



National State of Oceans and Coasts: Blue Economy Growth

VIETNAM





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National State of Oceans and Coasts: Blue Economy Growth of Vietnam

December 2020

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Acronyms and Abbreviations

As	– arsenic	GRDP	– gross regional domestic product
ASEAN	– Association of Southeast Asian Nations	GT	– gross tonnage
BMUB	– German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety	GVA	– gross value added
BOD	– biochemical oxygen demand	H ₂ S	– Hydrogen sulfide
CBD	– Convention on Biological Diversity	ha	– hectare
Cd	– cadmium	HDI	– Human Development Index
CITES	– Convention on International Trade in Endangered Species	Hg	– mercury
CN ⁻	– cyanide	Hp	– horsepower
CO ₂	– carbon dioxide	ICAFIS	– International Cooperation Center for Sustainable Aquaculture and Fishing
COD	– chemical oxygen demand	ICM	– integrated coastal management
CPUE	– catch per unit effort	IMO	– International Maritime Organisation
Cu	– copper	IPIECA	– International Petroleum Industry Environmental Conservation Association
CV	– chevaux vapeur	IUCN	– International Union for Conservation of Nature
DO	– dissolved oxygen	IUU	– illegal, unreported and unregulated (fishing)
DONRE	– Department of Natural Resources and Environment	km	– kilometer
DRR	– disaster risk reduction	km ²	– square kilometer
DWT	– deadweight tonne	KOICA	– Korea International Cooperation Agency
EAS	– East Asian Seas	kV	– kilovolts
ESI	– Environmental Sensitivity Index	LPG	– liquefied petroleum gas
EVN	– Vietnam Electricity	m	– meter
FAO	– Food and Agriculture Organization of the United Nations	m ²	– square meter
Fe	– iron	m ³	– cubic meter
GDP	– gross domestic product	MAM	– Mangroves and Markets
GEF	– Global Environment Facility	MARD	– Ministry of Agriculture and Rural Development
GII	– Gender Inequality Index	MARPOL	– International Convention for the Prevention of Pollution from Ships
GIS	– Geographic Information Systems	MFF	– Mangroves for the Future
GISEA	– Global Initiative for South-East Asia	MICE	– meetings, incentives, conferences, and exhibition
GNI	– gross national income	Mn	– manganese
GOT	– Gulf of Thailand	MOA	– Memorandum of Agreement
GPA	– Global Programme of Action for the Protection of the Marine Environment from Land-based Activities	MONRE	– Ministry of Environment and Natural Resources

MPA	– marine protected area	UNCLOS	– United Nations Convention for the Law of the Sea
MPI	– Ministry of Planning and Investment	UNCTAD	– United Nations Conference on Trade and Development
MW	– megawatts	UNDP	– United Nations Development Programme
NASOS	– Vietnam’s National Southern Oil Spill Response Center	UNEP	– United Nations Environment Programme
NH ₄₊	– ammonia	UNESCAP	– United Nations Economic and Social Commission for Asia and the Pacific
NO ₂₋	– nitrogen dioxide	UNESCO	– United Nations Educational, Scientific and Cultural Organization
NO ₃₋	– nitrate	UNFCCC	– UN Framework Convention on Climate Change
NSOC	– National State of Oceans and Coasts	UNWTO	– United Nations World Tourism Organization
ODA	– official development assistance	US\$	– United States dollar
OHI	– ocean health index	USAID	– US Agency for International Development
Pb	– lead	VASI	– Vietnam Administration for Seas and Islands
PEMSEA	– Partnerships in Environmental Management for the Seas of East Asia	VAST	– Vietnam’s Academy of Science and Technology
PO ₄ ³⁻	– phosphate	VEA	– Vietnam Environment Administration
PVN	– Petrovietnam	VINAFIS	– Vietnam Fisheries Association
R&D	– research and development	VINAMARINE	– Vietnam Maritime Administration
RQ	– risk quotient	VINASARCOM	– Vietnam National Committee for Search and Rescue
RSOC	– Regional State of Oceans and Coasts	VND	– Vietnamese dong
SDGs	– Sustainable Development Goals	WHO	– World Health Organization
SDS-SEA	– Sustainable Development Strategy for the Seas of East Asia	WTO	– World Trade Organization
SGP	– Small Grants Programme (of GEF)	WTTC	– World Travel and Tourism Council
SNV	– SNV Netherlands Development Organization		
SOLAS	– Convention for the Safety of Life at Sea		
TEU	– twenty-foot equivalent unit		
TSS	– total suspended solids		

FOREWORD

Sustainable development of marine economy on the basis of green growth, conserving marine ecosystems and biodiversity, and ensuring the harmony between economic development and natural ecosystems are cross-cutting points set out in the *Resolution No. 36NQ/TW* dated October 22, 2018 of the Eighth Conference of the 12th Party Central Committee on *Vietnam's Strategy for Sustainable Development of Marine Economy to 2030, with a vision to 2045*. This point of view demonstrates Vietnam's commitment to achieving the United Nations 2030 Agenda for Sustainable Development.

With the assistance of PEMSEA, the Report "*National State of Oceans and Coasts (NSOC) of Vietnam: Blue Economy Growth*" was developed to demonstrate the country's progress toward a sustainable, inclusive and resilient blue economy and healthy oceans and coastal communities. The report describes the key ocean or marine economic sectors, coastal and marine ecosystem services, risks and threats to ocean health, blue economy initiatives and investment opportunities, and governance structure to support blue economy development, pollution reduction, conservation of marine ecosystems and resources, and actions on climate change. Information and data in this NSOC Report follows the framework of the Regional SOC Report, in accordance with the PEMSEA guidelines.

The NSOC report is comprised of six parts. Part 1 focuses on the natural and socio-economic conditions in coastal areas of Vietnam, and drivers of environmental change. Part 2 describes the ocean economy, and marine and coastal resources and values, as well as assesses the current situation of major ocean-based economic sectors (fisheries and aquaculture; coastal and marine tourism; marine transport, ports and shipbuilding; and offshore oil and gas), including their contribution to economy and jobs, pressures and challenges, and response measures. Part 3 provides best practices and innovative actions on the transition to a blue economy, and opportunities in emerging ocean-related industries (e.g., green port development; marine renewable energy). Part 4 presents the current situation of ocean health and pressures on seawater quality and key ecosystems, and outlines major human and natural threats to the coastal areas including climate change. Part 5 reviews the policies, laws and institutional arrangements supporting the development of blue economy, and the issues, challenges and actions to protect the marine environment, ecosystems and biodiversity. Part 6 provides some recommendations for the integrated coastal and ocean management in Vietnam, and transformation of the ocean economy to a sustainable blue economy.

The process of developing this NSOC Report had faced many challenges, especially the issues related to data collection, data availability and analysis. Some data have not been collected and

processed in a systematic manner. In some cases, there is a lack of updated information for analysis and assessment, and it is difficult to obtain disaggregated data for the coastal zone or for the pure ocean economy. However, with inputs from ministries, various sectors, and experts, the data and information described in this NSOC report had been reviewed and screened. We hope that this Report will be useful in assisting planners, policymakers, environmental managers, researchers and other stakeholders to ensure sustainable growth of the ocean economy and protection of Vietnam's marine and coastal resources for future generations.

This report was prepared by the Report Development Working Group established by the Vietnam Administration of Seas and Islands with the contribution of a number of experts in the fields of natural resources and environment, planning and investment, tourism, fisheries, shipping, science and technology, and policy and institution from different ministries, sectors and agencies, especially the Ministry of Planning and Investment, Ministry of Transport, Ministry of Culture, Sports and Tourism, Ministry of Industry and Trade, Ministry of Agriculture and Rural Development, Ministry of Natural Resources and Environment, and Vietnam Academy of Science and Technology. We also constantly received effective cooperation, guidance and technical support from PEMSEA during the whole process of developing and completing the Report.

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for implementation of Sustainable Development Strategy for the East Asian Seas"

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The *National State of Oceans and Coasts* (NSOC) Report is developed under the framework of the Project on ICM Scaling up in Vietnam for the implementation of the *Sustainable Development Strategy for the Seas of East Asia* (SDS-SEA), supported by PEMSEA. It has received many comments and inputs from various ministries, sectors, coastal provinces and cities, and experts in the fields of natural resources and environment, planning and investment, tourism, fisheries and aquaculture, ports, marine transport, science and technology, and institutions and policies. The report demonstrates Vietnam's desire and responsibility for the development of a blue economy for the sustainable development of the country's marine and coastal areas. On behalf of the Vietnam Administration of Seas and Islands (VASI), I would like to express sincere gratitude to ministries, sectoral agencies, institutions, coastal provinces and cities, and other stakeholders for providing data and information for the Report preparation and contributing valuable comments for the Report completion.

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Finally, I would like to extend my deepest thanks to GEF/UNDP and PEMSEA for their technical and financial support in the preparation of the NSOC Report, especially to Ms. Maria Corazon M. Ebarvia for her inputs, guidance and specific comments during the preparation and finalization of the Report and technical editing, Mr. John Castillo for the layout of the report, and to Ms. Nancy Bermas for her support and advice.

Ta Dinh Thi

Director General

Vietnam Administration of Seas and Islands



"Bac Lieu offshore wind power farm in the Mekong Delta" by <http://shansov.net>, licensed under CC BY-SA 3.0



Oyster-pearl farm in Bai Tu Long Bay.

EXECUTIVE SUMMARY

1. Background

In November 2015, the Ministers of the Environment of the East Asian Seas (EAS) countries adopted the Danang Compact at the EAS Congress 2015 held in Danang City, Vietnam. One of the targets set forth in the Danang Compact is to develop the first Report on the Regional State of Oceans and Coasts. The first set of reports will focus on blue economy, which was adopted in the EAS region with the signing of the Changwon Declaration in 2012.

The countries in the EAS Region, including Vietnam, have developed their respective National State of Oceans and Coasts (NSOC) Report, to contribute to the Regional State of Oceans and Coasts (RSOC) Report. These SOC reports help to assess the development of a blue economy as well as contribute to the monitoring of the progress of implementation of the *Sustainable Development Strategy for the Seas of East Asia (SDS-SEA)*; *2030 Agenda for Sustainable Development* (Sustainable Development Goals or SDGs); the *World Summit on the Implementation Plan for Sustainable Development*; and other global and regional instruments related to sea, islands and coastal areas. In addition, the Report also contributes to the monitoring and assessment of the implementation of the **Strategy for Sustainable Development of Vietnam's ocean economy to 2030, vision to 2045** in the spirit of *Resolution No. 36-NQ/TW* dated October 22, 2018 of the XII Party Central Committee's Executive Committee, as well as the national policies and legislations related to the sea and coastal areas, and relevant multilateral environmental agreements to which Vietnam is a party.

The definition of a blue economy is given in the **2012 Changwon Declaration**, adopted by EAS region as a way to deal with the challenges of environment and climate change as well as to promote sustainable and inclusive development through economic activities that also reduce the negative impacts on ocean health and coastal communities.

“We understand the Blue Economy to be a practical ocean-based economic model using green infrastructure and technologies, innovative financing mechanisms, and proactive institutional arrangements for meeting the twin goals of protecting our oceans and coasts and enhancing its potential contribution to sustainable development, including improving human well-being, and reducing environmental risks and ecological scarcities.”

- **Changwon Declaration 2012**

The blue economy, as discussed in the 2012 EAS Congress and stated in the Changwon Declaration 2012, refers to a sustainable sea-based economic model, with innovative, environmentally-friendly infrastructure, technology and practices, including institutional and financial arrangements, to meet the goals of: (a) sustainable and inclusive development; (b) protection of marine and coastal areas, and reduction of environmental risks and ecosystem degradation; (c) attainment of water, energy and food security through innovative and sustainable use of the oceans; (d) protection of health, livelihoods and welfare of people in coastal areas; and (e) promotion of ecosystem-based climate change mitigation and adaptation measures. Various approaches and initiatives have been presented by different countries and organizations at the EAS Congress 2012, 2015 and 2018.

Vietnam has made many efforts to achieve green growth in general, and blue economy development in particular. However, the lack of relevant information and disaggregated data constrains a more clear-cut analysis of the ocean economy. Although there are only a few examples of blue economy initiatives included in this NSOC report, they already provide models of good practices and innovative approaches that could be replicated, scaled up, and contribute to a more sustainable, inclusive and resilient development of the coasts and seas.

Therefore, Vietnam's NSOC report, with focus on "Blue Economy Growth", aims to provide initial information on the state of the marine and coastal areas of the country, including socioeconomic, environmental and institutional aspects. Preparing the first NSOC report is a stocktaking effort, involving data collection and analysis of ocean-based and ocean-related economic activities, benefits and value of marine and coastal resources, and the ocean governance and blue economy initiatives that address the pressures and impacts affecting the ocean economy and ocean health.

The NSOC report also adopts the *Drivers-Pressures-State-Impacts-Response (DPSIR) framework* as a way to organize the indicators and assess ocean health and the ocean economy. It is policy-oriented, and it provides a framework for categorizing a problem domain, along the cause-effect chain. The highly-complex marine system has a large number of interrelated processes acting between its physical, chemical, and biological components.

For the drivers, the report provides an overview of the demographic, economic and social features. Many diverse human activities exert pressure on the complex coastal and ocean environment. The key ocean economic activities or sectors are described to show the benefits of oceans to the economy, and to incomes, jobs, livelihoods and well-being. The pressures and issues of each ocean economic sector, impacts on ocean health, and response measures like major policies, laws, strategies, and plans are also presented. Moreover, examples of blue economy initiatives are highlighted to show the ongoing transformation of the ocean economy to attain both economic growth and environmental protection, i.e., sustainable development of the coasts and marine areas of Vietnam.

For ocean health, the status of marine water quality, and condition of ecosystems and biodiversity are discussed as well as the pressures and risks from human activities and from natural hazards and climate change. The last part of the report focuses on the response measures in terms of ocean governance, ranging from policies, laws and institutional arrangements to key actions addressing the major pressures on ocean health, i.e., pollution, and fisheries, habitat and biodiversity loss.

2. The Sea, Coasts, Economy, and People of Vietnam

A number of important factors and developments will shape the coastal and marine areas of Vietnam in the coming years. The ocean like all other sectors responds to macro-level factors. Changes in marine ecosystem dynamics are influenced by socioeconomic activities. These drivers include:

- population growth and changes in demographic attributes
- economic growth, urbanization and land-use change, various economic sectors (both ocean-based and non-ocean-related industries), trade, and production and consumption patterns
- changes in social dimensions (including changes associated with cultural, ethnic, gender equity, prosperity, and improved education, health, welfare, and other social and environmental services, including access to water, sanitation, and wastewater and solid waste management).

2.1 Geographic Features

Vietnam is a country on the eastern edge of the Indochina peninsula, near the center of Southeast Asia. It is bordered by China to the north, Laos and Cambodia to the west, Gulf of Thailand to the southwest, and the East Sea (South China Sea) to the south and east.

Vietnam has the total land area of 331,212 km², including the whole mainland and more than 4,000 islands. The total length of the coastline is over 3260 km.

The whole country has 28 coastal provinces and centrally-run cities (hereinafter referred to as coastal provinces and cities): Quang Ninh, Hai Phong, Thai Binh, Nam Dinh, Ninh Binh, Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien Hue, Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan, Binh Thuan, Ba Ria-Vung Tau, Ho Chi Minh City, Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau, and Kien Giang.

Vietnam's principal physiographic features are the Annamese Cordillera (Nui Truong Son), extending generally from northwest to southeast in central Vietnam and dominating the interior, and two extensive alluvial deltas formed by the Red River in the north and the Mekong River in the south. Between these two deltas is a long, relatively narrow coastal plain. The meteorological and oceanographic features of Vietnam are likewise distinguished among the northern part of

the country and northern sea area; central region and central waters area; southern region and the southern sea; and southwestern-Gulf of Thailand areas. Vietnam's vegetation is rich and diversified, reflecting the country's range of climate, topography, and soils and the varying effects of human habitation.

Along the long coast of Vietnam, there are many cliffs, sand beaches, estuaries, bays, lagoons, harbours, etc. The coastline sections have differences in the slope and general morphological characteristics associated with the estuarine areas, wide coastal continental strip and the shallow coastal waters.

2.2 Demographic Features

Vietnam's population in 2018 was 95.54 million people, and the population density was 308.13 people/km². The population grew by only 0.99% in 2017-2018.

The population of 28 coastal provinces and cities is about 47.22 million people, accounting for 51% of the total population of the country. In 28 coastal provinces and cities, there are 125 coastal districts and 12 island districts with a total population of about 17.89 million people, and an average population density of 354 people/km².

In 2018, the age dependency ratio of the young (ages 0-14) is 10.46, while the age dependency of the old (ages 65 and above) is 43.78. However, in Vietnam, men usually retire at the age of 60 years old and women at 55, thus, this age dependency ratio have to be adjusted.

Rural population of the whole country is 1.8 times higher than that of urban areas and the rural population of 28 provinces and coastal cities is 1.36 times higher than urban population.

The labor force aged 15 and over throughout the country in 2018 was 54.3 million, including 20.7 million employed in agriculture, forestry and fisheries, accounting for 38.1% of the total (decreased by 2.1% compared to the previous year); 14.4 million in industry and construction sector, accounting for 26.6% (increased by 0.8%); and 19.2 million in service sector, accounting for 35.3% (increased by 1.3%).

2.3 Economic Features

Vietnam's economy is experiencing rapid development. In 2017-2018, the national gross domestic product (GDP) increased by 7.08% – this is the highest growth rate since 2008.

In 2018, the agriculture, forestry and fishery sector increased by 3.76%, contributing 14.68% to the economy. This is the highest growth rate of the sector in the period of 2012-2018 confirming that the restructuring of this sector has resulted in efficiency, especially in the field of agriculture

and aquaculture. Industry and construction sector increased by 8.85%, contributing 34.23% while the service sector increased by 7.03%, contributing 41.12%. Product tax sector minus product subsidies contributed 9.97% to the national economy (General Statistics Office, 2018). The total import-export turnover of the country in 2018 reached US\$ 480.17 billion, increase of 12.2% (equivalent to an increase of US\$ 52.05 billion) compared to the previous year.

The Vietnam's East Sea (located in the South China Sea) plays an extremely important role in global maritime trade, facilitating the development of key economic sectors, such as fisheries, oil and gas, seaports, maritime transportation, shipbuilding and tourism.

Regarding the governance structure, the maritime and oil and gas sectors have not been decentralized, while the fisheries, tourism and environment sectors have been decentralized. This vertical management approach helps the provinces to actively exploit its strengths and potentials and easily mobilize local resources, but this has also caused certain difficulties and shortcomings in monitoring and implementation of the related policies and legislations.

2.4 Social Conditions

2.4.1 Human development index (HDI)

Vietnam's HDI value in 2018 is 0.693, puts the country in the medium human development group, positioning it at 118 out of 189 countries and territories. Between 1990 and 2018, Viet Nam's HDI value increased on 45.6% (from 0.475 to 0.693). Viet Nam's progress in each of the HDI indicators showed that between 1990 and 2018, life expectancy increased by 4.7 years, mean years of schooling increased by 4.3 years, expected years of schooling increased by 4.9 years, and the GNI per capita increased by about 354%. In 2018, life expectancy at birth is 75.3 years, mean years of schooling is 8.2, expected years of schooling is 12.7, and GNI per capita (at 2011 PPP prices) is US\$ 6,220.

2.4.2 Gender Inequality Index (GII)

Vietnam has a GII value of 0.314, ranking it 68 out of 162 countries in the 2018 index. In Vietnam, only 26.7% of parliamentary seats are held by women. Around 66.2% of adult women have reached at least a secondary level of education compared to 77.7% of their male counterparts. Female participation in the labour market is 72.7% compared to 82.5% for men.

2.4.3 Poverty

Vietnam has implemented quite well the national target program on poverty reduction in coastal areas and islands. In the period of 2011-2015, there were 71 communes escaping from the extremely difficult situation (accounting for 22.8% of the total extremely difficult communes).

The percentage of poor households in the extremely difficult communes along the coastal areas and on islands was reduced to 8% (2%/year on average) by end of 2015. From 2016 to 2018, the multidimensional poverty rate in most coastal provinces and cities decreased from 50% to 30%.

2.4.4 Environmental sanitation

Access to basic water services. The proportion of people supplied with clean water throughout the country has increased annually (4.3% in the period 2006-2016). Currently, the proportion of households using hygienic water is 97.4%, of which 52.2% uses tap water. Access to hygienic water is 99.6% in urban areas, and 96.3% in rural areas. For coastal provinces and cities, the proportion of people using hygienic water is higher than that of clean water.

Access to basic sanitation services. According to a synthesis report from Vietnam's 63 provinces and cities, access to standard latrines in rural areas increased by nearly 12.8% in 10 years from 2008 to 2018. Currently, the proportion of households using hygienic toilets (septic and semi-septic toilets) is 88.9%. This contributes to reducing the incidence of diseases related to poor water and sanitation, such as diarrhea, dysentery, etc. (Statistical Yearbook 2018).

Solid waste management. The current rate of daily solid waste collection in urban areas is about 85% and in suburban areas: about 60%, compared to daily solid waste volume generated. The rate of domestic solid waste collection in rural areas is still low, only about 40-55% compared to the amount of domestic solid waste generated there.

The total amount of solid waste collected and treated in accordance with national technical regulations and standards is about 31,622 tonnes (accounting for 84%). Thus, there are still about 6,186 tonnes of solid waste (16%) collected but not yet treated according to regulations. In coastal provinces and cities, the amount of untreated waste as percentage of collected waste accounted for about 30.06% in 2015, 36.22% in 2016, and 27.15% in 2017.

Wastewater management. Nationwide, there are 43 centralized wastewater treatment plants in urban areas, with a total designed capacity of over 926,000 m³/day. However, the rate of wastewater collected and treated is only about 13% of total wastewater generated in the country.

Stormwater management. Vietnam will invest US\$ 8.3 billion to provide drainage services to about 36 million urban residents by 2025.

Table 1: Basic Geographic and Socioeconomic Indicators.

Indicator	
Land area*	331,212 km ²
Coastline length*	> 3260 km (excluding the islands)
Population (in 2018) ^a	95,540,395
Coastal population (in 2018)*	~ 50%
Real GDP in 2018 (constant 2010 prices) ^a	US\$187,686,812,137.29
Real GDP growth rate (2017-2018) ^a	7.08%
Real GDP per capita in 2018^a (constant 2010 prices)	US\$ 1964.48
GDP of 28 coastal provinces and cities*	VND 3,610,390.97 billion (over 65% of the national GDP)
Real gross national income in 2018 ^a (GNI, in constant 2010 US\$)	US\$ 173,533,09,1,756
GNI per capita in 2018 ^b (in PPP 2011 \$)	US\$ 6,220
Human development index (HDI) in 2018 ^b	0.693 - ranked 118th out of 189 countries and territories
Access to basic drinking water services^a (as of 2017)	Total population: 94.72% urban: 98.55% rural: 92.64%
Access to basic sanitation services^a (as of 2017)	Total population: 83.52% urban: 94.26% rural: 77.68%
	The average percentage of people having toilets in most of the coastal provinces and cities is over 90%, the lowest rate is about 53%.
Access to environmental sanitation services – wastewater and solid waste management (as of 2017)*	Wastewater collection and treatment: ~ 13%. Solid waste collection: 85% in urban areas, 60% in suburban areas, and 45-50% in rural areas. Solid waste treatment: 84% (2017)
Ocean economy	Ocean GDP: US\$ 7.8 billion (in 2017) Valuation of coastal and marine ecosystem services: US\$ 3.9 billion
Employment in marine economic sectors	4.5 million laborers in fisheries; 800,000 laborers working directly at sea; ~ 1.3 million of direct laborers in tourism; 174,000 employees in coastal economic zones; (The laborers in oil and gas industry and other coastal industries are not yet included).
Percentage of coastline with integrated coastal management (ICM)	40%
Marine protected area (MPA)	About 0.134% of the total area of Vietnam's waters; 1.8% of territorial waters; 0.46% of exclusive economic zones (EEZs) and territorial waters.
Ocean health index (OHI) in 2018 ^c	56– ranked 199th out of 221 EEZs

Sources:

* *Statistical Yearbook*

^a *World Bank, 2020. [58]*

^b *UNDP, 2018. [42]*

^c *OHI. (<http://www.oceanhealthindex.org/region-scores/scores/vietnam>)*

3. Ocean Economy

The entire ocean economy is measured as the sum of: (a) the economic activities with dependence on the ocean and coastal and marine resources, and (b) natural assets, goods and services of marine ecosystems upon which these industries depend on, and people rely on for food, income, livelihood, recreation, shoreline protection, climate regulation, etc.

3.1 Ocean Industry

Ocean-based and ocean-related industries include: (1) Marine tourism and services; (2) Maritime industry (shipping, ports, shipbuilding); (3) Mining of offshore oil and gas and other marine mineral resources; (4) Aquaculture and fishing; and (5) Marine renewable energy and emerging new marine economic sectors. In general, there has been a strong growth, with significant contribution to the national economy, and incomes, livelihoods, jobs and well-being of the people, especially in the coastal areas.

