans

1. Increase knowledge from research and monitoring of marine and coastal resources.

- Conduct research to understand and create new innovations such as the cause of the degradation of resources, Environmental Economics (Direct and indirect use), effluent treatment, waste management, and Ecological restoration.
- Monitoring changes in resource status continuously for and updating situations to provide suitable information for solving problems.
- Evaluation of habitat restoration and artificial reef projects.
- Produce media to disseminate correct knowledge to the people, local government organizations and government sectors (books, manuals, brochures, posters, signs, videos, websites, etc.)

2. Strengthening the participation of communities and private sectors

- Establishing a network of people sector by registering individuals and coastal communities.
- Support suitable CSR activities for resource conservation and restoration.
- Provide accurate awareness with the public sector, community networks, schools, local events or conferences, etc.
- Establish community agreement for the conservation and sustainable uses of marine and coastal resources, according to the Section 16 of the laws.

3. Protecting and patrolling of marine and coastal resources for sustainable uses

- Establish a surveillance monitoring program for coral reefs, sea grass, mangrove forests, beaches and beach forests and rare marine life.
- Set up boundary signs for marine and coastal resources areas such as mangrove forests, coral, seagrass, etc.
- Define the coast line and monitor changes of coastlines.
- Establish a mooring buoy and permanent buoy base in Coral reef area.
- Installing of artificial corals to restore and protect the ecosystem.
- Litigation, prosecution and reclaim the mangrove area.
- Define the marine spatial uses planning in coral reefs, mangrove forests and seagrass areas.

4. Marine and coastal resources rehabilitation

- Coral reef restoration.
- Seagrass transplantation demonstration.
- Mangrove restoration.
- Mangrove restoration with bamboo wave protection lines.
- Beach and dune nourishment.
- Marine endangered animal rescue and rehabilitation.



5.2 Long-term (3 years) measures and management plans (cont.)

Long-term (3 years) Measures and Management Plans

5. Reduce impact from mainland and island into the sea

- Use the provincial marine and coastal resources committee mechanism according to Articles 12 and 13 to provide comments on the impact of activities on land and islands such as waste, sewage, sedimentation effects on marine and coastal resources.
- Prepare policies and plans for managing marine and coastal resources for provincial and national levels.

6. Established Mangrove Conservation Areas and Marine and Coastal Protected Areas

- Issue Ministerial Regulations on the conservation of Mangrove Forest Areas according to Section 18 and Measures under Section 23.
- Issuing Ministerial Regulations on the marine and coastal resources protected areas according to Section 20 and measures under Section 23 in areas with important marine and coastal resources such as coral reef, seagrass, sandy beach, outside the current protected areas.
- Issuing Ministerial Regulations on areas where measures will be taken to prevent coastal erosion according to Section 21.

- Issuing a ministerial announcement to establish measures to protect marine and coastal resources in the event that marine and coastal resources may be destroyed or seriously damaged in accordance with Article 22, including coral reefs, seagrass, beaches, upland and marine areas, both in conservation areas and non-conservation area.

7. Implement laws and regulations

- Establish guidelines for implementing Section 17 in solving problems of any person causing serious damage to marine and coastal resources.
- Establish guidelines for implementing Article 22 for the protection of marine and coastal resources in the situation of destruction of marine and coastal resources or has been seriously damaged in a critical level.
- Support the spatial planning of coastal areas including the establishing a buffer zone to control constructions that affect the coast to reduce impact from coastal erosion.
- Supporting the management of coastal areas following the beach system to control and prevent the development of coastal areas that may affect the coastal erosion.

5.2 Long-term (3 years) measures and management plans (cont.)

Long-term (3 years) Measures and Management Plans

- Establish a mechanism to control the impact of the development project and coastal erosion protection projects that strengthen the widespread coastal erosion to adjacent areas such as control the budget requests for the projects that increase the coastal erosion. An Environmental Checklist must be requested for a seawall project that does not require an Environmental Impact Assessment.

8. International collaboration and agreement

- Support and participate in conservation cooperation activities Manage marine and coastal resources with international cooperation.





The DPSIR assessment framework (Drivers – Pressures – States – Impacts – Responses)

6. National issues that need to be solved urgently

Urgent issues need an urgent policy drives are coastal erosion, stranding of rare marine life and marine litter. These issues occur in all coastal provinces and need to be emphasized in formulating an appropriate policy. The marine debris is a national issue that spans upstream, midstream and downstream, which the Ministry of Natural Resources and Environment is already working on an integrated program. Therefore, there are two urgent issues that need to be solved urgently, which are coastal erosion and the stranding of rare marine species. Recommendations, guidelines and measures to address the problem of coastal erosion and stranding of rare marine species are as follows.