In 2018, fishery GVA reached VND 190,123 billion, accounting for 3.43% of the GDP of the whole economy. The contribution of oil and gas sector in 2017 was 2.76% of GDP. With 6.6% of GDP contribution, Vietnam's tourism ranked 40/184 countries in terms of direct contribution to GDP and ranked 55/184 countries in terms of total contribution to national GDP. The output value of the shipping industry, port services and shipbuilding has continuously increased, with an annual growth rate of 22% in the 2007-2010 period, and 13% per year in 2011-2015. Thus, it can be seen that these four sectors alone contributed nearly 17.3% to the economy. The contributions from other ocean-related industries, such as marine renewable energy, marine pharmaceuticals processing, cultivation and processing of algae and seaweeds, etc., have not been taken into account.

Table 2: Contribution of Key Economic Sectors to National Economy, 2018.

Economic sector	VND, in billions	Share in GDP
Fisheries and aquaculture	190,123	3.37%
Tourism (about 70% from coastal provinces/cities)	620,000	10.99%
Offshore oil and gas mining	115,000	2.04%
Maritime transport and ports	-	0.86% (in 2017)
GDP*	5,542,332	
Total contribution to GDP		17.26%

Source: MONRE. * World Bank, 2020. [58]

The ocean industry, comprised of ocean-based economic activities (such as fisheries and aquaculture, offshore oil and gas, maritime transport, marine tourism) and ocean-related economic activities (shipbuilding and repair, oil and gas processing, fishery product processing, port services and onshore industry development, etc.) have only been preliminarily assessed for the years 2015-2017 as shown in **Table 3**. The ocean industry contributed 4% of the country's GDP in 2017, excluding marine tourism.

Table 3: GDP of Ocean Economy and Coastal Economy.

(In US\$ millions, in constant prices)

	2015	2016	2017
Ocean economy [A+B]	8,227.68	7,104.58	7,816.19
Share to total GDP	5%	4%	4%
GDP of ocean-based industries [A] (directly linked to the sea)	6,653.23	5,480.86	6,151.18
Offshore oil and gas mining	4,403.62	3,145.61	3,710.71
Marine tourism	-	-	-
Marine fisheries and aquaculture	1,779.82	1,850.78	1,950.79
Maritime transport	469.80	484.48	489.68
GDP of ocean-related industries [B]	1,574.45	1,623.71	1,665.01
Shipbuilding and ship repairing	98.18	122.16	127.26
Oil and gas processing	340.63	241.08	203.20
Fishery processing	478.55	547.33	570.21
Marine port services	657.09	713.14	764.34
Coastal economy (GDP of 28 coastal provinces/cities)	76,046.93	79,740.29	85,768.63
Whole country*	154,508.62	164,104.86	175,284.08

Source: MONRE [27]. * World Bank, 2020. [58]

In the *Resolution No. 36-NQ/TW*, Vietnam has initially defined the target for the ocean economy, which is expected to contribute 10% of the national GDP by 2030.

Coastal economy (the economy of coastal provinces and cities) and island economy contribute around 60% of the national GDP (in current prices), especially from coastal tourism activities, economic zones, industrial parks and important coastal industrial facilities, agriculture, fisheries, shipping, and various services sectors.

3.2 Coastal and Marine Ecosystem Services

Ecosystem services include *direct* values, such as fisheries, tourism, oil and gas exploration, port services and shipping (included in the account of the sea), and *indirect* values, such as coastal protection, climate regulation, assimilation of waste. Using different studies and referencing assessments from other areas in the Region, the value of ecosystem services of Vietnamese marine and coastal ecosystems was estimated to be over US\$ 3.9 billion each year (**Table 4**).

The Center for Conservation of Marine Biology and Community Development assessed the mangrove ecological value in the Mekong Delta and showed that 1 km² of mangroves could provide 450 kg of seafood catch per year.

The total value of our country's coral reefs products and services as evaluated by the Center for Marine Conservation and Community Development is estimated at US\$ 100 million per year, of which 1 km² of coral reefs can provide seafood worth up to US\$ 10,000.

Also according to the assessment of the Center, the seagrass beds provide seafood and ecosystem services worth more than US\$ 26.86 million per year.

Table 4: Estimated Values of Important Marine and Coastal Ecosystems.

Ecosystem	Area (ha)	Price	Total value	Note
Mangrove forest	213,142	~ VND 45,301 billion/year (~ US\$ 2 billion/year)	Economic and ecological service values of mangrove forest	Estimated based on the evaluation of mangrove ecosystem in Nam Hung commune (327.03 ha), Tien Hai district, Thai Binh province [29]: 69,504,543,950 VND/year
Coral reef	8,671	US\$ 1.875 million/year	Total value of coral reefs	Estimated based on the ratio of Vietnam's coral reef area to be about 0.5% of the global total [48]
Seagrass bed	16,000	US\$ 26.86 million/year	Providing seafood and services	It is estimated that each hectare (ha) of seagrass in Vietnam is worth about \$ 1,678.77 per year (MCD, "Vietnam Country Assessment Report, 2008") [6]
Total		~US\$ 3.902 billion/year		

Source: (1). Nguyen Thi Hoai Thuong, Hoang Thi Hue, "Valuation of some economic values of mangrove ecosystems in Nam Hung commune, Tien Hai district, Thai Binh province", *Environmental Magazine*, Issue No. III, 2018; (2). Centre for Marine life Conservation and Community Development, "National Assessment Report, Vietnam", 2008; Vietnamplus online paper, November 3, 2017

4. Ocean Economic Activities

4.1 Fishing and Aquaculture

Vietnam's fisheries sector has great potential for comprehensive development in the fields of fishing, aquaculture and fish processing, as well as the associated ancillary services, such as fishing boat or shipbuilding and repair, etc. However, the contribution to the ocean economy is mainly from marine fishing and fish processing. Aquaculture at sea is still small, as it is mainly done inland.

Status: In 2019, the total fisheries production increased by 4.9% from previous year, and reached about 8.15 million tonnes. Of this, fish catching production reached 3.77 million tonnes, (an increased of 4.5% compared to 2018), and in which marine fish catching reached 3.56 million tonnes. Fisheries export turnover in 2019 reached over US\$ 8.6 billion, decreased on 2.3% compared to 2018. Seafood exports reached over US\$ 3.2 billion, mainly due to increase in tuna production (US\$ 728 million) and some other marine fish (US\$ 1.65 billion). In 2019, the GDP of fishery sector at current prices reached VND 205,252 billion, accounting for 3.4% of the national GDP, and 24.4% of the GDP of the entire agricultural sector, reaching the highest growth rate in the agriculture-forestry-fishery sector. With this growth, the fisheries sector contributed 0.22% to the overall growth of the agriculture-forestry-fishery sector and the whole country.

The fisheries sector also creates jobs, improves livelihoods for local communities, contributes to protecting sovereignty at sea, and contributes to food security of Vietnam, as well as the World.

Currently, there are over 800,000 fishermen directly engaged in marine fishing activities and about 4.5 million workers in logistics services. In addition, aquaculture activities promote the development of a number of industries and services, such as fish feed production, agricultural extension, seed supply, etc.

Pressures: Overall, the potential exploitation of fishery resources is ineffective and unsustainable. The structure of fishery industry is not appropriate, with some fisheries exploitation methods seriously damaging the resources. Although the quantity of production is increasing, the productivity and production value, catch per unit of effort, as well as the size of fish and other products are decreasing. Modern technology has not yet been commonly applied in fishing. Vietnam aquaculture is also affected by diseases. The fishery support services still have many weaknesses, such as ineffective fishery logistics, shortcomings in processing and preservation of exploited products, etc.

The situation of unplanned aquaculture occurs in many localities, leading to polluted water sources due to excessive food, causing environmental pollution for coastal areas. Wastewater from seafood processing facilities often contains fragments of meat, blood and organs of aquatic products, as well as fish scales, bones and fat that cause a fishy odor and has a higher pollution index, much more than the standard type B of wastewater for aquaculture.

Response: Vietnam is currently (a) strengthening the state management system of fisheries sector from the central to local levels; (b) improving the system of standards, technical regulations, processes and conditions in the fields of fisheries production and trading; (c) promoting the application of 4.0 technology and advanced technology in aquaculture; (d) improving the quality of the water environment through application of certain technologies in wastewater treatment and in the breeding process; and (e) strictly following the regulations on illegal, unreported and unregulated (IUU) fishing, including catch of prohibited and endangered aquatic species.

Vietnam recently amended the *Law on Fisheries* in 2017, which replaces the 2003 Law, and developed *Decree No. 26/2019/ND-CP* dated March 8, 2019 detailing a number of articles and measures in implementing the Law on Fisheries. At the end of 2017, the Prime Minister also issued *Directive No. 45/CT-TTg* on urgent tasks and solutions to overcome the European Commission's warning against IUU fishing, and following which, many coastal provinces have developed directives and plans for implementation. This is especially reflected in the promulgation of a **National Action Plan for Combating IUU Fishing by 2025**, the establishment of the national steering committee for IUU fishing, the accession to the *United Nations Fish Migration Agreement* and *FAO's Agreement on Port State Measures*, and the improvement of the legal system to ensure compatibility with international regulations on sustainable fisheries management.

On August 9, 2019, the Ministry of Agriculture and Rural Development (MARD) issued a national technical regulation on the products used for aquaculture environmental treatment (*Circular No. 08/2019/TT-BNNPTNT*), setting safety limits for the chemicals and biological products to treat the aquaculture environment. Previously, on November 15, 2018, MARD also issued *Circular No. 26/2018/TT-BNNPTNT* on the management of aquatic breeds, aquatic feeds, and products for treatment of aquaculture environment, which provides the list of chemicals, biological products, microorganisms banned from use in aquatic feeds, and products for treatment of aquaculture environment; and the list of chemicals, probiotics, microorganisms and raw materials for food production permitted for use in aquaculture in Vietnam.

4.2 Marine and Coastal Tourism

Status: The total direct revenue from tourists in 2017 reached VND 510,900 billion (equivalent to about US\$22.6 billion), of which the tourism revenue of 28 coastal provinces and cities accounts for about 70% of total tourism industry revenue. The total revenue in 2018 reached about VND 620,000 billion, increased by more than VND 109,000 billion, compared to 2017. Most provinces/cities have implemented attractive tourist activities, attracting the attention of a large number of international visitors [47]. Tourism has been greatly contributing directly to national economy and creating multiplier effects to other economic sectors.

Marine tourism has a specific role and an important position in the country's tourism development strategy. Data from the project "Development of marine, island and coastal tourism to 2020" shows that each year the marine and island tourism attracts around 48-68% of tourists. Income from tourism activities accounts for a high proportion, about 70% of the total tourism revenue of Vietnam. The hotel system in coastal provinces in 2018 includes 17,212 establishments with a total of 406,208 rooms, including 434 5-star hotels with a total of 30,951 rooms.

According to preliminary statistics of Vietnam's tourism sector, the country currently has about 1.3 million workers directly serving in the tourism industry (accounting for 2.5% of the total labor force in the country), of which only 42% have been trained in tourism, 38% have been trained

in other specialities, and about 20% have not been formally trained. Each year the tourism sector needs nearly 40,000 workers, but the number of graduated students and specialized trainees is only about 15,000 people/year, of which just over 12% have college or university degrees or higher. There is a great opportunity for employment that the Vietnamese tourism industry has created, but more skilled and trained workers are needed to ensure efficient services and sustainable tourism industry.

In addition to traditional jobs in coastal provinces/cities, community-based tourism in coastal districts has begun to take shape, with promising beginnings. The central region (from Thanh Hoa to Binh Thuan) is considered as the golden land to develop community-based tourism, attracting the attention of a large number of international visitors. Nature-based tourism or ecotourism also offers significant opportunities.

Pressures: Marine and coastal tourism in Vietnam is facing many challenges, such as:

- Limited tourism vision: lack of tourism sustainability and linkage; localism eliminates the strengths of Vietnam's tourism.
- Policies on promoting tourism development are inadequate, lack of regulations mechanism on sanction for the acts affecting tourism activities.
- The infrastructure system for tourism is not guaranteed to make fast, safe and convenient movement for visitors. During the rush hours, the congestion, jostling, and pushing occur, causing uncomfortable feeling for visitors.
- Regarding the business culture in tourism service, there is an attitude of self-seeking, particularly in raising room and food prices. There are instances of clinging to ask for money and enticing customers to buy souvenirs.
- Scenic space and cultural heritage have been encroached: the exploitation of resources for economic purposes has disrupted the landscape, and resulted in loss of sacred space of the monument.
- Poor tourism products: the quality of tourism products to serve tourists is not yet competitive with other countries.

These factors create difficulties in keeping the visitors to stay, and many international visitors do not want to return, while domestic tourists tend to travel abroad.

Regarding the environment, in a number of fast-growing coastal tourist destinations, such as Ha Long, Phan Thiet, Vung Tau and Phu Quoc, inappropriate planning and lack of treatment facilities for wastewater and solid waste are causing adverse impacts on the quality of the marine environment. Currently, domestic wastewater, especially from hotels and restaurants located along the coast, is still discharged into stormwater drainage systems in many urban areas, so under heavy rain or prolonged rain, the sewage spills into the coastal waters.

The indiscriminate discharge of plastic waste, especially during the tourist season, is an alarming issue in coastal areas and islands. Data collected from the Beach Plastic Waste Monitoring Program in Vietnam conducted at the end of 2018 showed that styrofoam waste accounts for the largest amount of plastic waste.

Response: The tourism sector continues to improve mechanisms, policies and regulations for developing marine and island tourism:

- increasing investment and upgrading material infrastructure at ports
- improving technical, hygiene and safety conditions at cargo ports to accommodate cruise ships
- investing in new equipment and improving tourist fleets to serve tourists with best quality according to international standards
- supporting prices and taxes for tourism businesses to invest in developing marine and island tourism products, travel routes to remote islands, and new and diversified products for cruise ship groups with unique tour program
- linking with service companies, restaurants, hotels, as well as localities to reduce service prices, room rates and improve the quality of service to tourists
- enhancing marine culture, marine cuisine, and supporting people to develop community-based tourism in agriculture and fisheries.

In 2017, the *Tourism Law No. 09/2017/QH14* was issued and replaced the Law of 2005. On August 10, 2018, the Vietnam National Administration of Tourism developed *Plan No. 1075/KH-TCDL*, which promotes the socialization movement on toilets for tourists in key tourist areas. Many localities have developed and implemented policies and plans to upgrade and develop ships and tourism infrastructure, and to consolidate tourism business mechanisms and activities. Recently, the Ministry of Culture, Sports and Tourism developed a Plan to implement the Project “Restructuring the tourism industry to meet the requirements of developing it into a key economic sector” (*Decision of the Ministry of Government No. 2031/QD-BVHTTDL* dated June 10, 2019).

The coastal provinces and cities, especially those having strong tourism activities, such as Quang Ninh and Da Nang, have studied, elaborated and adjusted the plans, and implemented projects on water drainage and wastewater treatment in urban areas in the direction of separating stormwater from domestic and services wastewater, minimizing negative impacts on the marine environment in general, and on coastal tourism activities in particular.

4.3 Ports and Shipping

Status:

Shipping: In 2018, the total transport volume carried out by the Vietnamese fleet was estimated at 144.6 million tonnes, while the volume of rotating cargo, which accounts for 55.6% of the total cargo turnover of all modes of transport, was estimated at 148,024 million tonnes, indicating an increase of 10.9% compared to 2017. The Vietnamese national flag fleet has now been able to

handle nearly 100% of inland transport by sea, except for some specialized vessels transporting liquefied petroleum gas (LPG), bulk cement, etc. The total volume of goods transported through the seaport of inland waterway vehicles in 2018 was estimated at 171.6 million tonnes, which was an increase of 30.5% from the 2017 volume.

Currently, Vietnam's fleet has 1,568 ships (1,128 of which are cargo ships) with a total volume of 4.8 million gross tonnage (GT) and 7.8 million deadweight tonnage (DWT). In particular, the number of *general cargo ships* is 819, accounting for over 72.6%; *bulk ships*: 99, accounting for 8.7%; *oil tankers*: 150, accounting for 13%; *specialized vessels for liquefied gas*: 16, accounting for 1.4%; and *container ships*: 41, accounting for 3.6%. According to the United Nations Conference on Trade and Development (UNCTAD), the Vietnamese fleet is the 4th in the ASEAN region and the 29th in the world.

The average age of the Vietnamese fleet is 15.6 years old, which is 5.2 years younger than that of the world (according to UNCTAD data, the average age of the ship in the world is 20.8 years). The rejuvenation of Vietnam's fleet in recent years is due to the fleet restructuring process and increased investments in new ships.

Ports: Vietnam's seaport system is divided into six groups of seaports with 45 active seaports, of which: two IA type ports (international gateway port); 12 seaports of type I (regional general port of hub); 18 ports of type II (local general port); and 13 ports of type III (offshore oil port). Currently, the total number of harbors is 286, with about 82.8 km long wharves, and total capacity of over 550 million tonnes/year.

Most of seaports are owned and directly operated by state-owned enterprises and other economic entities. There are four ports invested with the state budget: **Cai Lan port** (the wharfs 5,6,7), **Cai Mep ODA container port**, **Thi Vai international general port** and **An Thoi - Kien Giang port**. These ports assigned Vinamarine, which is the representative of the state agency, to sign contracts for exploitation and leasing.

Shipbuilding: In the country there are about 97 shipyards (from 1,000 DWT and above) belonging to SBIC, Vinalines, PVN, some military and private enterprises. There are 92 factories in the North, 13 factories in the Central Region, and 15 factories in the South. The total designed capacity of newly built factories is 2.6 million DWT/year, equivalent to 150-200 pieces/year.

Pressures: The economic development of the seaport industry is slow and inefficient. There is lack of coordination and synchronization in the development of ports, port services, and behind-port logistics services. Many ports have excess capacity. The connection of seaports with railways and roads is inadequate, and in general, the linkage between modes of transportation is not good. The Vietnamese shipping fleet is mostly small scale with inappropriate structure, and shipping enterprises have limited financial capacity.

Shipbuilding industry causes coastal water pollution due to oil and sedimentation caused by heavy metal deposition, which directly affects marine aquatic flora and fauna, as well as hinders the development of other sectors, such as salt-making, aquaculture and coastal tourism. The main pollutants are heavy metals in the form of oxide powder: Pb_3O_4 , Pb_2O_3 , $PbCrO_3$, CuO , ZnO , Fe_2O_3 , TiO_2 , $ZnCrO_3$; cellulose paints ($-C_3H_7O_2(OH)_2$), epoxy paints ($-CHOCH-$), phenol formaldehyde paints ($-C_6H_5O-$) and oil alkyd paints ($-CHO-$).

Response: In the period to 2020, with orientations to 2030, the focus is on: (1) developing synchronized and modern system of seaports and access channels, and increasing investment in building key seaports in locations of appropriate conditions; (2) the construction of international entrepot ports, international gateway ports in key economic regions, some deep-water ports specialized in handling large-scale containers, and coal and oil, with modern equipment; (3) renovating and maintaining navigable channels to ensure coordinated and efficient operation of ports; (4) developing the network of rail, road and inland waterways to ensure the connections of seaports with inland ports, cargo distribution centers, economic zones, industrial parks, inland waterway ports and wharves.

Port planning and plan reviewing have also been carried out in coastal provinces.

The structure of the Vietnamese fleet is also being developed towards specialization, especially focusing on container fleets. Vietnam National Shipping Lines (Vinalines) is studying to invest in a new fleet with modern technology and fuel-saving system, and expand operations on liner routes (cargo ships run regularly on one route) in the region to meet requirements for mother ships to enter the transshipment port at Cai Mep - Thi Vai area and to other regional transshipment centers.

The maritime industry — shipping, ports and shipbuilding sectors — has to include environmental management and climate considerations as priority areas in its development and modernization plans.

The National Committee for Search and Rescue (VINASARCOM) is the lead agency for oil spill response and is responsible for the implementation of the national contingency plan. The Ministry of Natural Resources and Environment (MoNRE) is responsible for assessing the environmental damage and would work closely with VINASARCOM during an incident.

To address the oil pollution issue in transboundary waters, an example of good practice is the Joint Statement on Partnership in Oil Spill Preparedness and Response in the Gulf of Thailand (GOT Programme). The Joint Statement was initiated by PEMSEA, and signed on 12 January 2006 in Hanoi by Cambodia, Thailand, and Vietnam. This coordination mechanism aims to enhance national and regional competences on oil pollution prevention, preparedness, and response by exchanging information, research, and conduct of oil spill response exercises for capacity building and Gulf-wide implementation.

The Environmental Sensitivity Index (ESI) Mapping in the Gulf of Thailand project, in support to the Framework Program for Joint Oil Spill Preparedness and Response in the Gulf of Thailand, produced the GOT Atlas. It contains sensitivity maps for planning and response to oil spill incidents covering the coastal and marine resources of the Gulf, existing economic activities along the coast and offshore and gazetted areas, as well as locations of emergency services, spill response equipment and related services.

4.4 Oil and Gas Industry

Status: Vietnam's oil and gas industry was formed right after the country's unification, but until mid-1986 the first tonnes of crude oil were extracted from the Bach Ho field at the continental shelf of Vietnam, bringing Vietnam in the list of oil and gas producing countries in the world. Since 2006, many new oil and gas fields have been explored and discovered (such as Dai Hung, White Rhino, Su Tu Nau, White Rabbit, Diamond, Thien Ung). However, the annual crude oil production increased slowly and has tendency to decrease in recent years.

Vietnam has developed petrochemical refineries. **Dung Quat oil refinery** (put into operation in 2010) has the capacity of 6.5 million tonnes/year. Dung Quat polypropylene factory has the capacity of 150,000 tonnes/year. A number of small-scale processing plants, such as condensate processing plant, Cat Lai (Ho Chi Minh City), Cai Mep (Ba Ria - Vung Tau), Nam Viet (Can Tho), Dong Phuong (Can Tho), annually provide 0.5-1 million tonnes of gasoline for domestic demand.

The plants producing nitrogenous fertilizer from gas, including **Phu My** and **Ca Mau**, have total capacity of over 1.5 million tonnes/year, meeting 70-75% of the domestic urea demand annually.

Nghi Son Petrochemical Complex (NSRP), which has a capacity of 10 million tonnes/year (equivalent to 200,000 barrels/day) with a source of material being 100% of heavy crude oil imported from Kuwait, was put into operation in the fourth quarter of 2018.

Binh Son Oil Refinery of the Petrochemical Joint Stock Company (BSR) is operating safely, stably and efficiently with a processing capacity of 6.5 million tonnes of crude oil/year, equivalent to 148,000 barrels/day meeting more than 30% of gasoline demand nationwide.

The contribution of the oil and gas industry (including oil and gas exploitation and processing) to GDP was quite high and stable in the period of 2008 - 2013, with an average contribution of over 22%; then decreased to an average of 8.35% between 2014 and 2015. However, the industry's contribution was only 3.79% in 2016, and further went down to 2.76% in 2017. The value of industrial production (in 2010 constant prices) reached VND 519.8 trillion in 2019. PetroVietnam (PVN) contributed about VND 108,039 trillion to the State budget in 2019, an increase of VND 13.23 trillion from 2018.

Pressures: Oil and gas is a non-renewable resource, which is one of the main reasons for the declining output in the past few years. World oil prices were also going down, which contributed to decreasing revenues and contribution to the economy.

Oil and gas exploitation and processing industries in Vietnam have encountered difficulties and have not been fully developed to meet the requirements. Oil and gas processing industry develops slowly; production capacity for petrochemical refining and processing of products from petrochemical refinery is still very limited.

Oil and gas exploration and exploitation also put pressure on the marine environment. On average, each year, oil and gas exploration and exploitation activities generate about 5,600 tonnes of petroleum waste and over 15,000 tonnes of floating oil and grease, of which 23-30% are untreated hazardous solid wastes.

Response: Oil and gas sector is implementing measures to address the different challenges: (1) it sets out solutions of improving oil recovery coefficient and maintaining optimal oil and gas exploitation output level; (2) intensive investment for dominating the high-tech services market, such as seismic explosion; (3) drilling for exploration and exploitation in deep-water and offshore areas, with complex geological conditions; (4) actively expanding investment activities to exploit oil and gas abroad; (5) diversifying gas consumption market like supplying to electricity, fertilizer, chemical production, industries, transportation and civil industries; (6) building and expanding petrochemical refineries; (7) studying the possibility of connecting the East and Southwest pipelines as the basis for connecting the pipeline network with ASEAN countries; and (8) striving to reach the national gasoline reserve level: 60 days of average consumption in 2020 and 90 days in 2025, according to the *National Energy Development Strategy until 2020, with a vision to 2050*.

Many policies and regulations related to ensuring marine environmental safety and security in oil mining and handling of oil mines have been developed and applied effectively. There have been almost no oil spills from oil and gas exploitation and exploration activities. Measures to protect the environment during drilling and oil and gas exploitation include:

- Controlling and reusing of drilling fluid; treating discharged drilling mud in compliance with *QCVN 36: 2010/BTNMT* - Technical regulation on drilling fluids and drilling mud from offshore petroleum works.
- Treating water accompanying the exploitation equipment, complying with *QCVN 35: 2010/BTNMT* on wastewater from oil and gas works.
- Segregating and strictly managing domestic solid waste according to *BD-HSE P-0010* waste management process.
- Segregating, collecting, managing, transporting and disposing hazardous waste in compliance with the provisions of *Circular 36/2015/TT-BTNMT* on hazardous waste management and *Circular 22/2015/TT-BTNMT* on environmental protection for offshore petroleum activities.

5. State of Ocean Health Underpinning the Blue Economy

Improving sea water quality and coastal and marine ecosystems is critical for the long-term and potential efficiency of the blue economy development. People and industries must rely on the health of the sea in the exploitation of food, water, alternative energy, recreational value, as well as for coastal protection and climate regulation.

5.1 Marine Water Quality

Coastal water monitoring program is implemented by the Coastal and Marine Environmental Monitoring Stations in the North, Central and South regions, respectively managed by the Institute of Marine Resources and Environment, the Institute of Mechanics and the Institute of Oceanography, under the Vietnam's Academy of Science and Technology. Water samples are collected at least twice a year at 22 stations along the coast of Vietnam. Monitoring parameters for coastal water include: basic indicators for field measurements (salinity, temperature, DO, turbidity, pH and TSS), nutrients (NO_2^- , NO_3^- , NH_4^+ , PO_4^{3-}), Total Coliform, heavy metals (Cu, Pb, Hg, Cd, Fe, Mn, As, CN⁻), and oil-grease.

In general, the quality of coastal water in Vietnam is still quite good with most of the typical parameters of seawater quality being within the permitted limits of *QCVN 10-MT: 2015/BTNMT*. The risk quotient (RQ) results during the period 2015-2019 show that:

- 97.5% of the coastal water in the Central region has low pollution risk level (with $\text{RQ} < 1$).
- 85.5% of the coastal water in the Northern region has low pollution level.
- 75% of coastal water in the Southern region has low pollution level.

The Central Region has the highest percentage of coastal water with low pollution risks. The risk quotient (RQ) is calculated according to the *Circular No. 26/2016/TT-BTNMT*, and classified as follows:

- $\text{RQ} \leq 1$: Low pollution risk level
- $1 < \text{RQ} \leq 1.25$: Average pollution risk level
- $1.25 < \text{RQ} \leq 1.5$: High pollution risk level
- $\text{RQ} > 1.5$: Very high pollution risk level

However, some coastal areas have been locally polluted by suspended solids, nutrients, oil and coliform.

Quality of offshore water and water around island areas is monitored by the Center for Marine Environment Monitoring and Analysis of the Naval Forces at 180 points in areas, such as oil and gas exploitation areas. The monitoring results show that the quality of offshore water and water around islands is quite good. Specifically, the concentrations of parameters are relatively stable with less changes over the years. The values of the monitoring and analysis parameters all meet the allowable standards according to *QCVN 10-MT: 2015/BTNMT*.

The greatest pressure and threats to the quality of the marine environment are discharges of untreated domestic wastes and industrial wastes, including both solid and liquid waste. Organic waste from industrial activities has a significant impact on the marine environment, degrading the quality of fish and other marine organisms, and causing toxicity particularly in bays and estuaries. Other issues that cause environmental degradation in the coastal zone are: destruction of mangrove ecosystems, loss of coastal biodiversity, pollution of surface water from waste and surface-borne toxins, coastal erosion and loss of water absorption. At the same time, saline intrusion is still a danger in coastal areas.

Moreover, the pollution and degradation of the marine environment due to ocean plastic waste in Vietnam is quite serious. Vietnam is among the top 20 countries in the world in terms of volume of plastic waste discharged into the sea, with an average of about 0.5 million tonnes per year.

In addition, oil and chemical spills are also one of the main causes affecting the marine environment. According to statistics of MONRE, in the period of 1992 - 2015, there were 54 serious oil spills in Vietnam sea waters. From 2010 to 2017, there were over 100 oil spills from large and small ships and many large scale oil leaks. Environmental incidents led to a series of fish kills in four coastal provinces in Central Vietnam in 2016 (Ha Tinh, Quang Binh, Quang Tri and Thua Thien Hue) and several hot spots of environmental pollution at the same time broke out in many provinces and cities nationwide.

5.2 Habitats and Biodiversity

In coastal and marine areas of Viet Nam, there are more than 20 types of ecosystems, including mangroves, coral reefs, and seagrass beds. There are more than 11,000 species, consisting of 6,000 species of benthic animals; 2,038 species of fish (more than 100 species of economic value); 653 species of seaweed; 657 species of zooplankton; 537 species of phytoplankton; 94 species of mangrove plants; 225 species of sea shrimp; 14 species of seagrass; 15 species of sea snakes; 12 species of marine mammals; 5 species of turtles and 43 species of water birds. Other coastal wetland ecosystems distributed along Vietnam's coastline include estuaries, lagoons, sand beaches, rice fields and aquaculture ponds.

Mangroves: Vietnam's mangroves stretch from Quang Ninh (in the North) to Ha Tien (in the South) and are present along the coast and at big islands. The total area of the country's mangroves is about 213,142 ha. The Mekong Delta and the southeast region have the largest mangrove area in the country.

The area of mangroves has been seriously reduced by the conversion of mangrove forest areas to agricultural and aquaculture production, construction of sea dykes, and coastal erosion. The area of mangroves in Vietnam has decreased significantly from 1943 to the present: over the

past 70 years, it has decreased by about 219 thousand ha, or 54% compared to the total area of mangroves in 1943. Thus, mangrove restoration has been undertaken in 2016 and 2017, resulting in significant increase of mangrove area significantly compared to 2015.

Coral reefs: Vietnam has more than 200 coral reefs, widely distributed in coastal waters from the north to the south on an area of about 1,222 km², mainly around the islands Co To, Ha Long - Cat Ba, Bach Long Vi, Cu Lao Cham island, Van Phong Bay, Nha Trang, along the coast of Ninh Hai (Ninh Thuan), Ca Na Bay, Phu Quy Island, Con Dao Islands, Phu Quoc, Nam Du) and two archipelagos of Hoang Sa, Truong Sa. Vietnamese coral is abundant and diverse, with around 350 species of corals and about 3,000 other species that are associated with the coral reefs.

In the period 2000-2015, about 15-20% of the area of coral reefs has been lost, mainly in inhabited areas, such as Ha Long Bay - Cat Ba, central coastal provinces from Ha Tinh to Binh Thuan, and some inhabited islands of Truong Sa archipelago. The coral reef coverage is decreasing over time and has been reduced by over 30% in many places. Although there have been successful studies on growing and restoring and regenerating corals in the wild, the restoration area is still very limited.

Seagrass: Up to now, the area of seagrass beds in Vietnam has been preliminarily estimated to be about 16,000ha. Vietnam has 15 species of seagrass, distributed in coastal tidal flats, islands, estuaries in the mangrove forests, bays and brackish water swamps. The southwestern and central coastal regions have the highest diversity of species (Con Dao island: 10 species, Phu Quoc island: 9 species, Khanh Hoa: 9 species, Binh Thuan: 8 species, Phu Quy island: 7 species, Tam Giang - Cau Hai lagoon and Lap An swamp in the central region: 6 species). The sea areas in the north have a lower number of seagrass types and more limited distribution (Ha Long, Cat Ba: 5 species).

At present, seagrass beds in the country have been seriously degraded due to environmental pollution, fishing with explosives, seagrass exploitation activities for agricultural purposes, and aquaculture production leading to a reduced seagrass area, resulting in loss of habitat for valuable aquatic resources and limited seagrass growth. Significantly, seagrass has been completely lost in many places, such as Dong Rui, Chuong Ca, Tuan Chau (Quang Ninh), Trang Cat, Gia Luan (Hai Phong) or nearly lost as in Vung Bau (Phu Quoc).

Rare, threatened and endangered species: Varieties of precious and rare aquatic species, such as fish (*Semilabeo notabilis*, *Pangasianodon gigas*, squirrel tea, etc.), lobster, squid, and sea turtles have been identified in the Vietnam seas. All five species of sea turtles – green turtles, *Eretmochelys imbricata*, *Caretta caretta*, *Chelonia mydas*, leather turtles – are now included in the Vietnam's Red Book. Many marine species have decreased in number, some species have been locally extinct. There are 236 species of rare and endangered species, including more than 70 marine species listed in Vietnam's Red Book.

In recent years, the varieties and species of natural aquatic products have been seriously reduced both in quantity and quality, especially in the coastal and inland water fisheries resources. In particular, there are some rare and endangered species of aquatic and marine products, such as sea turtles, snails (distributed mainly in Ha Long Bay, Khanh Hoa coastal area, Con Dao and Phu Quoc islands); some fishes (at Cu Lao Cham - Quang Nam); and snails (at Tho Chu island, Con Dao island).

The Government has issued many policies to protect aquatic resources as well as the conservation and regeneration of precious and rare marine and aquatic species, such as the *Fisheries Law 2017*; *Decision No. 742/QĐ-TTg in 2010* on planning and setting up 16 marine protected areas, and *Decision No. 1479/QĐ-TTg in 2008* on planning and establishing 45 inland fisheries protected areas; *Decree No. 33/2010/ND-CP* on management of fishing operations; *Circular 19/2018/TT-BNNPTNT* guiding the protection and development of aquatic resources, and most recently the *Decree No. 26/2019/ND-CP* detailing a number of articles and measures to implement the *Fisheries Law 2017*, including content on management of endangered precious and rare aquatic species.

5.3 Coastal Erosion

Coastal erosion is a common phenomenon along the coast of all three regions of the country, with 397 sections having a total length of over 920 km.

In the North, coastal erosion is strongest in Hai Trieu, Hai Ly and Hai Tinh communes (Hai Hau district) with an average speed of 20-30m/year.

In the Central region, erosion occurred in 233 sections with a total length of up to 492km. Particularly, the coastline from Quang Nam to Phu Yen has 65 areas with 105 eroded sections; recently, erosion has occurred more severely, leading to many serious consequences.

In the South, most of the coastline in the Mekong Delta are eroded at different degrees. The coastal sections with strong erosion speed (from 30-100 m/year) are in Tan Thanh commune (Tien Giang); Dong Hai (Tra Vinh); Ganh Hao (Bac Lieu). In Soc Trang province, the coastline from Bien Tren hamlet, Vinh Chau town, Vinh Chau district to the area adjacent to Bac Lieu province is being strongly encroached. Along the coastal strip of Ca Mau province, some coastal sections are severely eroded, especially the area from the mouth of Trang Tram river to Tan An commune, Ngoc Hien district, where a land area of nearly 4890 ha was lost. In the area from Ong Doc estuary (Tran Van Thoi district) to Tieu Dua canal (U Minh district), an average of 22 ha of land is lost annually.

Coastal erosion is due in part to unreasonable coastal exploitation activities in coastal areas for socio-economic development.

5.4 Ocean Health Index (OHI)

The overall Ocean Health Index (OHI) score of Vietnam is 56, which is below the global score of 71 in 2019 [53]. The OHI score for Vietnam ranks #199 among 221 EEZs [53]. In particular, OHI scores are low for the following goals: food provision, natural products, and tourism and recreation. This shows that Vietnam needs to make more efforts to protect its sea and coastal areas, and ensure future ecosystem services and benefits.

6. Transforming to Blue Economy

For many years, Vietnam has implemented activities related to many aspects of the blue economy (sustainable fisheries development, ecotourism, green seaport development, environmental protection, marine resource conservation, food security and community livelihood development, etc.), which recently have been gradually institutionalized through policies and strategies on sustainable development and green growth. However, the concept of blue economy has not been mentioned in any official legal document, rather ‘ocean economy sustainable development’ was used.

6.1 Policies on Blue Economy and Sustainable Development

The Party and Government of Vietnam have set out directions and policies on blue economy and sustainable development, as reflected in the important documents below:

- *Politburo’s Resolution No. 03-NQ/TW* dated May 6, 1993 on a number of marine economic development tasks in the coming years
- *Party Central Committee’s Resolution No. 36-NQ/TW* dated October 22, 2018 on Vietnam’s **Ocean Economy Sustainable Development Strategy** was launched with viewpoints, objectives to 2030 and Vision to 2045 of the *Resolution 36/NQ-TW* are all consistent with the approach to the blue economy, although this term is not explicitly used in the Resolution.
- *Resolution No. 26-NQ/CP* dated March 3, 2018 of the Government promulgating the Government’s Master Plan and 5-year plan for implementation of *Resolution No. 36-NQ/TW* on **Vietnam’s Ocean Economy Sustainable Development Strategy until 2030, vision to 2045**, with 24 projects, and tasks for the period from now to 2025 and 9 for the period 2026-2030.
- *Directive No. 399/TTg* dated August 5, 1993 on a number of marine economic development tasks in the coming years and *Directive 171/TTg* in 1995 on implementing the *Resolution 03-NQ/TW*.
- *Directive No. 20-CT/TW* on promoting the development of ocean economy in the direction of industrialization and modernization.
- **Vietnam’s Sea Strategy to 2020** (*Resolution 09-NQ/TW* dated September 9/2/2007).
- *Decision No. 1393/QĐ-TTg* dated September 25, 2012 approving the **National Green Growth Strategy**
- Plans related to the exploitation and use of natural resources and the protection of marine and island environment, including those at national, regional and local levels, by sectors and fields.

Many years of ICM efforts in Vietnam have also contributed to promoting the blue economy. There have been important policies and documents on ICM, such as:

- **Integrated Coastal Management Strategy for Vietnam** until 2020 with a vision to 2030
- *Action plan on implementing National ICM Strategy* until 2020, vision to 2030
- Other policy and legal documents create a legal corridor, technical basis and guidelines for the implementation of ICM at the local level.

6.2 Efforts on Blue Economy Development

Vietnam signed the *Changwon Declaration* at the 4th Ministerial Forum on the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) in 2012. This Declaration forms an operational definition of the blue economy and provides a plan for the next timely and important step in the journey towards the blue economy development.

The sectors and localities also launched initiatives to support the development of the blue economy. Following the Prime Minister's direction on the research and application of the environmentally friendly seaport development model, the Ministry of Transport has assigned the Vinamarine to deploy the "Green Port Development Project in Vietnam" by completing the legal and policy corridor and mechanisms to more effectively control sources of impacts, minimize environmental pollution, reduce greenhouse gas emissions, and economically and efficiently use energy in port operation in Vietnam. Lach Huyen Port (Hai Phong) has been chosen as a pilot model of a green port in Vietnam.

In addition, in many fields, industries and localities, initiatives to support the development of blue economy are studied and applied. For example, in the tourism sector, many of the achievements of the EU-funded Environmentally and Socially Responsible Tourism Capacity Development Program (ESRT), 2011-2016 have been applied. The *Sustainable Tourism Blue Lotus* label is issued to the accommodation establishments that meet the standards of environmental protection and sustainable development.

At the community level, there have been many efforts in transforming activities related to the sustainable sea exploitation and use towards the blue economy. There are good examples of ecosystem-based approach, such as the conservation of habitats for sustainable fisheries and ecotourism.

6.3 Integrated Coastal Management

The members of the PEMSEA Network of Local Governments Sustainable Coastal Development (PNLG), including Danang City and Quang Nam Province of Vietnam, adopted the **Dongying**

Declaration on building a “blue economy” by applying the Integrated Coastal Management (ICM) approach.

At present, ICM is implemented in most coastal provinces and cities, although in many places it is still passive, fragmented, discontinuous, and not yet systematic. Some provinces/cities currently have more regular ICM activities, including the six participants in the PEMSEA-VASI Project on ICM scaling up in Vietnam (Quang Ninh, Hai Phong, Thua Thien Hue, Da Nang, Quang Nam and Kien Giang); Ba Ria - Vung Tau Province — the key province implementing the KOICA Project “Setting up the foundation for integrated coastal management in some coastal provinces of Vietnam”; and Nghe An and Quang Ngai province, continuously implementing 2 ICM projects since 2011 and 2012, respectively. The total length of the coastline of the above provinces/cities alone accounts for about 40% of the entire coastline of Vietnam.

6.4 Initiatives to Protect Ocean Health and Support Blue Economy

a. Marine conservation activities

The concerns in marine conservation towards achieving the Aichi goals and targets and related SDGs are addressed in the **National Strategy for Biodiversity until 2020, vision to 2030**.

According to the **Master plan on the marine protected area system** up to 2020, there are 16 zones with an area of 169,617 ha. Marine protected areas help to restore marine biodiversity, creating a spillover effect, and contributing to sustainable socioeconomic development. Up to now, a network of 11/16 marine protected zones has been established and each MPA has a management board.

Table 5: Marine Protected Areas Established in Vietnam.

No.	MPA name	Province	Area (ha)	Typical species
1	Cat Ba	Hai Phong	10,900	Coral, seaweed, seagrass
2	Bai Tu Long	Quang Ninh	96,500	Coral, seagrass
3	Bach Long Vi	Hai Phong	10,900	Coral, abalone
4	Con Co	Quang Tri	2,140	Red coral, seagrass
5	Cu Lao Cham	Quang Nam	6,716	Coral, seaweed, seagrass
6	Ly Son	Quang Ngai	7,925	Coral, seagrass
7	Nha Trang Bay	Khanh Hoa	12,000	Coral, seagrass
8	Nui Chua	Ninh Thuan	7,352	Coral, sea turtles
9	Hon Cau	Binh Thuan	12,390	Coral, seagrass, rock crab, shrimp
10	Con Dao	Ba Ria-Vung Tau	23,000	Dugong, sea turtle, coral
11	Phu Quoc	Kien Giang	18,700	Coral, seagrass

Moreover, there are other nature reserves in the coast of Vietnam, such as the Cat Ba Biosphere Reserve (Hai Phong); Red River Delta inter-provincial World Biosphere Reserve Tien Hai wetland nature reserve with the Xuan Thuy Ramsar Site in Nam Dinh; Nam Hai Van - Natural History and Culture Protection Area, Son Tra Nature Reserve (Da Nang city); Nui Chua National Park (Ninh Thuan province); Binh Chau - Phuoc Buu Nature Reserve (Ba Ria - Vung Tau province); Can Gio Biosphere Reserve (Ho Chi Minh City); and Mui Ca Mau National Park (Ca Mau province). A number of other coastal wetland conservation areas are also being studied, planned and established, such as Dong Rui wetland conservation area (Tien Yen district, Quang Ninh province), Thai Thuy wetland conservation area (Thai Binh province) and Tam Giang - Cau Hai wetland nature reserve (Thua Thien Hue).

b. Management of solid waste, wastewater, and marine plastic waste

The current rate of domestic solid waste collection is about 85% in urban areas, and 60% in suburban areas, compared to the solid waste volume generated. The rate of domestic solid waste collection in rural areas is still low, about 40-55% compared to the amount of domestic solid waste generated there. The collection and transportation of solid waste is still scattered, not centralized; vehicles and equipment are backward, and the collection is inadequate, which affect the urban landscape and environment.

According to the General Statistics Office, in 2017, in the whole country about 37,808 tonnes of solid waste were collected, of which the total amount of ordinary solid waste collected (about 31,622 tonnes accounting for 84%) was treated meeting the corresponding national standards and technical regulations. In 28 coastal provinces, the amount of untreated waste was 30.06% in 2015, 36.22% in 2016, and 27.15% in 2017 of collected volume. In addition, there is an amount of solid waste that has not been collected.

According to the data of the Ministry of Construction, as of 2018, the proportion of urban areas (from grade III or higher) that invested in constructing centralized wastewater treatment system was 39%, with 43 concentrated wastewater treatment plants in operation, and with total designed capacity reaching 926,000 m³/day. If including the projects under construction, there are about 80 centralized wastewater treatment systems with a total designed capacity of about 2,400,000 m³/day. However, the plants put into operation only meet about 13% of the demand. In big cities, the proportion of wastewater treated is higher than that of small and medium cities, but still low, and not able to keep up with the current urbanization rate. In Hanoi, only about 20.62% of the city's total domestic wastewater is treated, while in the Ho Chi Minh City, the proportion of treated domestic wastewater is about 13%.

Regarding plastic waste, the Prime Minister of Vietnam has proposed to the G7 countries the initiative on promoting the formation of a global cooperation mechanism to reduce plastic waste in order to achieve the goal of green and clean oceans, which are free of plastic waste. In the

framework of the 6th General Meeting of the Global Environment Fund (GEF 6) on June 26, 2018, at the sideline event “Marine litter” organized by MONRE in cooperation with GEF, the Minister of Natural Resources and Environment proposed the initiative of “Establishing a Partnership for the East Asian Seas free of plastic waste”.

Implementing *Resolution 36-NQ/TW of October 22, 2018*, on the **Strategy for Vietnam’s sustainable ocean economy development to 2030, vision to 2045**, the Government has issued the **National Action Plan for reducing ocean plastic waste by 2030**. The objective by 2025 is to develop and improve mechanisms and policies for the management of ocean plastic waste; reduce 50% of ocean plastic waste; collect 50% of lost or discarded fishing gear; ensure that 80% of tourist resorts and coastal services do not use nonbiodegradable disposable plastic products and plastic bags; and achieve zero plastic waste in 80% of marine protected areas.

By 2030, Vietnam will: strive for 100% of coastal tourist and service areas not using disposable plastic products and plastic bags; stop disposing of fishing gear directly into the sea; basically restrict the import of plastic scrap for use as raw materials in industrial production in coastal export processing zones and industrial parks; reduce 75% of ocean plastic waste; achieve zero plastic waste in 100% of marine protected areas; and expand annual monitoring and periodically evaluate the current state of ocean plastic waste in the main estuaries and islands with tourism development potential.

6.5 Initiatives Contributing to Climate Action and Resilient Blue Economy

6.5.1 Mangrove planting for the coastline protection and climate change response

In order to proactively respond to climate change, Vietnam has been making efforts to limit the impacts caused by climate change. The Government through the Ministry of Natural Resources and Environment (MONRE) has implemented many priority and important tasks. From 2011 to 2019, the Government has invested in climate change adaptation measures that are suitable for each region and locality affected by climate change, with a total budget of nearly VND 19 trillion, especially in the Mekong Delta provinces and coastal provinces and cities. These funds have been invested in upgrading the salt control system, sections of sea dike and river dike in crucial areas, and the storage and supply water system for living, production and flood control; planting upstream protection forest, etc.

On July 20, 2019, at Kinh Hon hamlet (Khanh Binh Tay commune, Tran Van Thoi district), the Central Steering Committee for Disaster Prevention and GIZ in collaboration with the People’s Committee of Ca Mau province organized “Launching ceremony of the movement of planting mangroves and protecting beaches in some Mekong Delta provinces”. Attending the ceremony were Deputy Minister of Agriculture and Rural Development, Vice Chairman of Ca Mau People’s Committee and representatives of leadership of 19 provinces and cities in the Southern Region,

as well as the international organizations and experts. After the ceremony, leaders of MARD and representatives the provinces, international organizations and youth organization of Ca Mau planted thousands of mangrove trees in accretion areas along Hon Da Bac estuary.

Following this event, many coastal provinces and cities launched their troops, in response to the Launching Ceremony, spreading the movement of planting mangroves and protecting coastlines and beaches nationwide. The provinces and cities conducted pilot environmentally friendly and low cost constructions using local materials to prevent coastal erosion, and developed beaches in combination with environmental protection in some areas of the Mekong Delta.

The regeneration of protection forests in coastal areas along the sea dike is considered as a sustainable “soft solution” and green, nature-based infrastructure for long-term and effective response to climate change.

6.5.2 Clean energy development

a. Solar power

Status: According to Vietnam Electricity (EVN), more than 4,460 megawatts (MW) of solar power were connected to the grid as of June 2019. Specifically, 82 solar power plants, with a total capacity of about 4,464 MW, have been inspected and successfully utilized the National Electric Net Dispatch Center. Among them, there are 95 solar power plants under the control at the National level (A0) with a total capacity of 4,819 MW; and 10 power plants under the control of regional dispatch level with a total capacity of 275 MW.

The aforementioned figures show that the installed solar power capacity has far exceeded the targets of the adjusted Power Planning 7 (*Decision No. 428/QĐ-TTg*), in which the orientation towards solar power capacity in the whole country will reach 850 MW in 2020 and increase to 4,000 MW by 2025.

In addition to these large solar farms, with solar panels installed on ground, there are rooftop solar power panels installed, and solar power floating systems with solar panels installed on water surfaces that are also developed in the South of Vietnam.

Pressures: The development of solar power in recent years is rapid and bullish, causing many difficulties for the operation and regulation of the electricity system. Such development of concentrated solar power projects in some provinces, such as Ninh Thuan, Binh Thuan, has caused the 110 kV, 220 kV grid overload in these areas.

Technically, the electricity generation capacity is unstable due to the dependence on solar radiation intensity and to low power factor (only about 15% to 20%). Therefore, when building grid-

connected solar power systems, it is necessary to consider having other backup power sources, such as hydroelectricity.

In addition, the development of solar power in Vietnam also has problems related to the lack of capacity and trained and experienced personnel, and the lack of domestic auxiliary technology (most of equipment and materials in the solar power system are imported).

Response: The Government of Vietnam has issued many legal documents that guide and encourage the development of solar power, such as the *Prime Minister's Decision No. 2068/QĐ-TTg* dated November 25, 2015 on the **Strategy for renewable energy development of Vietnam until 2030, vision to 2050**, and *Decision No. 11/2017/QĐ-TTg*, dated April 11, 2017 of the Prime Minister on supporting solar power development. The state currently compensates solar power, and it is forecasted that after 2025, solar power prices will be able to compete fairly with prices of traditional electricity sources.

Solutions on training and capacity building, developing auxiliary industries, and applying new systems for the operation of integrated electric systems will be further studied to develop solar power cost-effectively and in sustainable way.

b. Wind power

Status: Research by the World Bank shows that Vietnam has a great advantage in wind due to a long coastline of more than 3000 km and many islands where an average wind speed is of 5m/s or more at 65m high the whole year, equivalent to a total capacity of 512 GW. In particular, more than 8% of Vietnam area is ranked as having very good wind potential (wind speed of 7-8 m/sec at the altitude of 65m), that can generate more than 110 GW.