6.1 Coastal erosions

6.2 Stranding of rare marine species

6.1 Coastal Erosion

Coastal Erosion

In order to propel the Cabinet Resolutions on January 16, 2018 on guidelines for making plans /Coastal Erosion Prevention and Solution Project Effective in practice, urgent measures are need. The Lessons learned from the coastal erosion and an analysis of the weaknesses of the management of the coastal erosion in Thailand indicated that the integration and collaboration among government agencies are not yet concrete. Each agency still sets a budget in accordance with the framework of authority and also have a different understanding of the issues, including the selection of protection measures and solving problems that are not suitable for the erosion beaches and non-erosion beaches. In addition, the selection of shoreline equilibrium and restoration approaches is a systematic approach that requires systematic management of coastal areas. There is still a lack of methods and approaches to compensate for damages in the event of a buffer zone. Therefore, there are 5 recommendations for solving the country's coastal erosion issues at the policy and management level as follows:

1. Management of equilibrium coasts

- Accepting coastal dynamic conditions and create a buffer line.
- Make a list and issue measures to control projects, activities or constructions that can damaged the coastal dynamic process.
- Apply the concept of the coastal zone management plan.
- Increase knowledge to the public to understand the value of the coast and coastal processes.

2. Restoring and solving urgent critical areas and moderate critical areas

- Assess the project and the impacts of the construction on the coast to find a suitable solution.
- suspend construction and all types of coastal invasions that can affect the balance of coastal sediment transport and gradually demolish constructions that have invaded the coast in order to return the natural sediment transport.
- Determine the critical areas as a Special Area Management.
- Promote conservation and restore mangrove forests.
- Promote conservation and restore sandy beaches, dunes and beach plant communities.

3. Integrate the coastal erosion solutions of all organizations and agencies

- Promote collaboration mechanisms between government agencies.
- Communication of accurate information to public.
- Promoting the participation of relevant sectors in the area.
- Supporting academic information for local authorities.



6.1 Coastal Erosion (cont.)

Coastal Erosion

4. Improve laws or regulations related to coastal development

- Clearly define the spatial plan of use and conservation of coastal areas throughout the country.
- Manage for the sustainable use of coastal areas.
- Strictly enforce relevant laws.

5. Support research, data collection and analysis

- The application of sediment dredged channels to compensate for coastal areas.
- Appropriate measures on sand nourishment.
- Proper restoration of coastal morphology according to the Living Shorelines principles.
- Dynamics of beach and coast.
- Assessment of economic damages and remedies and compensation payment guidelines.



6.2 Stranding of Rare Marine Species

Stranding of Rare Marine Species

Despite an increasing of the number of rare marine animal encounters reported through knowledge building and networking and reporting channels for rare marine species, the deaths of rare marine life are still increasing every year, especially the dugong, which is a wildlife reserve animal. According to the situation analysis of rare marine animals with the DPSIR technique, there are guidelines and measures for the conservation and management of rare marine animals as follows:

1. Protection and restoration of habitats and nesting beach of rare marine animals

- Marine SMART Patrolling.
- Developing remote patrolling and surveillance technology.
- Training to save rare marine life.
- Set up a rescue center for rare marine animals and equipment.

2. Improve the relevant regulations

- Establish the spatial uses planning in their main habitats.
- Set up protected areas for rare marine species / nesting areas.
- Improve / issue measures and related laws to support conservation and protection of rare marine species.

3. Establish a participatory process and awareness program

- The National Integration Working Group or committee.
- Conservation Network and participatory exploring rare marine species.
- Restoration of sea turtles' nesting sites.
- Marine debris management.
- Responsible fishing in marine habitats.

4. Public communications on rare marine animals

- Rare marine species museum.
- Community learning center.
- Public relations and Social media.
- Training and meeting for stakeholders.

5. Research

- Guidelines for management of fisheries that pose a threat to rare marine life.
- Guidelines for organizing friendly tourism activities to rare marine animals.
- Economics of Rare Marine Resources.
- Survey population and habitats / nesting sites.
- Study of population genetics and the health of rare marine animals.
- Collect death statistics and analyze the cause of dead.