Currently, there are nine wind farms operating with a total capacity of 304.6 MW, of which the largest one is Bac Lieu wind farm with capacity of nearly 100 MW, while the smallest is the Phu Quy wind farm with capacity of 6 MW farm connected to independent grid (not to the national grid) on Phu Quy island, Binh Thuan province, and the rest are 7 wind power plants with small capacity of less than 50 MW (Source: EVN).

The major project is the offshore wind power project Thanglong Wind in Binh Thuan province, with a capacity of 3,400 MW, with a capital of up to US\$ 11.9 billion. If this project is successfully implemented, in addition to providing a huge amount of clean electricity for Vietnam's electricity system, contributing to ensuring energy security and environmental protection in the future, it will use domestic contractors, which increases the localization rate and will bring Vietnam to a new step in the field of wind power.

Vietnam targets to have 6,200MW of wind power by 2030. Although Vietnam is a country with great potential for renewable energy, so far, the number of projects implemented is very small and the proportion of renewable electricity in the total amount of electricity produced is negligible.

Pressures:

- The cost of investing in wind power is still quite high and administrative procedures are one of the major barriers. The policies on investment procedures, contracts/prices of electricity trading between the project investor and Vietnam Electricity Corporation (EVN) have not been fully issued.
- Wind power projects have not been properly supported to meet the life cycle of turbines of about 20 years as required.
- Information, data on geography, tides, and wind speed in many regions are lacking, inconsistent, unreliable and not uniform in different regions of Vietnam, resulting in difficulties for the initial (pre-feasibility) evaluation step of a wind power project.
- Vietnam does not have any specialized training school in the field of “green” energy, so the shortage of leading experts is an issue affecting the effective operations and maintenance of the wind farms.

Response:

The Government has issued *Decision No. 39/2018/QĐ-TTg* amending and supplementing some articles of *Decision No. 37/2011/QĐ-TTg* dated June 29, 2011 on the mechanism to support the development of wind power projects in Vietnam, including the setting of the purchase price of US\$0.085/kWh for inland projects and US\$0.098/kWh for offshore ones. This is the price that many investors consider to be quite attractive and will be valid until November 1, 2021. The Government will also formulate the price policy to attract more investors in the wind power sector, especially for the offshore wind power projects.

Furthermore, the Government also focuses on the development of training programs in this field in universities and research institutes. There were associations and specialized energy organizations with experience that were established and tapped to advise the Government in formulating policies and developing procedures and technology. On February 11, 2020, the Party Central Executive Committee signed *Resolution No. 55-NQ/TW* on the orientation of **Vietnam’s National Energy Development Strategy until 2030, vision to 2045** with the aim of developing supporting policies and breakthrough mechanisms for offshore wind power development in association with the implementation of **Vietnam Sea Strategy**.

7. Ocean Governance: Preparation for Future Challenges

Recognizing the need for sustainable development of the country and the importance of the sea, over the past few decades, the Party and State have issued many directions, policies and measures to improve the management structure for the transformation and sustainable development of the ocean economy.

7.1 Sustainable Development Policy

The sustainable development policy of Vietnam is reflected in the 1992 Constitution, orientations and strategies for socioeconomic development in general and the marine economic development in particular of the Party, the Government, ministries, sectors and provinces/cities.

At the Fourth Conference of the 10th term Central Party Committee, the *Resolution 09-NQ/TW* dated September 9/2/2007 on **Vietnam's Sea Strategy to 2020** was approved.

It can be said that the *Resolution on the Vietnam Sea Strategy to 2020* has inherited the views on the development of ocean economy and other sea-related fields issued earlier, but it is the first comprehensive Resolution of the Party Central Committee on the sea, opening a new chapter in thinking about the sea for the cause of nation development and defense in the first decades of the 21st century.

On September 25, 2012, the Prime Minister issued *Decision No. 1393/QĐ-TTg* approving the **National Green Growth Strategy**, not directly addressing marine economic activities, but orienting the socioeconomic development activities in “greening” direction.

The Party Central Committee's *Resolution No. 36-NQ/TW* dated October 22, 2018 on Vietnam's **Ocean Economy Sustainable Development Strategy** was issued on the basis of evaluating outstanding results and problems in the field of marine economic development over the past time. It points out 5 guiding views, targets to 2030 and vision to 2045, and 5 major directions, 3 breakthrough stages and 7 key solutions. It can be said that the viewpoints, objectives to 2030 and Vision to 2045 of the *Resolution 36/NQ-TW* are all consistent with the approach to the blue economy, although this term is not explicitly used in this Resolution.

Carrying out the responsibilities of the maritime state, Vietnam fully participates in the international conventions, treaties and commitments related to the marine environment, and formulates corresponding policies and regulations at the national level for protecting marine natural resources and environment of the Region.

7.2 Laws on Management and Development of Ocean Economy

For implementing the directions and policies on the development of the ocean economy and management of marine and coastal resources and environment of Vietnam, many related legal documents have been issued (Annex). Some recent important legal documents related to the development of blue economy include:

- *Law of the Sea of Vietnam No. 18/2012/QH13*
- *Law on the Sea and Island Resources and Environment No. 2/2015/QH13*
- *Law on Planning No. 21/2017/QH14*
- *Law on Fisheries No. 18/2017/QH14*
- *Law on Tourism No. 09/2017/QH14*
- *Vietnam Maritime Code No. 95/2015/QH13*
- *Law on Environmental Protection No. 55/2014/QH13*

Many legal documents related to ICM of Viet Nam address various management aspects that support sustainable development, including:

- Integrated ocean and coastal management
- Inter-sectoral coordinating mechanism for coastal management
- Marine spatial planning/coastal use zoning
- Ecosystem-based management of coastal areas
- Climate change adaptation and mitigation
- Economic instruments in support of coastal and marine management policies and regulations
- Empowerment of local governments to manage marine and coastal resources
- Multi-stakeholder consultation and participation in decision-making
- Integrated environmental monitoring, evaluation and reporting
- Information management and sharing
- Capacity development and competency requirements of responsible managers and personnel

7.3 Institutional Arrangements

The Ministry of Natural Resources and Environment (MONRE) was established on 5 August 2002, on the basis of consolidating the General Department of Land Administration, the General Department of Meteorology and Hydrology and the organizations performing the state management of water resources, mineral resources and environment under the ministries of Agriculture and Rural Development, Industry, Science, Technology and Environment.

According to the *Decree 36/2017/ND-CP*, MONRE is a government agency that performs the function of state management in the fields of land, water resources, mineral resources, geology,

environment and hydrometeorology, climate change, measurement and mapping, integrated management of natural resources and environment of sea and islands, remote sensing, and public services in fields under its management. The functions, tasks, powers and organizational structure of MONRE are regulated, adjusted and supplemented through *Decrees No. 91/2002/ND-CP* of 11 November 2002, *No. 25/2008/ND-CP* of 4 March 2008, *No. 19/2010/ND-CP* of 5 March 2010, *No. 89/2010/ND-CP* of 16 August 2010, *No. 21/2013/ND-CP* of 4 March 2013, and *No. 36/2017/ND-CP* of 4 April 2017.

The Vietnam Administration of Sea and Islands (VASI) under MONRE is the national focal point for unified and integrated management of marine and island natural resources. VASI was established on August 27, 2008 under the *Prime Minister's Decision No. 116/2008/QD-TTg*. VASI has made a number of changes in its organizational structure in 2015 and 2018, focusing on strengthening its focal point role in the implementation of ICM in Vietnam.

At the local level, the Department of Natural Resources and Environment is defined as a body that advises and assists the provincial people's committees to perform the function of integrated management of the sea and islands. To date, 25 out of 28 coastal provinces have established sea and island sub-divisions directly under the Department of Natural Resources and Environment, while the other three coastal provinces have Marine and Island Divisions, or Marine and Islands unit integrated into some division of the Department of Natural Resources and Environment.

Regarding the exploitation, use and management of Vietnam's seas and coastal areas, there are many other ministries, agencies and agencies at central and local levels, such as *General Department of Fisheries* under the Ministry of Agriculture and Rural Development, *Vietnam National Administration of Tourism* under the Ministry of Culture, Sports and Tourism, and *Vietnam Maritime Administration* (Vinamarine) under the Ministry of Transport. The forces playing key role in supporting the enforcement of the sea-related legislation include Coast Guard, Fishery Control Force, Navy and Border Guard. In addition, there is the participation of customs, police and other law enforcement forces in seaport and coastal areas and on islands; forces engaged in rescue operations at sea, natural disaster prevention and fighting on islands and coastal areas. The assignment of roles and responsibilities in marine and island management will also be changed and improved as needed.

The *National Inter-Ministerial Coordination Committee* was established through the *Decision No. 975/QD-TTg* dated 31 May 2016 of the Prime Minister to implement the **Integrated Coastal Management Strategy of Vietnam to 2020 with a vision to 2030**. The Coordination Committee has the function of assisting the Prime Minister in studying, directing and coordinating the implementation of the Integrated Coastal Zone Management Strategy in interdisciplinary and inter-regional way.

On natural hazards and climate change, there are other interdisciplinary organizations, such as National Committee on Climate Change and National Committee for Natural Disasters and Incident Response and Search and Rescue.

7.4 Issues and Challenges

It can be said that recent efforts to improve the management of the sea and islands as well as the economy and social conditions are in line with the blue economy development. However, many problems and challenges still exist, such as:

- The system of policies and laws on environmental protection, marine conservation, adaptation to climate change and sea level rise and ICM is slowly concretized and put into practice.
- Intersectoral coordination mechanism for the unified and integrated management of sea and islands is not well functioning.
- The cooperation between sectors, departments, units and localities is not synchronized.
- Awareness and perception about environmental protection and sustainable development is limited among a significant part of the population and businesses.
- Contribution of scientific research to the ocean economy and ICM is limited and ineffective.
- International cooperation activities and sharing of knowledge and experience in state management of sea and islands are inadequate.

The main causes include:

- The term and model of the blue economy has not been clarified, resulting in limited knowledge.
- The capacity of officials and public servants performing state management of sea and islands is limited.
- The interest in marine environmental protection in many industries is not satisfactory, thus, the demand for the balance between economic development and environmental protection has not been achieved.
- Inadequate investment capital for sea and island development.

8. Towards the Future

In order to develop ocean economy and transform it to blue economy, it is necessary to have innovative and breakthrough thinking in line with the global general trend of sustainable development, harmonization of economic development and ocean resource conservation, and cost-effective solutions to address transboundary environmental pollution and climate change issues. Therefore, building a blue economy must be the foundation as it plays a central role in implementing the *National Strategy on Sustainable Development of Ocean Economy by 2030, Vision to 2045*. Development activities of economic sectors need to move from a exploitation

causing environmental pollution to a blue economy, investing in natural capital in an organic chain, from the mainland to the sea; reducing sources of environmental pollution to the sea right from the mainland; restricting the development of industries that use outdated technologies, causing environmental pollution; combining the promotion of recycling and reuse, and raising the efficiency of natural resources through a circular economic model; contributing to prevention of marine environmental incidents.

Vietnam needs to increase investment to conserve the natural capital from the seas through expanding areas and establishing new marine protected areas, restoring natural ecosystems, especially coral reefs, seagrass beds, mangrove forests and coastal protection forests, reducing pollution, at the same time improve the capacity for forecasting, early warning, proactively preventing, avoiding and mitigating natural disasters from the sea, and adapting to climate change and sea level rise.

Vietnam also needs to synchronously implement measures to prevent and combat coastal erosion, inundation, saline intrusion due to high tide and sea level rise in coastal areas. At the same time, it is necessary to restructure the marine and coastal economic industries based on the ecosystem and suit the natural advantages and potentials. Priority should be given to the development of emerging sectors and fields, such as sea and island tourism; renewable marine energy (wind, flow and wave energy); step by step investing in the development of marine biotechnology and marine pharmaceutical products in addition to promoting traditional economic sectors such as maritime economy; exploitation of oil and gas and mineral resources; fishing and aquaculture; fisheries infrastructure development; shipbuilding industry; etc.

Some important solutions that need to be considered for implementation include:

- 1) Further developing and improving mechanisms and policies to support ICM and integrate the objectives of ICM and blue economy development initiative into marine and coastal socio-economic development strategies and plans.
- 2) Developing human resources and ensuring the necessary conditions for the implementation of the SDS-SEA in the new situation in Vietnam; contributing to the successful implementation of the *Vietnam Ocean Economy Sustainable Development Strategy to 2030, vision to 2045*, as well as implementation of the *Sustainable Development Goal 14* that Vietnam has committed to the international community.
- 3) Strengthening scientific and technological research, development of database and integrated information management system (IIMS) to support ICM, blue economy development, climate change adaptation, and nature-based climate mitigation.
- 4) Promoting cooperation and sharing experiences in science, technology, information, and coastal and marine management with PEMSEA member countries, as well as with other countries around

the world to address challenges in the management of marine resources and environment in the Region and in Vietnam, such as: marine pollution due to wastewater and plastic waste, increasing ocean acidification, habitat loss, and illegal, unreported and unregulated (IUU) fishing.



Fish market. (Photo by VASI)

Table 6: Preliminary Assessment of the State of Ocean and Coast of Vietnam.

Indicator	Status
State of ocean economy	
Ocean economy	↑
Fisheries	↑
<i>Fishing</i>	—
<i>Aquaculture</i>	↑
Tourism	↑
Oil and gas industry	↓
Marine transport and port development	↑
Marine renewable energy	↑
Status of ocean health	
Fisheries resource	↓
Mangrove forest	—
Coral reef	↓
Seagrass bed	↓
Tidal flat	↓
Beach	—
Rare, threatened and endangered species	ND
Sea water quality	—
Marine protected areas (MPAs)	↑
Pressure	
Population increase	↑
Illegal, un-reported and unmanaged fishing	↑
Coastal erosion	↑
Untreated wastewater pouring into the sea	—
Marine litter (including plastic waste)	↑
Oil spill	↓
Greenhouse gas emissions	—
Response	
Marine and coastal management policy	↑
Proportion of coast with ICM	↑
MPA	↑
People's access to clean water and sanitation	↑
Sustainable ecotourism, sustainable community-based coastal tourism	↑
Seaport with environmental management system	↑
Mainstreaming valuation of ecosystem services and natural capital accounting	ND

Note: ND - No data; ↑ - Increased; ↓ - Decreased; — - Unchanged



Da Nang, Vietnam. (Photo by Da Nang PMO)

1 Introduction

1.1 Background

In December 2003, 12 countries in the East Asia Seas (EAS) Region, including Vietnam, signed the *Putrajaya Declaration* and adopted the *Sustainable Development Strategy for the Seas of East Asia* (SDS-SEA) as a common foundation of the Region to implement Agenda 21, the Millennium Development Goals, the World Summit on the Implementation Plan for Sustainable Development, and other major global and regional environmental instruments related to sea, islands and coastal areas. The Vietnamese Government has since then been strengthening and consolidating the policies, laws and organizations to manage, use and the sustainably develop the national coastal and marine areas. The country is also undertaking many activities that contribute to the implementation of regional and national SDS-SEA, including participation in the GEF/UNDP/PEMSEA Regional Project on the Scaling Up of Integrated Coastal Management (ICM) in Vietnam to support the implementation of the SDS-SEA.

In 2012, the leaders of natural resources and environment ministries of 10 countries in the region signed the **Changwon Declaration**¹ at the 4th Ministerial Forum during the EAS Congress 2012 in Changwon, RO Korea. In this Declaration, an operational definition of blue economy has been adopted, paving a way for the next timely and important steps in the journey towards the blue economy. The blue economy refers to a sustainable sea-based economic model, with innovative, environmentally-friendly infrastructure, technology and practices, including institutional and financial arrangements, to meet the goals of: (a) sustainable and inclusive development; (b) protection of marine and coastal areas, and reduction of environmental risks and ecosystem degradation; (c) water, energy and food security from use of ocean and coastal resources; (d) protection of health, livelihoods and welfare of people in coastal areas; and (e) promotion of ecosystem-based climate change mitigation and adaptation measures.

“We understand the Blue Economy to be a practical ocean-based economic model using green infrastructure and technologies, innovative financing mechanisms, and proactive institutional arrangements for meeting the twin goals of protecting our oceans and coasts and enhancing its potential contribution to sustainable development, including improving human well-being, and reducing environmental risks and ecological scarcities.”

- Changwon Declaration 2012

On 26 July 2011, in Dongying City, People's Republic of China, the members of the PEMSEA Network of Local Governments Implementing ICM (PNLG), including Danang City and Quang Nam Province of Vietnam, adopted the *Dongying Declaration* on building a "blue economy" by applying the ICM approach.

In November 2015, the Ministers of the Environment of the EAS countries adopted the *Danang Compact* at the EAS Congress 2015 held in Danang City, Vietnam. One of its targets is the development of a Regional State of Oceans and Coasts report by 2018 to show benefits of oceans and the resources therein, pressures and impacts from unsustainable practices, response measures, and progress in ensuring healthy oceans, economies and people.

Vietnam developed this National State of Oceans and Coasts (NSOC) Report, to contribute to the Regional State of Oceans and Coasts Report for assessing the development of a blue economy and monitoring the progress of SDS-SEA implementation. In addition, the Report also contributes to the assessment of supporting institutional arrangements, enabling national marine and coastal laws and policies, as well as relevant international agreements to which Vietnam is a party.

The blue economy approach is in line with the 2030 Agenda for Sustainable Development, especially Sustainable Development Goal (SDG) 14 – Life Below Water, and the Oceans Agenda. It is in keeping with other international agreements, such as the Regional Plan of Action on Illegal, Unregulated and Unreported (IUU) Fishing; Convention of Biological Diversity (CBD) and Aichi Biodiversity Targets, Ramsar Convention on Wetlands, International Maritime Organizations (IMO) Conventions (on marine pollution, ocean dumping, maritime safety, etc.), Convention on Trade of Endangered Species (CITES), Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA); UN Framework Convention on Climate Change (UNFCCC), Kyoto Protocol and Paris Climate Agreement; etc.

1.2 Rationale

Increasingly, it is recognized that the sea and oceans are finite, with fragile ecosystems and biodiversity, and constantly under pressure from human activities and climate change. In addition, the benefits gained from the sea and oceans have not been fully quantified, and the environmental and social impacts and costs of over-exploitation of natural resources and environmental pollution are neglected for many years. Human activities, whether on land or at sea, affect the sea and each of our uses is related to other current or potential uses. This means that we need a better and more detailed understanding of the economic value of marine and coastal resources, as well as the state of ocean health, as the basis for sustainable development of marine and coastal areas.

In this context, the term “blue economy” has been introduced for economic development in all parts of the world. While the concept of a blue economy is still being further developed, it focuses on transforming the established ocean economic sector to a more sustainable, inclusive, resilient, and ‘green’ economy, promoting new or emerging marine-based industries, such as marine renewable energy and marine biopharmaceuticals, preserving the marine natural capital, and providing opportunities for green growth and livelihoods in the coastal and marine areas.

All ongoing socioeconomic development activities can change the climate and bring about changes in the physical properties of the sea, which could consequently alter the foundation of the development of marine and coastal economic sectors. Although the changes due to sea level rise and ocean acidification have been identified, the extent and duration of these changes and how they could affect coastal and marine resources, economic activities and well-being of people in coastal areas have not been thoroughly assessed yet. Given the uncertainty, precautionary and mitigating measures and innovative approaches and technologies are needed. In this context, the blue economy approach provides the framework to achieve economic growth, generate jobs and livelihood opportunities, and ensure food security, disaster and climate resiliency and well-being while protecting ocean health and the resources upon which the economy and people are dependent on.

1.3 Purpose of the Report

Vietnam’s NSOC report is prepared with the following specific objectives:

- To support the marine and coastal information management system through collection of data, reports, and studies from various relevant agencies for the assessment of status and condition of Vietnamese marine and coastal areas.
- To assess the blue economy development in Vietnam, including the implementation of SDS-SEA, SDGs, relevant international commitments and national laws and policies, and contribute to the Regional State of Oceans and Coasts Report.
- To support the development of policies, enhance the planning of the country’s marine and coastal areas and management of natural resources, environment, activities and investments of economic sectors, and strengthen the cooperation between institutions.
- To monitor the Vulnerability and Adaptation Assessment Program for the development of a blue economy in Vietnam.
- To identify blue economy initiatives for replication and scaling up, especially in ICM sites.

1.4 Caveats

The report uses data and information related to the exploitation, use, protection and management of marine and coastal resources and environment. Most of the data are collected, processed, and analyzed based on the administrative boundaries of provinces, districts and communes. Some limitations on the data used in this report include:

- **Consistency of spatial data.** There is lack of data for the whole Vietnam Sea and more specific data for coastal and marine areas. Some data are for the whole East Sea, while other data are for one marine region or an ecosystem. The socioeconomic data are also for different administrative levels, and quality of data varies by region.
- **Consistency of time or period of the data.** Most of the data is from the year 2018 (according to the latest available official statistics). Older data are used when there are no recent data. Some new data and information are also used, especially on Vietnam's recent efforts towards sustainable marine economic development. Note that PEMSEA Country Partners and Collaborators agreed that all NSOC Reports will present 2015 data as a common period to be used in the Regional SOC Report, and as baseline information.
- **Lack of disaggregated data.** For most marine economic sectors, it is difficult to separate the contributions of the marine activities, so it is difficult to estimate the total contribution of the ocean economy to the national economy.



Mangrove planting. (Photo by VASI)

PART 1

SEAS, COASTS AND PEOPLE OF VIETNAM

2 Geography

2.1 Location

Vietnam is a country on the eastern edge of the Indochina peninsula, near the center of Southeast Asia, with the following coordinates: 16°10'N, 107°50'E. It is bordered by China to the north, Lao PDR and Cambodia to the west, Gulf of Thailand to the southwest, Gulf of Tonkin to the northeast, and the East Sea (South China Sea) to the east and south.

Vietnam has the total land area of 331,212 km², including the two offshore island. The coastline of Vietnam's mainland (excluding islands) is over 3,260 km. The country extends 1,650 km from north to south, but it is only 50 km across at its narrowest point.

2.2 Natural Features

2.2.1 Topography of the Coastal Zone

The terrain of the country consists of: (a) low, flat delta in south and north; (b) central highlands; and (c) hilly, mountainous in far north and northwest. Vietnam's principal physiographic features are the Annamese Cordillera (Nui Truong Son), extending generally from northwest to southeast in central Vietnam and dominating the interior, and two extensive alluvial deltas formed by the Red River in the north and the Mekong River in the south. Between these two deltas is a long, relatively narrow coastal plain. The country's mean elevation is 398 m. The highest point is 3,147 m – Fan Si Pan (Phan Xi Pang) mountain.

As the coastline stretches from north to south, the coast of the Bac Bo Gulf (Gulf of Tonkin), the open central and southern coasts of the East Sea (South China Sea), and the coast of Gulf of Thailand have basic ocean characteristics that are significantly distinguished.

The coastal zone of Vietnam is characterized by three main topographic types:

- *Deltas*: mainly distributed in the Red River delta in the northern part of the country, and the Mekong delta in the southern part. This type of coastline is characterized by coastal accretion intercalating with local erosion and dense network of rivers, lakes, tidal mudflats and mangroves.

- *Coastal mountains*: mainly distributed in the northern part of the country – from Mong Cai to Hai Phong, and central part – from Da Nang to Ca Na. These coastal mountains developed on solid rock formations.
- *Coastal plains*: mainly in the north central part – from Thanh Hoa to Chan May, and in south central part – from Ca Na to Vung Tau. The coastal plains developed on sedimentary formations, which are mostly sandy, interspersed with rocks.

Along the coast of Vietnam, there are many cliffs, sand beaches, estuaries, bays, lagoons, harbours, etc. The coastline sections have differences in the slope and general morphological characteristics associated with coastal continental strip and the shallow coastal waters. The topography of Vietnam's coastal waters is quite complex; each region has different characteristics. Depending on geological history and hydrodynamic processes, the Vietnamese coast can be divided into following main types [41]:

- Coasts formed by tectonic division with the continent less changed by coastal processes.
- Coasts formed by non-oceanic elements (cumulative triangular coast, alluvial delta cumulative coast, tidal cumulative coast, coral cumulative coast, and chemical eroded coast)
- Coasts formed by the wave process (deposited and/or eroded by waves).

Vietnam is one of the countries of Southeast Asia having wide coastal continental strip. The Northern continental strip extends from the Vietnam - China border to Da Nang, with a slope of 2-5'. The Central continental strip extends from Da Nang to Phan Thiet in the northwest-southeast or northeast-southwest, with a slope of 5-10' (in some places it reaches 10-30'). The Southern continental strip extends from Phan Thiet to Ca Mau cape in the northeast-southwest direction; the topography is flatter. The Southwest continental strip extends from the Ca Mau Cape to the Vietnam-Cambodia border; the topography has an average slope of 1-3'.

Vietnam's vegetation is rich and diversified, reflecting the country's range of climate, topography, and soils and the varying effects of human habitation.

2.2.2 Hydrological Features

Vietnam has more than 2,360 rivers with a length of 10 km or more, of which there are 109 main rivers. Nationwide, there are 16 river basins. Ten of these 16 river basins, with an area of over 10,000 km², are the basins of Bang Giang - Ky Cung, Hong - Thai Binh, Ma, Ca, Vu Gia. - Thu Bon, Ba, Se San, Srepok, Dong Nai and Mekong. The total area of river basins across the country is over 1,167,000 km², of which, the basin area outside the territory accounts for 72%. The total surface water of the river basins in the territory of Vietnam is about 830-840 billion m³/year, but only about 310-315 billion m³ (37%)

are endogenous, and 520-525 billion m³ (63%) consist of the water flowing from neighboring countries into Vietnam [24].

2.3 Administrative Features

There are 58 provinces and five centrally-controlled cities. Of these, 28 are coastal provinces and cities.¹



Mekong River delta to South China Sea. (photo by M. Gifford-De Wys Inc.)

¹ The 28 coastal provinces and cities of Vietnam include Quang Ninh, Hai Phong, Thai Binh, Nam Dinh, Ninh Binh, Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien Hue, Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan, Binh Thuan, Ba Ria - Vung Tau, Ho Chi Minh City, Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau and Kien Giang.

3 The People and Economy

A number of important factors and recent developments have been shaping the coastal and marine areas of Vietnam. In broad terms, the coastal and marine sectors like all other sectors respond to macro-level factors, such as: (a) demographic features and population growth; (b) economic growth, including trade, urbanization rate, infrastructure development, changes in coastal land- and sea-use; (c) changes in social aspects; and (d) related socioeconomic policies. These factors could drive the ecosystem, environmental and climate changes and create pressures on the marine environment.

3.1 Demographic Features

3.1.1 Population

One of the drivers of environmental change is population growth and demographic change. The total population of Vietnam in 2018 is around 94.67 million people (**Table 3.1**). Population growth in 2017-2018 was 0.99%. The total population density of the country in 2018 was 280 persons per km² [35].

Table 3.1: Population of Vietnam, 2015-2018.

	2015	2016	2017	2018
Population, total	92,677,076	93,638,724	94,596,642	95,540,395
Population growth (annual %)	1.04	1.03	1.02	0.99
Population density (people per km ² of land area)	298.89	301.99	305.08	308.13

Source: World Bank, 2020.

a. Coastal population

Vietnam has 28 coastal provinces and cities, which together have a population of about 47.215 million people. In the coastal provinces/cities, there are 125 coastal districts and 12 island districts with a total population of about 17,890,000 people, and average population density of 354 persons/km² in 2018 (**Table 3.2**).

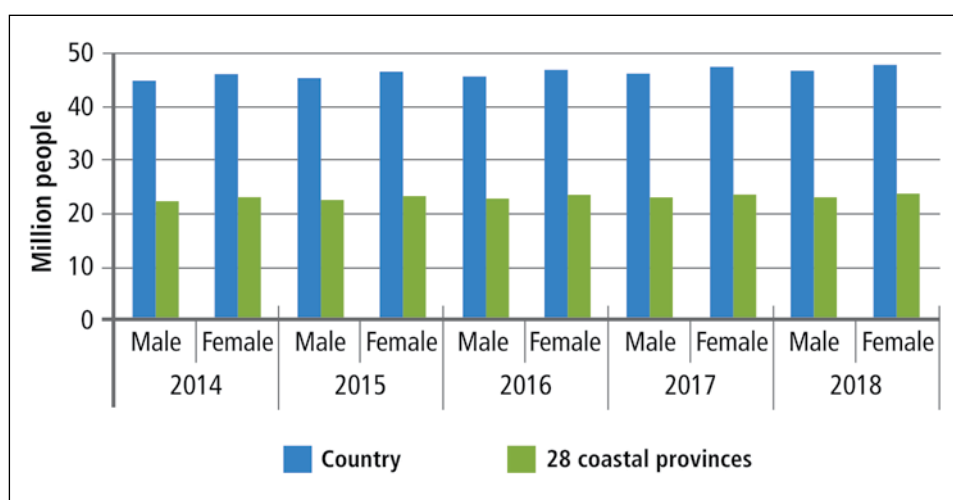
Table 3.2: Population and Population Density of the Coastal Provinces and Districts.

Coastal provinces		Coastal districts	
Population	Population density	Population	Population density
47,215,000	344	17,890,000	354

Source: Statistical Yearbooks of Viet Nam and of 28 coastal provinces, 2018.

b. Gender ratio

The average male/female ratio of the whole country population is 0.977 (977 males per 1,000 females), while this ratio of the 28 coastal provinces is 0.98 (980 males per 1,000 females). The male and female populations of 28 coastal provinces compared to those of the whole country are shown in **Figure 3.1**.

Figure 3.1: Coastal and Nationwide Male and Female Population.

Source: Statistical Yearbooks, 2014 - 2018.

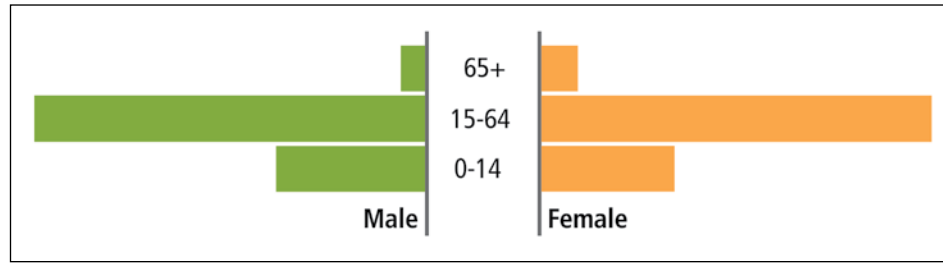
c. Age-Sex Structure

The population in 2018 by age group and gender (age-sex structure) is shown in **Table 3.3** and **Figure 3.2**.

Table 3.3: Population, by Gender and Age Group, in 2018.

	Male	Female	TOTAL
Population ages 65 and above	2,710,562	4,239,888	6,950,450
Population ages 15-64, total	33,313,641	33,136,959	66,450,600
Population ages 0-14, total	11,653,884	10,485,460	22,139,344
TOTAL	47,678,087	47,862,307	95,540,394

Source: World Bank, 2020.

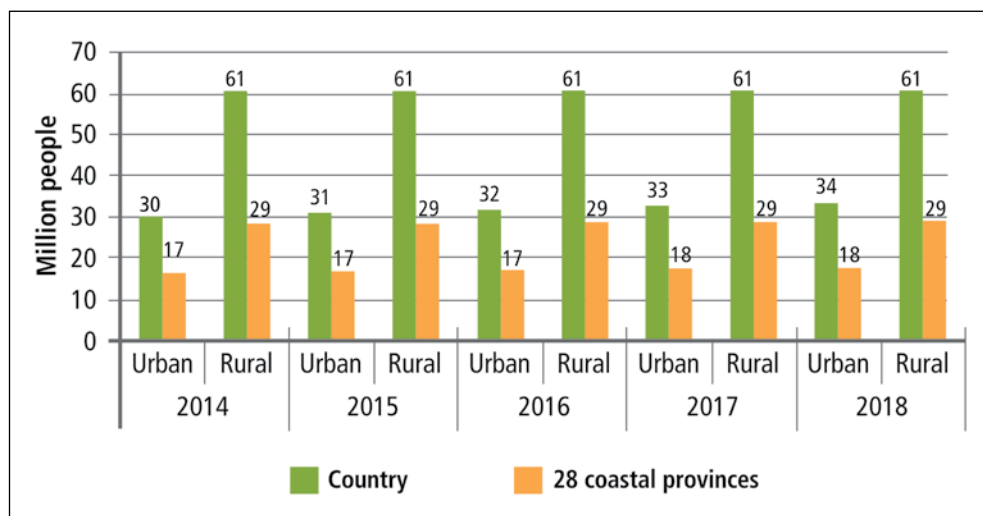
Figure 3.2: Age-Sex Structure.

The age dependency ratio is a measure of the number of dependents aged zero to 14 and aged over 65 years, compared with the total population aged 15 to 64 or working age population. This demographic indicator gives insight into the number of people of non-working age, compared with the number of those of working age. In 2018, the age dependency ratio of the young (ages 0-14) is 10.46, while the age dependency of the old (ages 65 and above) is 43.78. However, in Vietnam, men usually retire at the age of 60 years old and women at 55, thus, this age dependency ratio have to be adjusted.

d. Urban-Rural Population

For the entire country, the rural population was 61 million in 2014 to 2018, while the urban population increased by 1 million per year during this period – from 30 million in 2014 to 34 million in 2018 (**Figure 3.3**).

For the coastal provinces, the rural population has remained the same, at 29 million in 2014 to 2018, while the urban population was 17 million in 2014 to 2016, and it increased to 18 million in 2017 to 2018 (**Figure 3.3**). This indicates the urbanization rate in the coastal provinces.

Figure 3.3: Urban and Rural Population.

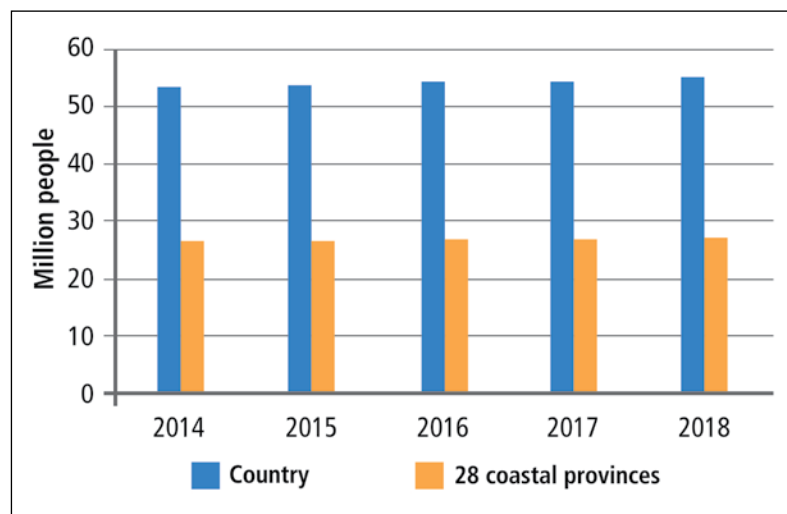
Source: Statistical Yearbooks of 28 coastal provinces/cities, 2014 - 2018.

From 2014 to 2018, the rural population decreased slightly, while the urban population is on the rise. In 2014, the rural population of the country was 2.02 times higher than the urban population, while the rural population in 28 coastal provinces was 1.71 times higher than the urban population. By 2018, the rural population of the whole country was only 1.8 times the urban area, while the rural population in 28 coastal provinces was 1.36 times the urban population.

3.1.2 Labor force

The labor force – aged 15 and over – nationwide in 2018 was 54.3 million. The labor force in all 28 coastal provinces compared to the whole country from 2014 to 2018 is shown **Figure 3.4**. Total unemployment is 1.89% of the total labor force. Of the employed people, 20.7 million are employed in agriculture, forestry and fishery, accounting for 38.1% of the total (decreased by 2.1% compared to the previous year); 14.4 million in industry and construction sector, accounting for 26.6% (increased by 0.8%); and 19.2 million in service sector, accounting for 35.3% (increased by 1.3%). This shows that the economy is becoming more services-driven.

Figure 3.4: Labor Force in the Whole Country and 28 Coastal Provinces.



Source: Statistical Yearbook, 2014 – 2018.

3.1.3 Ethnic Composition of Coastal People

There are 52 ethnic groups living in coastal areas, which include the Kinh (95.7%), Cham (0.5%), Hoa (0.7%), Dao (0.18%), Nung, Khmer (2.3%), and others. The Kinh people are distributed mainly in the coastal plains of the North and the South. The Khmer people are mainly distributed in Tra Vinh, Soc Trang and Bac Lieu provinces.

Coastal areas of Vietnam have a relatively complex development history, so the cultural, social and historical characteristics of the areas are abundant and diverse. Many traditional festivals imbued with national identity are maintained in coastal provinces.

Some of the ethnic minorities living in the coastal strip have their own cultural identity, creating a diversity and richness in Vietnamese cultural identity, expressed through lifestyles, such as eating, dressing, relationships among relatives, festivals, customs, languages, etc. These differences in ethnic and religious identities are supporting, but also challenging aspects for the development process, because they require the effective application of the principle of equity and respect of the cultural characteristics of all nations.

Most people in coastal areas of Vietnam follow the traditional beliefs (accounting for 83%). The rest of the population follow different religions, mainly Buddhist (9.04%), Catholic (Christian) (7.0%), and other religions, such as Protestant (Christian), Muslim, Cao Dai, Hoa Hao, which are of very small percentage.

3.2 Economic Development

3.2.1 National Economy

a. GDP and GNI

The **gross domestic product** (GDP) is the total market value of the goods and services produced by a country's economy during a specified period of time. The GDP of Vietnam in 2007 was US\$ 97.8 billion (in constant 2010 US\$ prices), and it increased to US\$ 175.28 billion in 2017 and US\$ 187.69 billion in 2018 (**Table 3.4**). The economy therefore grew by 7.08% in 2017-2018. This is the highest growth rate since 2008 (**Figure 3.5**).

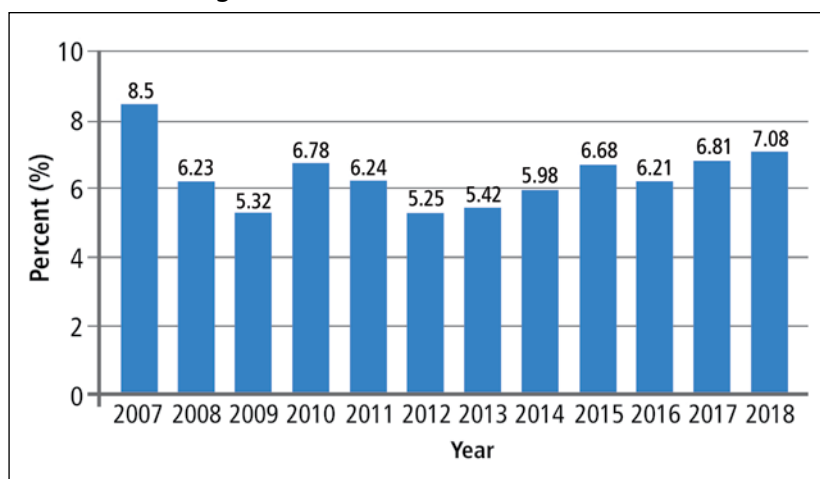
Consequently, the **GDP per capita** (in constant 2010 US\$ prices) increased from US\$ 1145.14 in 2007 to US\$ 1579.16 in 2015, and to US\$ 1964.48 in 2018 [58].

The **gross national income** or GNI refers to the GDP plus net receipts from abroad of compensation of employees, property income, and net taxes less subsidies on production. The GNI of Vietnam has also been increasing steadily over the last decade, from US\$ 95.24 billion in 2007 to US\$ 146.35 billion in 2015, and to US\$ 173.53 billion in 2018 (**Table 3.4**). The **GNI per capita** (in constant 2010 US\$ prices) increased from US\$ 1115.00 in 2007 to US\$ 1579.16 in 2015, and to US\$ 1816.33 in 2018.

Table 3.4: GDP and GNP of Vietnam, 2015-2018.

	2015	2016	2017	2018
GDP (constant 2010 US\$)	154,508,616,052	164,104,855,205	175,284,081,081	187,686,812,137
GDP growth (annual %)	6.68	6.21	6.81	7.08
GNI (constant 2010 US\$)	146,351,773,168	156,897,180,072	161,235,716,856	173,533,091,756
GDP growth (annual %)	6.28	7.21	2.77	7.63

Source: World Bank, 2020.

Figure 3.5: National GDP Growth Rate.

Source: General Statistics Office, 2018.

b. GDP by industrial origin

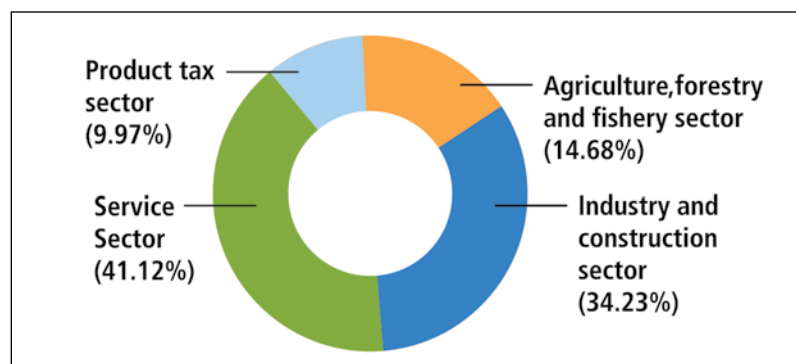
GDP can be measured as the sum of the gross value added (GVA) of all economic activities at basic prices, plus the taxes less subsidies on production and imports. In 2018, the GVA of the agriculture, forestry and fishery sector increased by 3.76%. This is the highest growth rate of this sector in the period of 2012-2018, confirming the sector restructuring that promoted efficiency, especially in the field of agriculture and aquaculture. The industry and construction sector's GVA increased by 8.85% in 2018 while the service sector's GVA increased by 7.03%. The taxes less subsidies on production and imports contributed 9.97% to the GDP (General Statistics Office, 2018).

The share of the agriculture, forestry and fishery sector has been decreasing as the economy is industrializing and becoming more services oriented as well. The economy of Vietnam has indeed transformed from an agrarian to a service economy. More than 40% of the country's GDP is generated by the services sector, which include the hotel and catering industry (for tourism), and transportation in 2018 (**Table 3.5**). The manufacturing and construction sector accounts for 34% of GDP, while the agriculture, forestry and fishery sector has a smaller share, at 15% of GDP.

Table 3.5: Gross Value Added of Economic Sectors.

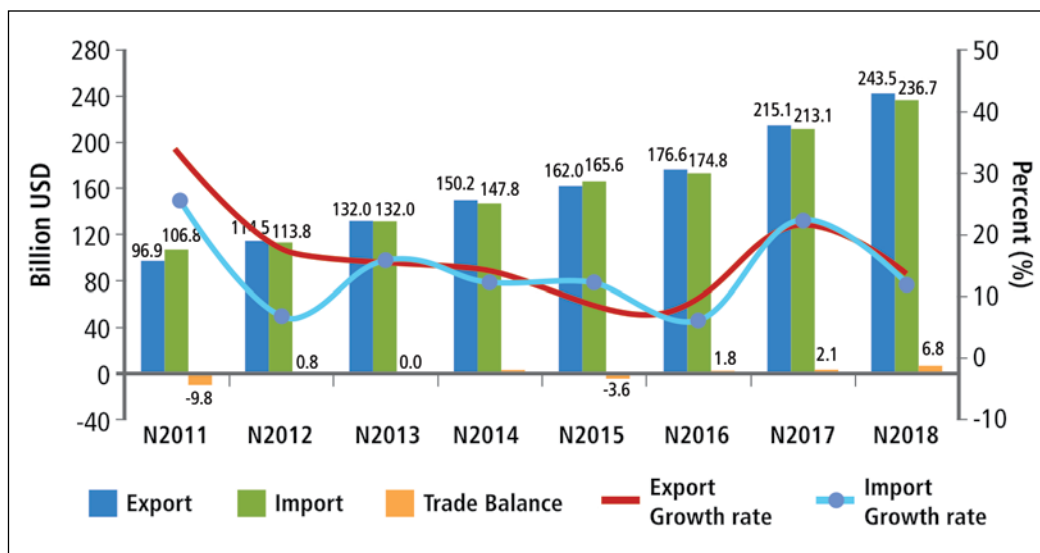
	2017	2018
Agriculture, forestry, and fishing, value added		
In constant 2010 US\$	25,918,398,915	26,893,528,192
% of GDP	15.34	14.68
Growth rate (%)	2.90	3.76
Industry (including construction), value added		
In constant 2010 US\$	61,321,340,357	66,750,419,616
% of GDP	33.40	34.23
Growth rate (%)	0.08	8.85
Services, value added		
In constant 2010 US\$	68,007,664,806	72,787,947,308
% of GDP	41.26	41.12
Growth rate (%)	7.44	7.03
Gross value added at basic prices (constant 2010 US\$)	155,247,404,078.27	166,431,895,115.07
Taxes less subsidies on production and imports (% of GDP)	10.00	9.97
Gross domestic product (constant 2010 US\$)	175,284,081,081.18	187,686,812,137.29

Source: World Bank, 2020.

Figure 3.6: Share of Gross Value Added (GVA) of the Economic Sectors and Net Taxes on Products to GDP in 2018.

c. Trade

The total import-export turnover of the country in 2018 reached US\$ 480.17 billion, increase of 12.2% from previous year (equivalent to an increase of US\$ 52.05 billion). Of which, the value of exported rice reached US\$ 243.48 billion, an increase of 13.2% from previous year, and imported rice reached US\$ 236.69 billion, increase of 11.1%. Overall, Vietnam's trade balance in 2018 had a surplus of US\$ 6.8 billion.

Figure 3.7: Turnover, Export and Import Growth Rates and Trade Balance, 2011-2018.

Source: General Department of Customs.

The biggest market of Vietnam's exports in 2018 was Asia, followed by the Americas, and Europe. The total value of Vietnam's trade with Asia in 2018 reached US\$ 321.4 billion, corresponding to increase of 11.9% compared to 2017. Trade with Asia accounted for 66.9% of the total import-export turnover of the country, the highest proportion compared to other continents in the world. The import-export value of trade with countries of the Americas had a turnover value of US\$ 78.37 billion, an increase of 14.6% compared to the previous year; and accounted for 16.3% of the total turnover. Total turnover of exports and imports with Europe in 2018 was US\$ 64.11 billion, accounting for 10.5% share, and it increased by 10.5% from previous year. Although the share of Australia was only 1.94% of total turnover, this market had the highest increase at 19.1% in 2018. **Table 3.6** shows the export and import turnover, by continent.

Table 3.6: Export and Import Turnover, by Continent or Major Market, in 2018.

Market	Export			Import		
	Turnover (US\$ billion)	Compared to 2017 (%)	Share to total exports (%)	Turnover (US\$ billion)	Compared to 2017 (%)	Share to total imports (%)
Asia	131.36	16.15	53.95	190.04	9.14	80.29
Europe	46.30	7.68	19.01	17.81	18.65	7.53
Australia	4.90	21.05	2.01	4.41	17.10	1.86
Americas	58.04	10.95	23.84	20.33	26.66	8.59
Africa	2.88	8.18	1.18	4.10	1.14	1.73
Total	243.48	13.19	100.00	236.69	11.12	100.00

Source: General Department of Vietnam Customs, 2019.

3.2.2 Coastal Economy

The coastal economy is strongly developed in most coastal provinces/cities. In the period of 10 years from 2008 to 2017, the gross regional domestic product (GRDP) of coastal provinces/cities grew at average of 7.5% per year, higher than the national growth rate (6%/year). Some coastal provinces/cities have high growth rates, such as Quang Nam, Da Nang, Thanh Hoa and Ha Tinh.

In 2017, the GRDP per capita reached 64.9 million VND, higher than the national average of 53.5 million VND. In particular, some provinces/cities have a high GRDP per capita, such as Ba Ria - Vung Tau (over 225 million VND), Quang Ninh (over 90 million VND), and Da Nang (over 70 million VND).

The economic structure of coastal provinces/cities has shifted positively towards reducing the proportion of agriculture, forestry and fishery, and increasing the proportion of service sector (**Table 3.7**). From 2007 to 2017, the proportion of GRDP² in agriculture, forestry and fisheries in coastal provinces decreased from 12.1% to 11.4%; industry and construction decreased from 37.6% to 33.3%; while the service sector increased from 42% to 47.3% (MPI, 2018).

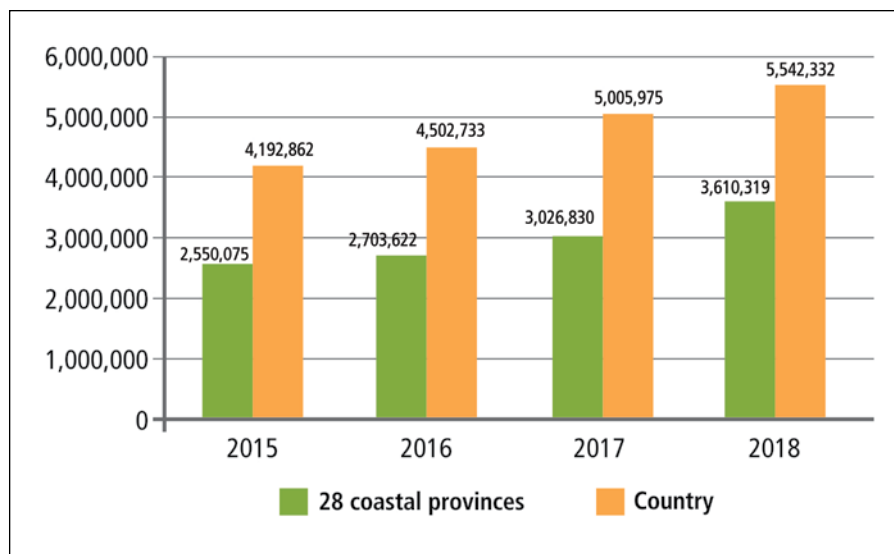
Table 3.7: GRDP of 28 Coastal Provinces and Cities, in Billion VND.

	2007	2017	Increase/decrease
GRDP of 28 coastal provinces and cities	882,766	3,026,830	
Gross value added (GVA):			
Agriculture-Forestry-Fisheries (AFF)	107,196	344,794	↓ 0.7
Industry-construction	332,290	1,007,958	↑ 4.3
Services	370,445	1,432,880	↑ 5.3
Taxes minus subsidizes	72,835	241,198	

Source: *Statistical Yearbook of 28 coastal provinces and cities 2018*.

Nominal GRDP (at current prices, by province) for 28 coastal cities and provinces accounted for 60-65% of the national GDP in the period of 2015-2018, as shown in **Figure 3.8**. The Nominal GRDP of each province in 2017 and 2018 are shown in **Table 3.8**.

² GRDP = (Agriculture, forestry, and fisheries) + (Industry and construction) + Services + (Product tax - Product subsidies)

Figure 3.8: GRDP of Coastal Provinces/centrally-run Cities.

Source: Statistical Yearbook, 2017 and 2018.

Table 3.8: GRDP, by Province (in billion VND, at current prices).

No.	Province/city	2017	2018
1	Quang Ninh	128,569.17	147,031.04
2	Hai Phong	165,763.90	195,536.20
3	Thai Binh	59,726.00	68,822.00
4	Nam Dinh	52,521.37	58,736.26
5	Ninh Binh	42,589.24	47,138.99
6	Thanh Hoa	133,281.03	160,460.13
7	Nghe An	103,122.95	115,666.60
8	Ha Tinh	50,890.00	62,971.00
9	Quang Binh	29,908.50	33,259.80
10	Quang Tri	25,158.38	27,503.07
11	Thua Thien Hue	31,436.30	33,513.80
12	Da Nang	80,912.94	90,022.75
13	Quang Nam	83,439.97	91,676.07
14	Quang Ngai	191,455.30	236,172.57
15	Binh Dinh	63,102.20	70,214.00
16	Phu Yen	32,882.70	36,151.30
17	Khanh Hoa	68,188.30	74,873.86
18	Binh Thuan	56,874.02	63,386.79
19	Ninh Thuan	20,438.00	22,848.00

Table 3.8: GRDP, by Province (in billion VND, at current prices). (cont.)

No.	Province/city	2017	2018
20	Ba Ria - Vung Tau	288,743.80	328,678.53
21	Ho Chi Minh	1,131,502.00	1,246,206.00
22	Tien Giang	75,288.85	82,682.32
23	Ben Tre	40,365.03	43,885.45
24	Tra Vinh	41,003.00	45,846.00
25	Soc Trang	44,309.51	48,445.38
26	Bac Lieu	33,534.64	39,198.07
27	Ca Mau	46,924.07	52,108.46
28	Kien Giang	77,799.18	87,356.53
Total 28 coastal provinces/cities		3,199,730.34	3,610,390.97
Whole country		5,005,975.00	5,542,331.87

Source: Statistical Yearbook, 2017 and 2018.



Photo by DMBAutista

3.3 Social Features

3.3.1 Human Development Index (HDI)

Vietnam's HDI has risen continuously over the past 27 years. The HDI of Vietnam in 2018 is 0.693, which puts the country in the medium human development group, positioning it at 118 out of 189 countries and territories. Vietnam's HDI is only 0.007 lower than the threshold (0.700) of the High Human Development group. In 1990, Vietnam's HDI value was lagging behind the East Asia-Pacific region by an average of 8.1%. Between 1990 and 2018, Vietnam's HDI value increased by 45.6%, from 0.475 to 0.693; life expectancy increased by 4.7 years, mean years of schooling increased by 4.9 years, and the GNI per capita (2011 PPP\$) increased by about 354% (**Table 3.9**). In 2018, life expectancy at birth reached 75.3 years; expected years of schooling³: 12.7 years; mean years of schooling: 8.2 years (still below the expected years); and GNI per capita reached US\$ 6,220.

Table 3.9: Vietnam's HDI Trends.

Year	Life expectancy at birth	Expected years of schooling (*)	Mean years of schooling (**)	GNI per capita (2011 PPP\$)	HDI value
1990	70.6	7.8	3.9	1,369	0.475
1995	71.9	9.3	4.6	1,944	0.529
2000	73.0	10.6	5.4	2,725	0.578
2005	74.1	11.3	6.4	3,367	0.616
2010	74.8	12.0	7.5	4,266	0.653
2015	75.1	12.7	8.0	5,314	0.680
2016	75.2	12.7	8.1	5,638	0.685
2017	75.2	12.7	8.2	5,916	0.690
2018	75.3	12.7	8.2	6,220	0.693

Source: UNDP, Human Development Report 2019 (Brief Report for Vietnam). (*) Updated by HDRO based on UNICEF's Multidimensional Cluster Survey 2014; (**) Barro and Lee, 2018.

Gender Inequality Index (GII)

On gender equality, as measured by the GII, Viet Nam also performs well. Viet Nam has a GII value of 0.314 (a lower value reflects lower gender inequality), and it ranked 68 out of 162 countries in the 2018 index (UNDP, 2019).

³ Expected years of schooling: number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates persist throughout the child's life (UNDP, 2018).

As reported by UNDP (2019): In Viet Nam, 26.7% of parliamentary seats are held by women, and 66.2% of adult women have reached at least a secondary level of education compared to 77.7% of their male counterparts. For every 100,000 live births, 54 women die from pregnancy-related causes; and the adolescent birth rate is 30.9 births per 1,000 women of ages 15-19. Female participation in the labour market is 72.7 percent compared to 82.5 for men.

3.3.2 Living Conditions

a. Access to clean water

Currently, Vietnamese people are using domestic water from 5 sources: tap water supplied by water plants or water supply stations; treated well water managed by Department of Agriculture and Rural Development; well water dug and drilled by people individually; rainwater and river water (mainly in poor residential areas along river banks).

In urban areas, the beneficiaries of the clean water source are mainly the residents (accounting for 70% of the water volume), the remainders are industrial production establishments, administrative and non-business units, and services and healthcare units; water is also used for watering the roads.

For the rural areas, there are two forms of water supply services: more than half of the rural population (56.5%) use water from individual household and small scale systems, and the rest use rural piped centralized schemes managed by communities (National Center for Rural Water Supply and Sanitation, 2018). In rural areas, there is still a shortage of clean water due to water pollution caused by lack of infrastructure and discharge of industrial, agricultural, husbandry and domestic wastewater, as well as discharge of untreated garbage into ponds and lakes.

Table 3.10: Percentage of People Supplied with Clean Water (%).

	2006	2010	2014	2016	2018*
Whole country	89.1	90.5	93.0	93.4	97.4
Urban areas	96.9	97.7	98.3	99.0	99.6
Rural areas	86.1	87.4	90.6	90.8	96.3

Source: National Center for Rural Water Supply and Sanitation, 2017.

* Press release: The results of the 2019 Population and Housing Census, GSO.

Currently, the proportion of households using hygienic water is 97.4%, of which 52.2% uses tap water. The rate is 99.6% in urban areas, and 96.3% in rural areas [16]. In coastal provinces and cities, the proportion of people using hygienic water is higher than those using clean water.

Table 3.11: Percentage of Households in Coastal Provinces using Clean Water and Hygienic Water (%).

Coastal provinces/ cities	Clean water*			Hygienic water **		
	2016	2017	2018	2016	2017	2018
Quang Ninh	93.2	94.0	94.0	98.0	98.7	99.0
Hai Phong	97.0	97.0	97.0	99.5	99.6	99.6
Thai Binh				98.0	97.3	98.1
Nam Dinh	100.0	100.0	100.0	99.9	99.9	99.9
Ninh Binh	83.4	100.0	100.0	-	94.1	94.7
Thanh Hoa	85.5	88.7	92.4	93.0	94.6	96.7
Nghe An	59.5	64.7	70.3	95.9	96.5	97.2
Ha Tinh	85.6	-	88.0	99.6	-	99.6
Quang Binh	97.0	97.2	97.2	86.8	89.1	90.2
Quang Tri	88.0	90.0	91.5	96.3	-	98.2
Thua Thien Hue	100.0	100.0	100.0	97.2	97.2	97.3
Da Nang	99.2	99.5	99.5	99.2	99.5	99.5
Quang Nam	67.0	74.0	77.0	94.5	95.3	95.6
Quang Ngai	84.2	82.1	83.0	92.1		92.1
Binh Dinh				98.8	-	98.9
Phu Yen	77.0	80.0	85.0	91.7	-	
Khanh Hoa	95.2		96.2	92.8		95.3
Ninh Thuan	100.0	100.0	100.0	93.0	-	94.0
Binh Thuan				96.7	97.3	98.1
Ba Ria - Vung Tau	98.1	98.1	98.1	99.9	99.9	99.9
Ho Chi Minh city						
Tien Giang				99.7	-	99.8
Ben Tre	80.4	87.5	89.2	89.1	93.2	94.5
Tra Vinh	70.5	-	94.0	98.8	92.5	93.3
Kien Giang				85.3	85.7	86.0
Soc Trang	80.0	91.0	92.1	97.0	-	98.0
Bac Lieu	68.1	68.9	69.8	99.7	99.9	99.9
Ca Mau	100.0	-	100.0	100.0	-	100.0

Source: Statistical Yearbooks of coastal provinces, 2018

* Clean water: The water meeting clean water standards regulated by the Ministry of Health according to QCVN 01-1: 2018/BYT;

** Hygienic water: The water used directly or after filtering and meets the quality requirements: colorless, odorless, tasteless, not containing the substances that may affect human health, and can be used for eating and drinking when boiled.

b. Access to basic sanitation (hygienic latrines)

According to a synthesis report from 63 provinces and cities, the proportion of standard latrines in rural areas increased to nearly 12.8% in the 10 years from 2008-2018. This contributes to

reducing the incidence of diseases related to unsafe water and poor sanitation like cholera, diarrhea, dysentery, etc. (Statistical Yearbook 2018).

For coastal provinces, the provinces with:

- more than 92% of people having latrines: Nam Dinh, Quang Tri, Thua Thien Hue, Quang Ninh, Quang Nam, Thai Binh, Ba Ria-Vung Tau and Khanh Hoa
- 85-90%: Nghe An, Quang Ngai, Ninh Thuan, Thanh Hoa, Binh Dinh and Binh Thuan
- 70-84%: Kien Giang, Tra Vinh, Ninh Binh, Tien Giang and Ben Tre
- 53-70%: Kien Giang, Soc Trang, Ha Tinh and Bac Lieu

Table 3.12: Percentage of Households having Latrines in Coastal Provinces (%).

Coastal province/cities	2016	2017	2018
Bac Lieu	52.05	53.00	53.96
Ha Tinh	45.21	-	54.32
Soc Trang	55.34	-	58.05
Kien Giang	52.92	56.62	60.58
Tra Vinh	53.62	59.35	61.40
Ninh Binh	73.06	73.60	74.00
Tien Giang	75.25		75.50
Ben Tre	64.60	70.70	75.80
Nghe An	74.40	77.90	81.50
Quang Ngai	83.98		84.98
Ninh Thuan	84.07		85.00
Thanh Hoa	83.80	85.60	88.10
Binh Dinh	88.20		89.00
Binh Thuan	85.08	87.70	89.97
Nam Dinh	91.58	92.50	92.50
Quang Tri	89.81		93.80
Thua Thien Hue	92.54	93.06	94.20
Quang Ninh	93.00	94.50	96.00
Quang Nam	92.66	95.04	96.17
Thai Binh	96.40	97.20	97.80
Ba Ria - Vung Tau	97.82	97.83	97.84
Khanh Hoa	97.46		98.08
Hai Phong	98.67	98.90	98.95
Ca Mau	65.71		
Phu Yen	73.60		

Source: Statistical Yearbooks of coastal provinces, 2018.

c. Living conditions of the inhabitants on the islands

The living conditions of the people on the islands have changed; in particular, transportation, electricity, water and communication facilities and services have been improved. In the center of island district, there have been investments in constructing spacious urban infrastructure, passenger wharves and fishing wharves combined with passenger wharves to serve tourism the transportation of goods, passengers and transportation of goods and passengers. The national power grid reaches the central area of seven island districts through the installation of underground cables; other island districts, including Bach Long Vy (Hai Phong), Con Co (Quang Tri), Phu Quy (Binh Thuan), Truong Sa (Khanh Hoa) and Con Dao (Ba Ria – Vung Tau), are using electricity generated locally from oil-powered generators and wind and solar power sources. The big islands have built a clean water supply system and reservoirs for domestic use; while in some islands, domestic water supply is linked with the irrigation system. The mobile communication network covers all islands, and wired Internet service is provided to the four island districts closed to the mainland, including Cat Hai (Hai Phong), Co To (Quang Ninh), Phu Quoc and Hon Dat (Kien Giang). However, on some islands, there are some issues related to freshwater and electricity for domestic use, and sanitation infrastructure.

3.3.3 Poverty

By 2017, extreme poverty still affects 291 communes along the coast and on islands, belonging to 23 of 28 coastal provinces and cities under central government, accounting for 62% of the total number of coastal communes in the country. The percentage of poor households in coastal and island areas has been rapidly decreasing, but there are volatilities. The situation of falling back into poverty occurs especially among fishermen and farmers in coastal areas, who are affected by natural disasters and climate change. Labor restructuring in coastal provinces tends to be positive but still slow. Jobs for rural labor in many places are still seasonal, thus, people's livelihoods are unstable, and their incomes are low.

In the coastal areas and islands, the relevant programs and policies of the Central and provincial governments have been well implemented to improve living standards and conditions, in particular, the national target program on poverty alleviation. From 2006 to 2016, per capita income per month in coastal provinces increased by 4.8 times. In 2016, it reached VND 3,035 thousand/month (for the whole country: VND 3,049 thousand/month). During the period of 2011 - 2016, jobs for about 4.67 million workers were created in coastal provinces and cities, accounting for 49.73% of total employment created nationwide.

In the period of 2011-2015, there were 71 communes escaping from the extremely difficult situation (accounting for 22.8% of the communes under extreme poverty). The percentage of poor households in the extreme poverty communes along the coastal areas and on islands by the

end of 2015 was reduced to 8% (2%/year on average). From 2016 to 2018, the multidimensional poverty rate in most coastal provinces and cities decreased from 50% to 30%.

The multidimensional poverty rates of coastal provinces are shown in **Table 3.13**

Table 3.13: Multidimensional Poverty Rate⁴ in Coastal Provinces (%).

Coastal province	2016	2017	2018
Quang Ninh	4.30	3.70	3.00
Hai Phong	2.10	1.90	1.40
Thai Binh	4.70	4.00	3.80
Nam Dinh	3.91	2.91	2.15
Ninh Binh	4.50	4.52	3.63
Thanh Hoa	10.97	8.43	5.84
Nghe An	10.40	8.81	6.80
Ha Tinh	10.46	8.57	6.92
Quang Binh	12.00	9.49	6.98
Quang Tri	13.49	11.52	9.77
Thua Thien Hue	7.19	6.06	5.03
Da Nang	1.48	1.20	0.90
Quang Nam	11.13	9.28	7.57
Quang Ngai	13.06	11.16	9.39
Binh Dinh	8.00	6.90	5.30
Phu Yen	10.23	7.85	5.85
Khanh Hoa	7.53		4.95
Ninh Thuan	12.50	10.37	8.34
Binh Thuan	4.57	3.67	2.72
Ba Ria - Vung Tau	1.91	0.99	0.60
Tien Giang	5.02	4.02	3.69
Ben Tre	10.01	10.30	6.10
Tra Vinh	11.16	8.41	5.95
Kien Giang	8.32	6.20	4.14
Soc Trang	15.32	11.85	8.53
Bac Lieu	12.24	8.42	4.30
Ca Mau	7.96	5.96	4.04

Source: *Statistical Yearbooks of coastal provinces, 2018*.

⁴ Multidimensional poverty can be interpreted as a situation where people do not meet one or some basic needs in life.



Photo by DMBautista

PART 2

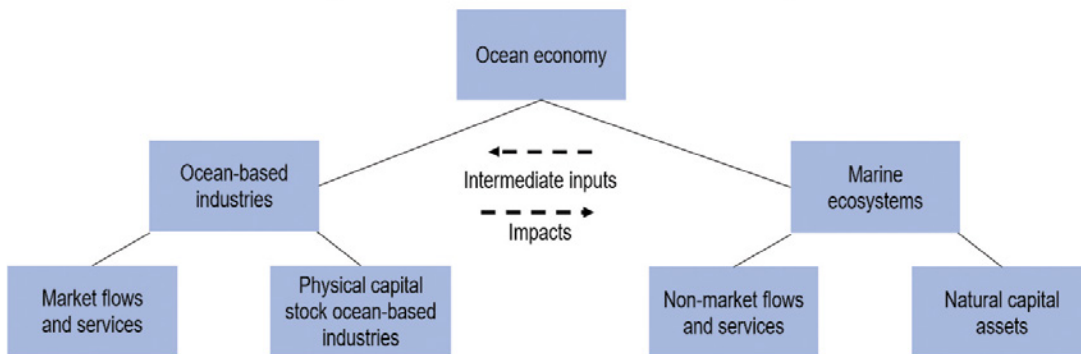
HARNESSING THE SEAS

4 Ocean and Coastal Economy

4.1 Ocean Economy

The entire ocean economy is measured as the sum of: (a) the economic activities with dependence on the ocean and coastal and marine resources (*produced capital*), and (b) natural assets, goods and services of marine ecosystems (*natural capital*) upon which these industries depend on, and people rely on for food, income, livelihood, recreation, shoreline protection, etc. (**Figure 4.1**)

Figure 4.1: Ocean Economy.



Source: OECD (2016).

The ocean economic activities can be measured using the System of National Accounts (SNA), Input-Output Tables, and International System of Industrial Classification (ISIC) or its national system counterpart, and include:

- *ocean-based activities*, such as fisheries, marine tourism, shipping, oil and gas, ocean energy, etc.
- *ocean-related activities*: (a) those that use products from the ocean (e.g., seafood processing, marine biotechnology, salt); (b) produce products and services for the ocean-based activities (e.g., ports, shipbuilding, communication, maritime insurance); (c) marine education, and research and development; and (d) activities of government agencies with direct maritime responsibilities (e.g., navy, coast guard, etc.).

The ocean also provides services that are not usually quantified and captured in the national income accounts, such as *regulating services* (e.g., carbon storage, shoreline protection, waste assimilation), *supporting services* (e.g., habitat, nursery), and *cultural services*.

Ocean industry includes: (1) marine tourism and services; (2) maritime – ports and marine transportation; (3) mining of oil and gas and other marine mineral resources; (4) marine fisheries and aquaculture; (5) marine-related manufacturing (e.g., fish and seafood processing; shipbuilding and repair); (6) public sector – rescue services; (7) marine renewable energy and new marine economic sectors. Although the development of these sectors has been fluctuating, in general, there has been a strong growth.

The following are the status and contribution of key ocean economic sectors:

- In 2018, fishery GDP reached VND 190,123 billion, accounting for 3.37% of the GDP of the whole economy.
- The contribution of oil and gas sector in 2018 was 2.04%.
- With 11% share of GDP, Vietnam's tourism ranked 40/184 countries in terms of direct contribution to GDP and ranked 55/184 countries in terms of total contribution to national GDP.
- The output value of the shipping industry, port services and shipbuilding has continuously increased, with the growth rate of 22% per year in the 2007-2010 period, and 13% per year in the 2011-2015 period. However, the overall contribution of this maritime industries to the national GDP is still very small and tends to decrease (1.05% in 2010, 0.85% in 2015 and 0.86% in year 2017).

Thus, it can be seen that these four sectors alone contributed 17% to the economy. However, contributions from a number of other industries, such as coastal/offshore wind power, and other forms of renewable energy, as well as industries related to marine biodiversity, such as marine pharmaceuticals processing, cultivation and processing of algae and seaweeds, etc., have not been taken into account yet.

The contribution of the ocean-based economic sectors is shown in **Table 4.1**.

Table 4.1: Contribution of Key Economic Sectors to National Economy, 2018.

Economic sector	VND, in billions	Share in GDP
Fisheries and aquaculture	190,123	3.37%
Tourism (about 70% from coastal provinces/cities)	620,000	10.99%
Offshore oil and gas mining	115,000	2.04%
Maritime transport and ports	-	0.86% (in 2017)
GDP*	5,542,332	
Total contribution to GDP		17.26%

Source: MONRE. * World Bank, 2020. [58]

Ocean economy, including industries directly linked to the sea (such as oil and gas exploitation, fishing, maritime transport, marine tourism) and related to the sea (shipbuilding and repair, port services, oil and gas processing and onshore industry development, etc.) have only been preliminarily assessed for the years 2015-2017 as shown in **Table 4.2**. It is around 6% of nominal GDP in 2017.

The *Resolution 36-NQ/TW* initially defined the target for Vietnam's ocean economy contribution, which is expected to be 10% of the country's GDP by 2030. However, growth should not be the sole focus, but rather sustainability and consideration of social, environmental and climate impacts. Further work is needed on accounting the ocean industry, as well as environmental accounting, valuation of ecosystem services and assessment of the ocean environment-economy linkage.

Table 4.2: GDP of Ocean Economy and Coastal Economy (In US\$ millions).

	Nominal (In Current Prices)			Real (In Constant Prices)**		
	2015	2016	2017	2015	2016	2017
Ocean economy [A+B]	11,995.56	10,473.18	11,993.06	8,227.68	7,104.58	7,816.19
Share to total GDP	7%	5%	6%	5%	4%	4%
GDP of ocean-based industries [A] (directly linked to the sea)	9,700.10	8,079.59	9,438.21	6,653.23	5,480.86	6,151.18
Offshore oil and gas mining	6,420.27	4,637.08	5,693.62	4,403.62	3,145.61	3,710.71
Marine tourism	-	-	-	-	-	-
Marine fisheries and aquaculture	2,594.89	2,728.32	2,993.24	1,779.82	1,850.78	1,950.79
Maritime transport	684.94	714.19	751.36	469.80	484.48	489.68
GDP of ocean-related industries [B]	2,295.46	2,393.59	2,554.84	1,574.45	1,623.71	1,665.01
Shipbuilding and ship repairing	143.14	180.08	195.27	98.18	122.16	127.26
Oil and gas processing	496.62	355.39	311.78	340.63	241.08	203.20
Fishery processing	697.70	806.85	874.91	478.55	547.33	570.21
Marine port services	958.01	1,051.27	1,172.79	657.09	713.14	764.34
Coastal economy (GDP of 28 coastal provinces/cities)	110,872.82	117,548.78	131,601.32	76,046.93	79,740.29	85,768.63
GDP of whole country*	193,241.11	205,276.17	223,779.87	154,508.62	164,104.86	175,284.08

Source: MONRE [27]. * World Bank, 2020. [58]

Note: US\$ 1 = VND 23,000

** Calculated using GDP implicit price deflator (2010 = 100.0): 2015: 145.80; 2016: 147.41; 2017: 153.44

4.2 Coastal Economy

The coastal economy refers to the GRDP of coastal provinces and cities, and consists of both ocean economy and non-ocean-related economic sectors. It is 60% of nominal GDP in 2017 (**Table 4.2**).

Coastal provinces/cities actively attract investment in construction and development of many new and modern coastal tourist areas and destinations, attracting a large number of domestic and international tourists. Quite a lot of projects on high-class marine and island resorts, coastal sports and entertainment resorts have a capital

investment cost of US\$ 500 million to US\$ 1 billion. Along the coast, the country has developed a series of modern tourist and recreation resorts of international standards (4-5 stars) in most coastal provinces/cities, develops a number of regional tourist centers, such as: Van Don, Da Nang, Phan Thiet, Phu Quoc, attracting millions of international tourists each year. Marine and island tourism currently contributes about 70% of the total annual turnover of the country's tourism industry.

Policies on supporting fishermen in fishing and building offshore fishing boats provide an important incentive to facilitate the shift to a more sustainable and efficient fishing model

From 2006 to 2017, the number of fishing boats increased from 93,600 ships (of which 21,200 are offshore fishing ships) to more than 120,000 ships (of which about 31,500 are offshore fishing ships with a capacity of 90 CV⁵ or more); the number of large-capacity fishing vessels with capacity of more than 400CV invested in by fishermen has been newly built, fully and modernly equipped (communication equipment, fish detectors, modern storage tanks, etc.) currently reaches about 13,000 ships. Annual fishing output increased rapidly and continuously, from 2006 to 2017, the output increased from 1.8 million tonnes to 3.2 million tonnes. Seafood processing enterprises increased rapidly in quantity and quality of products. Up to now, there are more than 620 industrial-scale seafood processing establishments, of which 415 processing factories meet export standards in markets that require high quality and food safety (e.g., Japan, USA, EU).

The system of seaports has been developed in terms of size, quantity and density in coastal areas. Up to now, the whole country has 45 seaports including 02 type IA ports (international gateway ports); 12 seaports of type I (regional general port of hub); 18 seaports of grade II (local general port) and 13 of seaports of grade III (offshore petroleum port); The total number of the ports is 286, with about 82.8 km of wharves and total capacity of over 550 million tonnes/year. Vietnam's seaport system is now investing in coordination with investments in infrastructure.

Coastal economic zones are growing. To date, 17 coastal EZs have been established with a total land area and sea surface of nearly 845,000 ha. By the end of 2017, coastal economic zones have attracted more than 390 foreign investment projects with a total registered investment of US\$ 45.5 billion and implemented investment capital of US\$ 26.5 billion, as well as 1,240 domestic investment projects with total investment capital of VND 805 trillion and implemented capital of VND 323.6 trillion. Some economic zones, such as Nghi Son, Vung Ang, Chu Lai, and Dung Quat, attract large investment projects (refineries, steel refining, steel lamination, mechanics, thermal power) and play an important role in strengthening the industrial production capacity of the whole country and at the same time facilitates the development of many other industries.

In 2017, coastal economic zones achieved a total turnover of about US\$ 14.3 billion and exported value over US\$ 7.2 billion, contributing to the revenues of about VND 40 trillion, attracting many laborers, and creating jobs for about 174 thousand workers.

⁵ chevaux vapeur (CV) = 0.99 Hp.

Living standards of people living in coastal areas and on islands have improved significantly both physically and mentally. From 2006 to 2016, per capita income per month in coastal provinces/cities increased by 4.8 times; in 2016, it was VND 3,035 million/person/month (the national average was VND 3,049 million/person/month). In the period of 2011-2016, coastal provinces and cities created jobs for about 4.67 million workers, accounting for 49.73% of total jobs created in the whole country.

Regarding the island economy, apart from traditional production activities, such as agriculture, aquaculture and fishing, the island districts have developed steadily. New industries, such as tourism, services and trade have been formed and step-by-step developed. Some island districts have become tourism centers, such as Van Don, Cat Ba, Phu Quoc, Con Dao, and Ly Son. Exploitation of marine products in island areas continues to grow, the most important being aquaculture with a total farming area having reached about 40,000 ha by 2017. There has been investment in all island districts to build fishing ports, fish wharves, and storm shelters for fishing vessels, and to establish fishing logistic centers for offshore fishing. Agricultural production has been maintained stably, mainly for food crops, fruit trees, and plants with special economic value in some large islands (Ly Son garlic, Phu Quoc pepper). Small islands, uninhabited, pristine and wild, have been neglected from the economic point of view.

4.3 Valuation of Ecosystem Services

GDP and national and regional income accounts do not fully reflect the value of natural capital, especially from the oceans. There is lack of market prices for coastal and marine ecosystem services like regulating services (e.g., shoreline protection, waste assimilation, carbon sequestration, climate regulation, etc.), and supporting services (e.g., habitat, breeding and nursery grounds, genetic resources, nutrient cycling, etc.).

4.3.1 Mangrove Forests

Mangrove ecosystem is an integral part of Vietnam's coastal ecosystem and plays a very important role in the life of coastal residents. Mangrove forests not only supply food, fuel, timber for human, but also provide habitat for wild birds and aquatic species, support biodiversity, offer recreational areas and aesthetic views, and protect coastal communities from erosion, flooding, waves and storm surge.

There have been studies on the economic value of mangroves, but it has only been conducted for some of specific regions; therefore, the value of mangrove forest ecosystem has not been assessed yet for the whole coastal area of Vietnam.

For indirect or non-use value of mangroves, research [28] showed that:

- The average amount of carbon sequestered and stored in the plant biomass (above ground) 26.31 ± 18.44 tonnes/ha
- The average amount of carbon accumulated in the mangrove forest land (underlying ground and sediments) is 124.85 ± 9.74 tonnes/ha.

For direct use value, there have been studies on mangroves in Can Gio (Ho Chi Minh City), Giao Thuy (Nam Dinh), Dong Rui (Quang Ninh), Hung Hoa (Nghe An), Long Son (Ba Ria - Vung Tau), Ca Mau Cape National Park (Ca Mau) and Nam Hung (Tien Hai district, Thai Binh province). The research results show that:

- Mangrove ecosystem of Ca Mau Cape National Park: VND 141.27 billion/year, of which for aquatic resources: VND 139,136 billion/year. With the presence of 574 recorded aquatic species, the biodiversity value of this ecosystem is estimated at VND 27.83 billion.
- Long Son ecosystem: VND 64,115 billion/year, of which for aquatic resources: VND 63,635 billion/year. Estimated biodiversity value: VND 12,727 billion (532 aquatic species have been recorded).
- Dong Rui ecosystem: VND 15,809 billion/year, of which for aquatic resources are VND 15,694 billion/year. Biodiversity value: VND 3.1 billion (530 aquatic species have been recorded).
- Hung Hoa ecosystem: VND 330 million/year, of which aquatic resources are VND 328.5 million/year. Biodiversity value: VND 65.7 million (462 aquatic species have been recorded).
- In the Mekong Delta, 1 km² of mangroves can provide 450kg of caught fish.

The value of mangrove ecosystem services has been assessed in different scientific studies. A mangrove area with conditions common to most mangrove forests was selected to provide a representative picture of the mangrove ecological value for the whole Vietnam. In this report, the mangrove ecosystem in Nam Hung commune (Tien Hai district, Thai Binh province) was selected as a typical mangrove ecosystem for the assessment.

Box 4.1 Mangrove ecosystem in Nam Hung commune (Tien Hai district, Thai Binh province)

Nam Hung mangrove ecosystem has the function of ecological buffer zone between the mainland and the lagoon. This is an ideal habitat for many aquatic species, such as fish, crustaceans, molluscs, etc. However, due to climate change and pressure from excessive exploitation and use of people, the mangrove forest in Nam Hung is facing degradation. Valuation studies show that the economic value of this mangrove area is 69,504,543,950 VND/year. The research results also clearly reflect different ecosystem services of Nam Hung mangroves, especially in providing food and maintaining and improving livelihoods for local people.

(Environment Magazine, No. III, 2018)

4.3.2 Coral Reefs

The direct use value of coral reef includes high value seafood resources for food and medicine; while indirect use values include being a breeding ground for fish and place to provide food and habitat for coastal aquatic species. Coral reefs have a high biodiversity, concentrate many

marine species, store genetic resources, and maintain ecological equilibrium with other coastal ecosystems. Moreover, coral reefs indirectly protect the coast, prevent erosion, create beaches, prevent the impacts of waves in storms, etc. The abundance and coverage of coral reefs are also important criteria to evaluate and establish marine protected areas (MPAs) and nature reserves, and develop functional zoning for core zone, buffer zone and transitional zone. The magical beauty of coral reefs attracts many visitors to the coral reef ecotourism destinations. In addition, the reef provides waste assimilation services by capturing contaminants in the water on the mucous membranes and digesting the organic matter.

The valuation of ecosystem services of coral reefs have been done in various studies. Coral reefs worldwide bring an estimated total economic value of US\$ 375 billion per year [48]. In addition, De Groot *et al* (2012) quantified the total economic value of coral reefs in the South China Sea to be US\$ 350,000/ha/year [37].

According to the assessment of the Center for Conservation of Marine Biology and Community Development, the total value of coral reef ecosystem products and services of Vietnam is estimated at US\$ 100 million, of which 1 km² of coral reef can provide fish with a value of up to US\$ 10,000.

Nha Trang City is a tourism center of Vietnam, with fringing coral reefs around islands near the shore. The scuba diving service here is estimated at US\$ 400,000 per year.

In terms of regulating services, the coastal protection function of coral reefs can be clearly seen at some points in the Central region, such as Bai Tien and Hon Khoi in Khanh Hoa province.

4.3.3 Seagrass Beds

In addition to the fertilizers and other products made from seagrass itself, the direct use values of seagrass beds are the organisms living in it, especially the fish group with very specific biological characteristics compared to other ecosystems. In terms of indirect use, seagrass bed plays an important role as a transitional place in the life cycle of fish and living organisms between seagrass ecosystems and other ecosystems such as coral reefs and mangrove forests. saline water, contributing to the nutrition network structure of the tropical sea, contributing to the nutrition network structure of the tropical sea. In addition, seagrass beds also serve to trap and stabilize sediments, protect benthic organisms from effect of tides, and protect the coast by reducing wave and flow intensity.

The studies have shown that the average organic carbon (Corg) content of seagrass is $26.55 \pm 2.3\%$ in Tam Giang - Cau Hai lagoon; $34.30 \pm 1.82\%$ in Thi Nai lagoon; and $36.32 \pm 4.1\%$ in Nai lagoon. The total organic carbon stock in the existing seagrass in the three lagoons is 10,416 tonnes Corg, equivalent to 38,228 tonnes of CO₂ [5].

According to the Center for Marine Conservation and Community Development, seagrass beds in Vietnam provide over US\$ 20 million worth of aquatic products and services each year.

Each m² of seagrass bed can produce 10 liters of dissolved oxygen, contributing to the balance of O₂ and CO₂ in water, and reduce the greenhouse effect when absorbing carbon in its leaves, biomass, roots, and underlying sediments.

Each acre (equivalent to 0.41 ha) of seagrass bed can produce 10 tonnes of leaves per year. This biomass sequesters carbon and provides food, habitat and breeding ground for many invertebrates, both in juvenile and adult stages.

Table 4.3 provides a summary of the value of Vietnam's important coastal ecosystems.

Table 4.3: Estimated Values of Important Marine and Coastal Ecosystems.

Ecosystem	Area (ha)	Price	Note
Mangrove forest	213,142	VND 45,301 billion/year (US\$ 2 billion /year)	Rough estimation based on the evaluation of mangrove ecosystem in Nam Hung commune (327.03 ha), Tien Hai district, Thai Binh province [29]: 69,504,543,950 VND/year
Coral reef	8,671	US\$ 1.875 million/year	Rough estimation, based on the ratio of Vietnam's coral reef area to be about 0.5% of the global total [48]
Seagrass bed	16,000	US\$ 27 million/year	It is estimated that each hectare (ha) of seagrass in Vietnam is worth about US\$ 1,678.77 per year (MCD, "Vietnam Country Assessment Report, 2008") [6]
Total		US\$ 3.902 billion/year	

4.4 Marine and Coastal Resources and Values

4.4.1 Biological Resources and Biodiversity

In coastal and sea areas of Vietnam, there are more than 20 types of ecosystems, including mangroves, coral reefs, seagrass beds with more than 11,000 species, of which about 6,000 species of benthic animals; 2,038 species of fish (more than 100 species of economic value); 653 species of seaweed; 657 species of zooplankton; 537 species of phytoplankton; 94 species of mangrove plants; 225 species of sea shrimp; 14 species of seagrass; 15 species of sea snakes; 12 species of marine mammals; 5 species of turtles and 43 species of water birds. Other coastal wetland ecosystems distributed along Vietnam's coastline include estuaries, lagoons, sand beaches, rice fields and aquaculture ponds.

In addition, there are also island ecosystems. Most of the more than 3000 islands are located in the waters of Quang Ninh province, forming the World Heritage Site of Ha Long Bay. Some of the other big islands are Cu Lao Cham (Quang Nam), Phu Quoc (Kien Giang), Con Dao, Tho Chu, which are characterized by many endemic ecosystems and endemic species. Some forests have been included in the list of national parks that require special biodiversity protection.

4.4.2 Fisheries Resource

Along with this great ecological value, Vietnam's coastal and marine areas bring tremendous fishery resources with a total allowable catch of 1.8-2.0 million tonnes per year. Many species of fish, shrimp and squid are of high economic value and are important exported products. There are 14 fishing grounds in the East Sea: Bach Long Vi, Gulf of Tonkin, Hon Mat, Hon Gio - Thuan An, East Da Nang, East Quy Nhon, North East Cu Lao Thu, South Cu Lao Thu, Con Son, Cuu Long estuary, South West coast, Southwest Phu Quoc, South Hoang Sa and South West Truong Sa.

4.4.3 Water Resources

Water resources in coastal Vietnam play an important role in socioeconomic development. The rainfall ranges from about 1,000 to 3,000 mm per year, creating a rich source of water. Rivers and streams are distributed evenly along the length of the country. Many natural and artificial reservoirs are distributed in different areas, which are favorable for the supply of fresh water all year round for daily life and production.

Vietnam's groundwater resources are plentiful, with a potential reserve of around 60 billion cubic meters (m³) per year. Water reserves range from very high in the Mekong Delta to relatively scarce in the Northern Central Coast.

4.4.4 Mineral Resources

Vietnam's oil and gas reserves are the fourth largest in Southeast Asia, after Malaysia, Indonesia and the Brunei. Recent exploration has identified prospective oil and gas tanks such as Red River, Phu Khanh, Cuu Long, Nam Con Son, etc.

Coastal Vietnam is also rich in coal and other minerals. 500 mines and quarries with 64 minerals were found in the coastal area, including fuel, metals, nonmetals, precious stones and mineral water. Many fine-quality glass mines are in Quang Ninh, Ha Tinh, Quang Tri, Da Nang, Binh Dinh, Khanh Hoa, and Binh Thuan with the total explored reserves of over 300 million tonnes (predicted reserves over 700 million tonnes). Valuable mineral elements such as titanium, Ilmenite, Monazite and Zircon are also found along the coast. In addition, the potential of sand and gravel quarrying on the seabed and coast of Vietnam for making construction materials is quite big, although there are environmental impacts that need to be considered and mitigated.

In particular, in the East Sea, there are also methane hydrate resource, a potential new form of energy. Vietnam has implemented the “Basic Research and Investigation Program on the potential of methane hydrate in the seas and continental shelf of Vietnam” (2007-2015). After this research and study of appropriate technology, approaching and researching technology, Vietnam began to assess and explore methane hydrate in potential sea areas and continental shelves in the period 2015-2020 [56].

4.4.5 Cultural and Historical Values

Many famous cultural and historical sites have been discovered in the coastal area. Cultural values are reflected in the way of life, philosophy and thought of the Vietnamese people. The UNESCO recognized Ha Long Bay and Phong Nha - Ke Bang as world heritage sites. The ancient Vietnamese has left a series of unique values, such as Hoi An Ancient Town, My Son Holy Land, and Hue Imperial City, also recognized by UNESCO as world cultural heritages. Ha Long Bay is recognized as one of the seven new natural wonders of the World in 2011, as it celebrates the many and unique values of the bay.

4.4.6 Development Values

Coastal and marine tourism. With its favorable geographic position, Vietnam is blessed with beautiful landscapes and seascapes, such as beaches, sand dunes, cliffs, marshes, mangrove forests, lagoons, bays, islands and coral reefs that offer great business potential for marine and coastal tourism. Water and white sand like in Cua Lo (Nghe An), Thien Cam (Ha Tinh), Nhat Le (Quang Binh), Cua Tung (Quang Tri), Lang Co (Thua Thien Hue) My Khe (Quang Nam), Binh Son, My Khe (Quang Ngai), Sa Huynh, Quy Nhon (Binh Dinh), Tuy Hoa (Phu Yen), Nha Trang (Khanh Hoa), Mui Ne, Ca Na (Binh Thuan) and Bai Sau (Ba Ria-Vung Tau) are ideal conditions for tourism development. The World Heritage Sites of Ha Long Bay, Hoi An Ancient Town, My Son Holy Land, and Hue Imperial City attract a large number of foreign tourists.

Aquaculture. With over 3,260 km of coastline, 12 lagoons, and big bays, 112 estuaries, rich canal systems and over 3000 large and small islands scattered along the coast, Vietnam’s aquaculture value is very big. Inland areas include an extensive network of rivers and irrigation lakes, with an area of about 1.7 million ha providing a great potential for aquaculture.

Ports and shipping. A key advantage of Vietnam is its location close to the international maritime route, where the density of sea-going vessels is the second highest in the world, Vietnam has many favorable conditions for developing the port and shipping sector. The system of seaports and docks, including deep-water seaports, is located in all sea areas of the country.

At present, the volume of goods transported by sea accounts for 70% of the total volume of goods transported in the country, of which domestic shipping accounted for 28% while imported and exported goods accounted for 72%.

Ocean energy. The coastal system of Vietnam can be used to exploit tidal energy (especially in Ha Long Bay and Ganh Rai Bay). The wave energy potential along Vietnam coast is also abundant due to the presence of two northeast and southwest wind regimes. The use of alternative wave power for households and production purposes can be implemented in the islands, such as Phu Quy, Ly Son, Cu Lao Xanh, and Con Co. At estuaries, the harbor can be equipped with floating buoys using wave power generators. In addition, coastal winds have significant potential in power supply, with capacity of about 900 - 1,000kWh/m² like in Cat Hai (Hai Phong), Lach Giang (Nam Dinh), from Cua Hoi (Quang Binh) to Pass Hai Van (Thua Thien Hue) and Cam Ranh (Khanh Hoa) to Vung Tau (Ba Ria - Vung Tau), and some southern provinces, such as Bac Lieu, Tra Vinh and Ca Mau.

4.5 Issues and Solution Options

4.5.1 Major Issues

- The exploitation and use of marine and coastal resources in many places are inappropriate and inefficient, especially in coastal areas. The economic development done in parallel with the protection of marine resources, especially the conservation of the marine and coastal ecological environment has not been thoroughly understood, leading to the degradation of natural resources and pollution in coastal areas, rivers mouths and bays.
- Some marine economic sectors are determined as priority in making breakthroughs, such as port services and shipping, shipbuilding, oil and gas exploitation and processing, but are being developed slowly, and may not be suitable with the potential conditions.

The main causes of the above-mentioned shortcomings and limitations include:

- Awareness of state management staff, businessmen and people on the position and role of the sea in sustainable socioeconomic development is limited.
- Mechanisms and policies of mobilizing resources into blue economy development are inadequate and incomplete.
- The training and vocational training for marine workers and technology transfer and application in many marine economic industries are still limited and not meeting requirements.
- The transfer and application of scientific and technological advances in service of ocean economy development and transformation to blue economy remain weak, mainly focusing on a few areas, such as aquaculture, and marine environment basic research and surveys.
- State management apparatus related to sea and islands is not strong enough. There is a lack of focal point to coordinate, inspect, supervise, urge, and advise interdisciplinary, inter-

regional activities on ocean management and blue economy development. There is also a lack of integrated management and development solutions for the entire coastal, marine and island economy.

- Financial resources are not sufficient for investing in marine infrastructure, implementing socioeconomic development programs and projects in coastal provinces/cities.

4.5.2 Solutions

To overcome these limitations and shortcomings, in the coming period, it is necessary to focus on the following tasks:

- Restructuring marine economic sectors, giving priority to strongly develop industries and products with opportunities for fast development and effective integration into regional and international marine economies.
- Focusing on building and developing strong marine economic centers with high integration competitiveness in the region.
- Prioritizing the construction of infrastructure for the development of key and essential marine economic sectors and associated infrastructure for the development of marine areas.
- Enhancing the mobilization of resources for solving social issues, improving living standards of people in coastal areas and on islands.
- Enhancing the transfer and application of scientific and innovative 4.0 technological advances to support the development of Vietnam's multifaceted marine and island economy, including the application of the Geographic Information System (GIS) in monitoring the marine environment.

For the coming period, Viet Nam identified six priority areas for marine economic development, including [34]:

- Tourism and marine services
- Maritime economy (shipping, ports and logistics services, shipbuilding)
- Exploitation of oil and gas and other marine mineral resources
- Aquaculture and fisheries
- Coastal industry
- Renewable energy and new marine economic sectors.

In addition, other activities related to the sea and coastal areas are also to be developed, creating jobs and employment for coastal laborers. However, it is important to consider the social, environmental and climate impacts of these priority marine economic sectors, and ensure a blue economy development to attain simultaneously sustainable growth, progress, prosperity, healthy ocean and ecosystems as well as the well-being of the people, especially in the coastal areas and islands.

5 Fisheries and Aquaculture

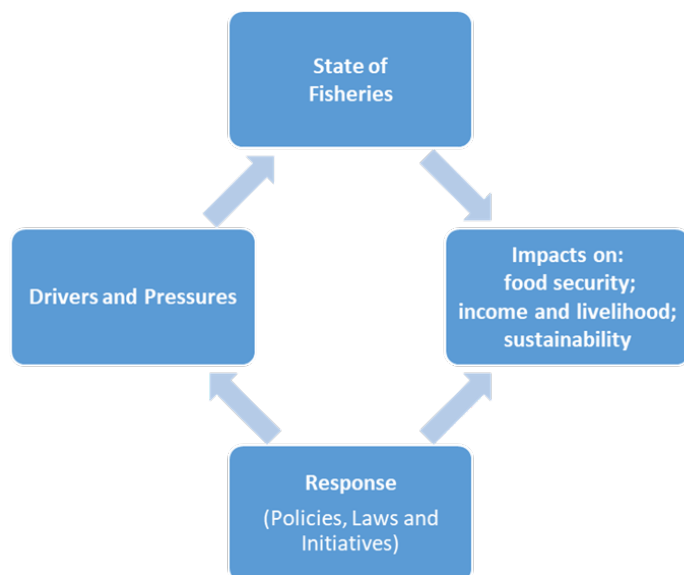


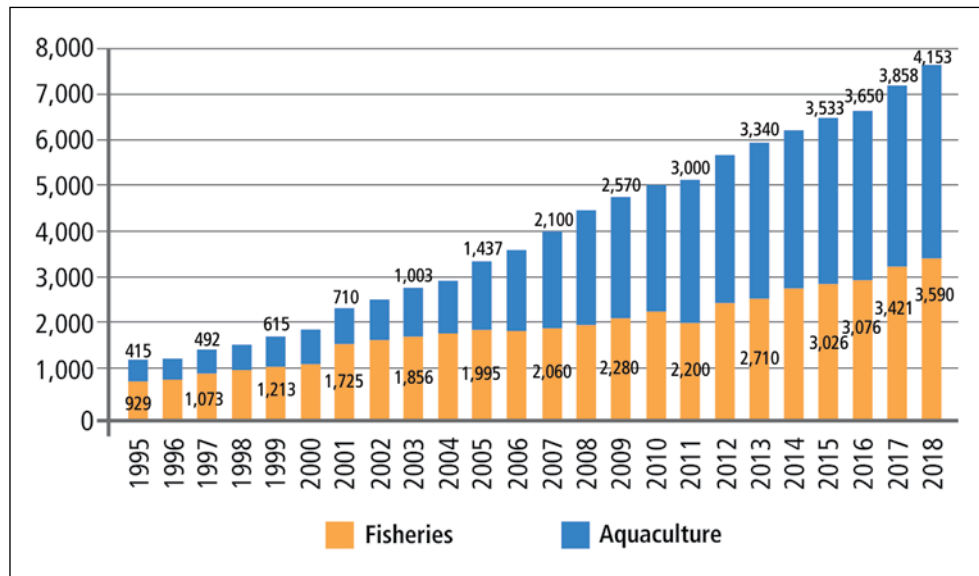
Photo by M.Ebarvia.

5.1 Status

Fisheries is a very important sector for the development of Vietnam taking into account its contribution to the achievement of food security, the alleviation of poverty, sustainable livelihood creation, economic growth and in the generation of rural employment.

Vietnam, with a complex system of rivers and a long coastline, has great advantages in developing fishing and aquaculture activities. Continuous growth of Vietnam's fisheries production has been maintained over the past decade with an average rate of 9.07% per year.

In 2016, Viet Nam became the fourth major producer of fishery and aquaculture in the world with a total production of 6.7 million tonnes. According to a report by the General Department of Fisheries, in 2019, the total fisheries production reached about 8.15 million tonnes, an increase of 4.9%, of which fish capture production reached 3.77 million tonnes, increased by 4.5% compared to 2018. In particular, marine fish catching reached 3.56 million tonnes.

Figure 5.1: Vietnam Aquaculture and Fishing Production.

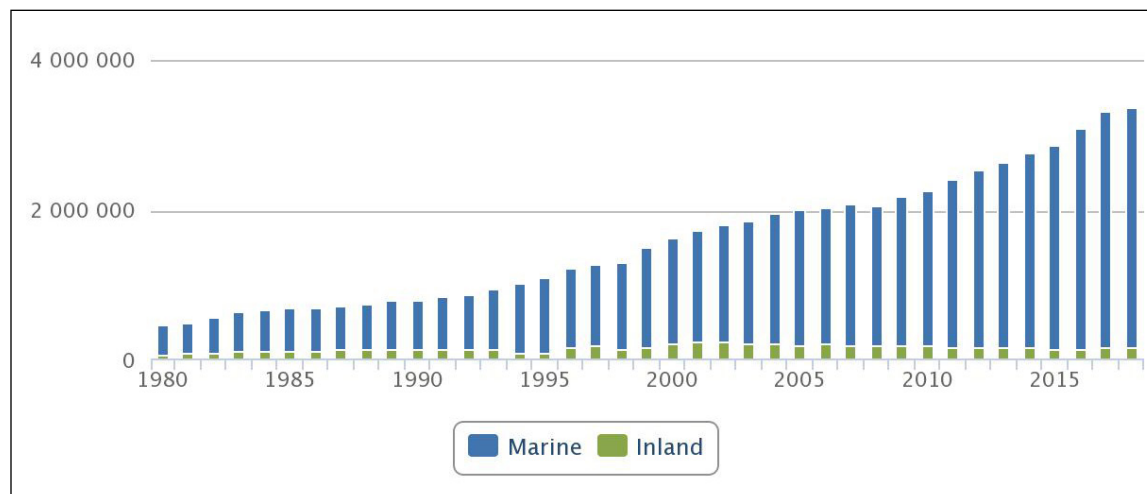
Source: <http://vasep.com.vn/1192/OneContent/tong-quan-nganh.htm> [45].

5.1.1 Fish Capture

Fish catching in Vietnamese waters can be divided into two seasons: northeast monsoon season (called the north fishing season) and the southwest monsoon season (called the south fishing season). The north fishing season takes place from November to the end of April of the following year. The south fishing season lasts from May to the end of October. The overall production of south fishing season (main season) was always higher than that of the north fishing season (supporting season).

a. Fishing production

The total fisheries production in 2013-2018 increased by 5.1% per year. Inland fisheries increased by 2.1% per year, and marine fisheries increased by 5.3% per year. Thus, most of the growth of capture fisheries production can be attributed to the growth in marine fisheries (**Figure 5.2, Table 5.1**). Fishing in the Central Region grew by 6.0% per year; 5.4% in the Southwest region; and 4.9% in the Gulf of Tonkin and Southeast regions. (**Table 5.1**).

Figure 5.2: Fish Capture Production by Inland and Marine Waters, 1980-2018.

Source: FAO FishStat.

Table 5.1: Fishing Production in 2010-2018 (in 1000 tonnes).

No.		2010		2015		2018		Growth (%/year)
		Production	%	Production	%	Production	%	
I	Whole country	2,414.4	100.0	3,049.9	100	3,590.0	100.0	5.1
1	Inland fishing	194.4	8.1	183.7	6.0	218.0	6.1	1.4
2	Marine fishing	2,220.0	91.9	2,866.2	94.0	3,372	93.9	5.4
	- Onshore fishing	1303.8	54.0	1,514.2	50.0	1,740.0	51.6	3.7
	- Offshore fishing	916.2	37.9	1,352.0	44.0	1,632.0	48.4	7.5
II	By region	2,220	100	2,866.2	100.0	3,372.0	100.0	5.4
1	Gulf of Tonkin	310.8	14	469.2	16.4	455.2	13.5	4.9
2	Central region	710.4	32	990	34.5	1,129.6	33.5	6.0
3	Southeast region	643.8	29	765.0	26.7	944.2	28.0	4.9
4	Southwest region	555.0	25	642.0	22.4	843.0	25.0	5.4

Source: Calculation from data of the General Statistics Office, 2018.

b. Fisheries productivity

Table 5.2 shows the fishing effort and productivity. The catch per unit effort in 2018 was 0.25 tonne/CV and 5.0 tonnes per fisherman per year.

Table 5.2: Fishing Productivity, 2010-2018.

No.	Productivity	Unit	2010	2013	2015	2016	2017	2018
1	By ship/boat	Tonne/ship/year	17.4	21.9	26.2	27.4	29.1	35.2
2	By fisherman	Tonne/person/year	4.1	5.2	4.8	4.9	5.1	5.0
3	By capacity	Tonne/CV/year	0.26	0.26	0.26	0.25	0.26	0.25

Note: CV = chevaux vapeur = 0.99 Hp.

Source: General Statistics Office, 2018.

c. Fishing vessels

The number of offshore fishing vessels has increased in recent years; in particular, there are currently about 13,000 fishing vessels with a capacity of more than 400 CV, invested and built by fishermen, and are modern, and fully equipped (communication equipment, fish detectors, modern fish storage tank, etc.).

The number of large-capacity vessels has increased rapidly due to Government policies combined with encouragement and support. Provinces/cities have also implemented their own mechanisms and policies to encourage offshore fishing, and support fishermen in building and upgrading ships/boats. In particular, the *Government's Decree No. 67/2014/ND-CP* dated July 7, 2014 on fisheries development policy included the promotion of offshore fishing, and support for the building of annual large-capacity ships with hull made from steel or other new materials by fishermen. This means a reduction in fishing methods affecting resources like trawling. Around 33.3% of the fishing methods used in 2017 is trawling (**Table 5.3**).

Table 5.3: Movements of Fishing Vessels Nationwide, 2013-2017.

No.		2013		2015		2016		2017		Average Growth (%)
		No. of ships/boats	%	No. of ships/boats	%	No. of ships/boats	%	No. of ships/boats	%	
I Region										
1	Gulf of Tonkin	35,100	29.5	32,200	29.4	32,310	29.1	33,270	30.3	-0.8
2	Central	51,200	43.1	45,950	42.0	46,350	41.8	45,633	41.6	-1.6
3	Southeast	17,600	14.8	16,100	14.7	16,453	14.8	15,431	14.1	-1.9
4	Southwest	14,889	12.5	15,106	13.8	15,837	14.3	15,288	13.9	0.4
	Total	118,789	100.0	109,356	100.0	110,950	100.0	109,622	100.0	-1.1
II Fishing method										
1	Drift-net	20,270	17.1	20,113	18.4	20,156	18.2	19,574	17.9	-0.5
2	Trawl	42,573	35.8	38,000	34.7	38,572	34.8	36,518	33.3	-3.2
3	Seine	6,596	5.6	5,100	4.7	5,601	5.0	5,231	4.8	-5.3
4	By rod fishing	20,516	17.3	18,000	16.5	19,127	17.2	18,462	16.8	-2.3
5	Cast-net	1,900	1.6	2,441	2.2	2,575	2.3	2,700	2.5	10.7
6	Logistics service	2,481	2.1	2,265	2.1	2,331	2.1	2,140	2.0	-2.1
7	Other	24,453	20.6	23,437	21.4	22,588	20.4	24,997	22.8	-2.6
	Total	118,789	100.0	109,356	100.0	110,950	100.0	109,622	100.0	-2.2
III Capacity										
1	Under 20 CV	53,617	45.1	48,500	44.4	46,741	42.1	45,985	41.9	-2.2
2	From 20 to 90 CV	38,774	32.6	30,298	27.7	29,206	26.3	27,182	24.8	-4.9
3	Above 90 CV	26,398	22.2	30,558	27.9	35,003	31.5	36,455	33.3	4.7
	Total	118,789	100.0	109,356	100.0	110,950	100.0	109,622	100.0	-1.1

Note: CV = chevaux vapeur = 0.99 Hp.

Source: General Department of Fisheries, 2017.



Photo by M. Ebarvia.

5.1.2 Aquaculture

Over time, marine aquaculture has grown widely in many parts of the country. However, marine aquaculture in Vietnam is still at a low level, small-scale, and found scattered mainly in coastal areas. According to the General Department of Fisheries, during the 2010-2017 period, marine aquaculture has made significant progress. The aquaculture area and output have been constantly increasing. The total area of marine aquaculture in 2010 was 38,800 ha, but in 2017 it reached 250,379 ha (of which 202,000 ha was used for crab mixed with farming other species). In 2010, marine production was 156,681 tonnes, and in 2017, it reached 377,040 tonnes. The main seafood species cultivated on marine waters and islands during 2010-2017 are: marine fish (grouper, cobia, sea bass, snapper, etc.), mollusks (clams, oysters, scallops, Geoduck Clam, snails, etc.), lobsters, crabs, crabs and seaweeds.

Table 5.4: Marine Aquaculture Area and Production.

No.	Productivity	2013	2015	2016	2017	2018
1	Marine aquaculture area (ha)	38,880	39,110	39,320	40,102	250,379
2	Marine aquaculture production (tonne)	168,681	200,175	282,188	308,587	377,040
2.1	Marine fish	15,651	34,413	34,026	30,550	29,770
2.2	Mollusk	133,534	158,277	139,470	29,161	287,075
2.3	Crustacean	7,396	7,485	8,689	8,876	60,195
2.4	Seaweed	11,700	11,800	11,830	12,100	12,600

Source: Draft Marine Aquaculture Strategy, MARD, 2018.

Box 5.1 Orientation of marine aquaculture development to 2030, vision to 2050

- By the year 2020, the marine aquaculture output will reach 750,000 tonnes, of which: 200,000 tonnes of marine fish group, 400,000 tonnes of mollusk group, 150,000 tonnes of seaweed group, and 60,000 tonnes of crustacean group. The export value will reach about US\$ 1.5 billion.
- By 2030, form and develop modern, economically stable marine aquaculture communities with high spiritual and cultural life and unique identities. The area of marine aquaculture will reach 300,000 ha, including 30,000 ha for offshore farming, 20,000 ha for nearshore and coastal aquaculture; 250,000 ha for farming in tidal flats; cage culture volume will reach 9,000,000m³. Marine aquaculture production will reach 1,750,000 tonnes, including 600,000 tonnes of marine fish, 500,000 tonnes of dried seaweed, 500,000 tonnes of mollusk, 100,000 tonnes of crustacean and 50,000 tonnes of other products. The export value of marine aquaculture will reach US\$ 5.0-8.0 billion.
- By 2050, Vietnam will be a country with advanced marine farming industry, developed in sustainable way, with modern technology and scientifically-sound management methods. Marine aquaculture will become a main part of our country's ocean economy, contributing 12-15% of GDP. Vietnam will become a leading country in marine farming industry in ASEAN and Asia, ranked in the top 5 in the world in terms of output and export value of farmed seafood. With a goal to 2050, Vietnam will strive to achieve 3.0 million tonnes/year of marine aquaculture production and over US\$10 billion of trade and export value.

5.1.3 Contribution to the Economy

a. GDP of Fisheries

In 2019, the GDP of fishery products at current prices reached VND 205,252 billion, accounting for 3.4% of the national GDP and 24.4% of the GDP of the entire agricultural sector, reaching the highest growth rate in the agriculture-forestry-fishery (**Table 5.5**). With this growth, the fisheries sector contributes 0.22% to the overall growth of the agriculture-forestry-fishery sector and the whole country (General Statistics Office, 2019).

Along with the restructuring process of the economy (reducing the proportion of agriculture and increasing the proportion of industry and services), within the agriculture-forestry-fishery sector, the economic structure also shifted towards reducing the share of agriculture and increasing the share of forestry and fishery. Specifically, agriculture decreased from 78.54% in 2010 to 71.39% in 2018. Forestry increased from 3.65% in 2010 to 5.04% in 2018. Fisheries increased from 17.81% in 2010 to 23.57% in 2018.

Table 5.5: GDP, by Sector, 2011-2019.

No.	Item	2011	2015	2017	2018	2019
I						
GDP (in current prices, VND billion)						
	Total GDP	2,779,880	4,192,862	5,007,857	5,535,267	6,037,348
A	Gross value added					
1	Agriculture, Forestry, and Fisheries	543,960	712,460	768,161	813,724	842,601
1.1	Agriculture	430,240	533,615	559,685	575,860	
1.2	Forestry	16,840	30,934	37,005	40,676	
1.3	Fisheries	96,881	147,911	171,471	190,123	
2	Industry and Construction	896,356	1,394,130	1,669,568	1,897,272	2,082,261
3	Services	1,021,126	1,665,962	2,069,566	2,278,892	2,513,859
B	Product tax less product subsidies	318,438	420,310	500,562	552,444	598,627
II						
Growth Rate (%)						
	GDP		5.89	6.68	6.81	7.08
1	Agriculture, Forestry, and Fisheries		0.66	0.40	0.44	0.36
1.1	Agriculture		0.38	0.26	0.24	0.09
1.2	Forestry		0.03	0.05	0.03	0.05
1.3	Fisheries		0.25	0.09	0.17	0.22
2	Industry and Construction		2.32	3.20	2.77	2.85
3	Services		2.91	2.39	2.87	2.24

Source: General Statistics Office, 2019.

b. Trade

Vietnam is the third major exporter of fish and fishery products in the world, with exports valued at US\$ 8.5 billion in 2017. Fisheries export turnover in 2019 reached over US\$ 8.6 billion, a decrease of 2.3% compared to 2018. An important proportion of these exports consisted of Pangasius, shrimps and tuna.

Seafood exports reached over US\$ 3.2 billion, increased mainly in tuna production (reaching US\$ 728 million) and some other marine fish (reaching US\$ 1.65 billion).

The United States, Japan, China and Korea are the top four importers of seafood from Viet Nam. The value of seafood exports in recent years has been increasing generally, but not stable (**Table 5.6**).

Table 5.6: Value of Seafood Exports (in US\$), 2013-2016.

Year	2013	2014	2015	2016
Value of seafood exports (US\$)	6.6 billion	7.92 billion	6.56 billion	7.05 billion

Source: General Statistics Office, 2019.

During the last few years, Viet Nam has also increased its imports of fish and fishery products, with a significant share consisting of raw material for processing and re-exports. In 2017, imports were valued at US\$ 1.7 billion.

4.1.4 Contribution to Income and Livelihood

In addition to contributing to the economy, the fisheries sector also creates jobs, improves livelihoods for local communities and contributes to food security of Vietnam, as well as the world.

Approximately four million people are employed in the fisheries primary sector in Viet Nam, of which 1.8 million people are marine fishers. Aquaculture employs an estimated 2.6 million people, with one million jobs in shrimp aquaculture alone. Most fishers and aquaculturists are small-scale producers.

Around 8.5 million people (10% of the total population) derive their main income directly or indirectly from fisheries. About 4.5 million workers are in the related logistics services. Moreover, aquaculture activities promote the development of a number of industries and services, such as fish feed production, agricultural extension, seed supply, etc.

4.1.5 Post-harvest

a. Fish ports

By the end of 2019, there were 83 fish ports in operation in 27 coastal provinces and cities. Of which, there are 25 fishing ports of type I (20 ports of type I combined with storm-sheltered mooring area), 58 fishing ports of type II (35 ports of type II combined with storm-sheltered anchorage area, including 4 anchorage area of regional level). There are 9 ports capable to accommodate fishing vessels with maximum capacity of 1,000 CV and 2 ports to accommodate fishing vessels with the largest capacity of 2,000 CV.



b. Seafood processing

The seafood processing industry is now developing into a leading economic sector, a major commodity manufacturing industry at the forefront of international economic integration.

According to the 2019 data of the General Department of Fisheries, the number of seafood processing establishments with production and business registration is over 4,000, of which 800 seafood processing and export enterprises have achieved certification on food safety and hygiene, and eligible for export into markets with a capacity of 3.0 million tonnes of products/year. The amount of seafood raw materials being processed is 75%, equivalent to over 6 million tonnes. The average processing capacity used is 70%, creating more than 2.1 million tonnes of products/year. The seafood processing factories have invested in capacity development, modern processing technologies and advanced quality management skills to meet the requirements of the world market. The seafood processing plants of Vietnam are evaluated and recognized to meet the standards and regulations of importing countries, such as the US, Japan and the EU.

5.2 Major Issues

Fisheries resources in both marine and inland water areas show signs of decline and fluctuation in an adverse direction for the maintenance, regeneration and restoration of fisheries resources. Most stocks are considered already fully or over-exploited and no further increase of capture production is likely. The issues related to trade barriers, technical barriers, traceability and commitments to protect the environment and marine resources, and implementation of responsible fisheries are the great challenges for the country's fisheries sector. The following are the key issues:

- The structure of fishing ships/boats and occupations is inappropriate, with the number of small boats fishing in the coastal areas accounting for a high proportion.
- Destructive fishing and non-seasonal fishing still exist, and aquatic ecosystems in many places are being destroyed.
- Illegal fishing still exists (such as using electrical impulses and trawl-net in nearshore waters).
- Post-harvest losses are high, and consequently reduces the fishing value and income of the people.
- The establishment and effective management of marine protected areas and aquatic resource protection areas are still inadequate.
- Some aquatic species are facing extinction; the breeding grounds and spawning sites have been lost.
- Fishery infrastructure and logistics have not been synchronized.

Aquaculture is also facing challenges. The construction of new dams and reservoirs have had significant negative impacts on inland fisheries, e.g., many fisheries in the Red River delta disappeared due to the Hoa Binh Dam. The substantive area of productive floodplains in the Mekong delta has also diminished due to its conversion to agriculture area. This has resulted in decreasing productivity. Estimate of total catch from inland fisheries in 2016 was around 108 000 tonnes, with a decrease of 56% compared to the peak reached in 2001.

Moreover, there are negative impacts from unplanned aquaculture development, which occurs in many localities. It has led to polluted water sources due to excessive use of feeds, causing environmental pollution in coastal areas.

Vietnam's seafood processing capacity is still limited, failing to meet the needs of raw material production and consumption markets. The technology of seafood processing is mainly rough processing. The proportion of high value-added products is still low, especially for the processing sector, in order to avoid excess raw materials.

Wastewater from seafood processing facilities often contains fragments of meat, blood and organs of aquatic products, as well as fish scales, bones and fat that cause a fishy odor and a pollution index that is higher than the standard type B of wastewater for aquaculture.

5.3 Response

To overcome these limitations and shortcomings, Vietnam is : (1) currently strengthening the state management system of fisheries sector from the central to local levels, (2) improving the system of standards, technical regulations, processes and conditions in the fields of fisheries production, processing and trading, (3) promoting the application of innovative 4.0 technology and advanced technology in aquaculture, (4) improving the quality of the water environment through application of technologies in water treatment and in the breeding process, and (5) strictly following the regulations on fishing, especially regarding illegal, unreported and unregulated (IUU) fishing and catch of prohibited aquatic species.

Vietnam recently amended the **Law on Fisheries** (in 2017, which replaces the 2003 Law) and developed *Decree No. 26/2019/ND-CP* dated March 8, 2019 detailing a number of articles and measures in implementing the Law on Fisheries.

At the end of 2017, the Prime Minister also issued *Directive No. 45/CT-TTg* on urgent tasks and solutions to overcome the European Commission's warning against IUU fishing, and following which, many coastal provinces have developed directives and plans for implementation. This is especially reflected in the promulgation of a **National Action Plan for Combating Illegal, Unreported and Unregulated (IUU) Fishing** by 2025, the establishment of the National Steering Committee for IUU fishing, the accession to the *United Nations Fish Stocks Agreement* and *FAO's Agreement on Port State Measures*, and the improvement of the legal system to ensure compatibility with international regulations on sustainable fisheries management.

Vietnam has addressed with high attention the protection and development of aquatic resources: The Prime Minister has issued *Decision No. 188/QĐ-TTg* dated 13/02/2012 on the approval of the **Program for the Protection and Development of Aquatic Resources** by the year 2020.

Localities throughout the country have organized breeding-stock release activities for regeneration of aquatic resources, mainly endemic aquatic species, indigenous species, and species of high economic value. In addition, the research on the production of breeding-stock for resource reproduction, on commercial farming of species of economic value and on rare species has also been implemented.

There are 16 marine protected areas (MPAs) representative of the national waters that have been established.

On August 9, 2019, the Ministry of Agriculture and Rural Development (MARD) issued a national technical regulation on the products used for aquaculture environmental treatment (*Circular No. 08/2019/TT-BNNPTNT*), and set safety limits for the chemicals and biological products to treat the aquaculture environment.

Previously, on November 15, 2018, MARD also issued *Circular No. 26/2018/TT-BNNPTNT* on the management of aquatic breeds, aquatic feeds, and products for treatment of aquaculture environment, and it also provides the list of chemicals, biological products, microorganisms banned from use in aquatic feeds, and products for treatment of aquaculture environment, and the list of chemicals, probiotics, microorganisms and raw materials for food production permitted for use in aquaculture in Vietnam.



Photos by MARD.

6 Marine and Coastal Tourism

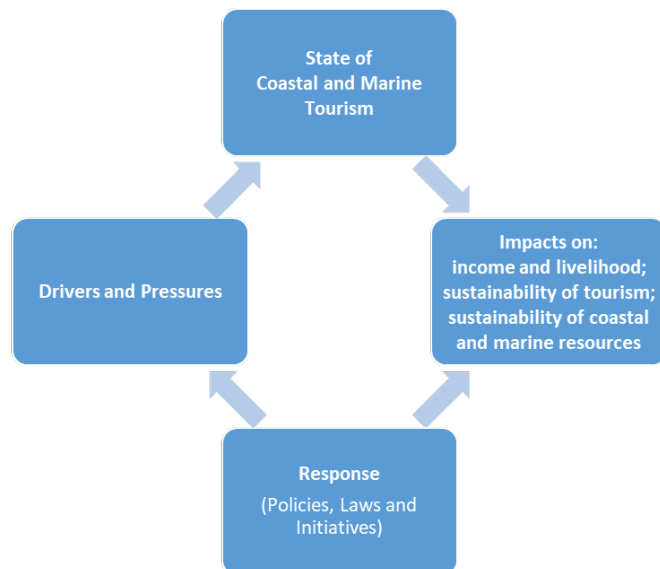


Photo by VASI.

6.1 Status

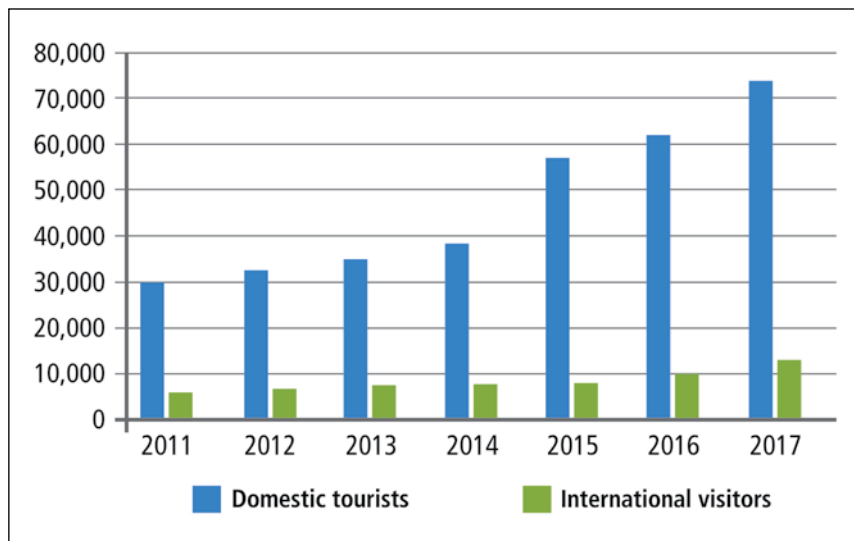
Since 2000, the number of international visitors to Viet Nam has grown at an annual rate of more than 12% on average (except for the 8% decline due to the severe acute respiratory syndrome (SARS) disease in 2003, and 11% decline due to the global recession in 2009). International arrivals increased from 2.14 million arrivals in 2000 to more than 10 million arrivals in 2016, and 18 million arrivals in 2019, a significant increase of 8.6 times in 19 years (**Table 6.1**).

Domestic tourism has also increased steadily throughout the same period, from 11.2 million domestic tourists in 2000 to 62 million in 2016, and 85 million in 2019 (**Figure 6.1**). This can be attributed to increasing incomes and improving standard of living of the people.

Table 6.1: Number of International and Domestic Tourists (in millions).

Year	2000	2016	2017	2018	2019
International	2.14	10.0	12.9	15.5	18.0
Domestic	11.2	62.0	73.2	80.0	85.0

Source: General Department of Tourism; World Bank, 2020.

Figure 6.1: The Number of Tourists to Vietnam.

Source: World Economic Forum (WEF, 2018)

In 2019, coastal provinces received over 34 million international visitors and over 144 million domestic visitors; the total revenue from the tourists in coastal provinces reached over VND 335 trillion. In particular, the number of tourists to island tourism destination accounts for 60% of the total number of tourists, according to data from the General Department of Tourism [47].

Marine tourism has a specific role and an important position in the country's tourism development strategy. Data from the project "*Development of marine, island and coastal tourism to 2020*" shows that each year the marine and island tourism attracts around 48-68% of tourists. Income from tourism activities accounts for a high proportion, about 70% of the total tourism revenue of Vietnam. The hotel system in coastal provinces in 2018 includes 17,212 establishments with a total of 406,208 rooms, including 434 5-star hotels with a total of 30,951 rooms.

Marine and coastal tourism has attracted many big investors in-country and abroad. Tourism infrastructure system is being strongly developed, including international-class hotels and resorts along the coast. International tourism sites include Ha Long Bay (Quang Ninh Province), Da Nang, Nha Trang (Khanh Hoa Province), Phu Quoc (Kien Giang Province). Modern 4-5 star accommodation facilities can accommodate groups of tourists for recreation purposes as well as for conferences, workshops or combined with tours and recreation. Phu Yen and Binh Dinh are also considered as localities with great potential to attract and implement large-scale tourism development investment projects.

Adventure sports tourism and MICE (Tourism in combination with meetings, incentives, workshops, conferences, and exhibitions) in coastal provinces/cities are tourism products with great potential for development. Tourism products recognized and appreciated by the market include sightseeing tours, visiting heritage sites, marine resorts, and ecotourism sites, spiritual tourism, and festivals.

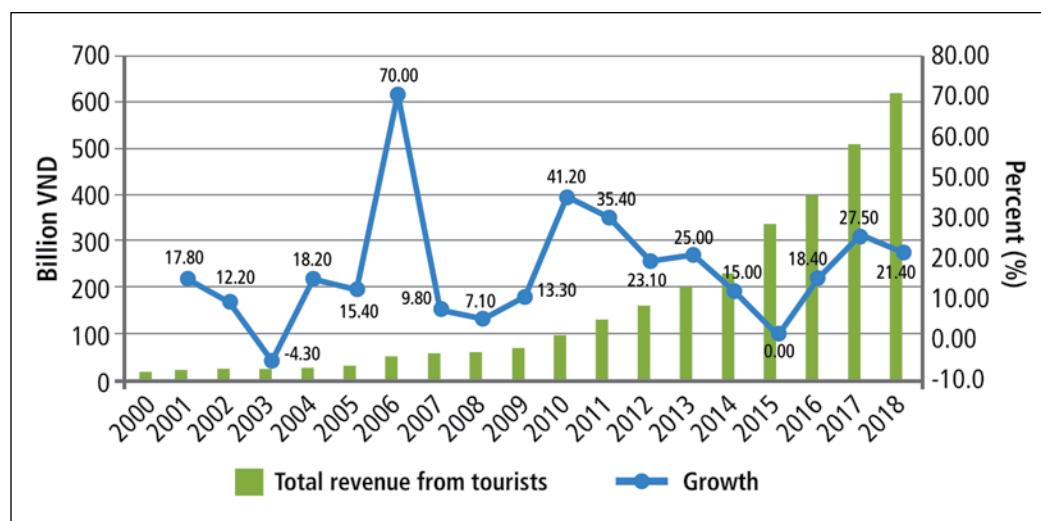
Nevertheless, the disaggregation of total tourism data to derive the figures for marine and coastal tourism is difficult. Therefore, the data in the report is mainly related to the whole country or 28 coastal provinces/cities.

6.2 Contribution to the Economy

The tourism sector contributes significantly to the national GDP, especially marine and coastal tourism.

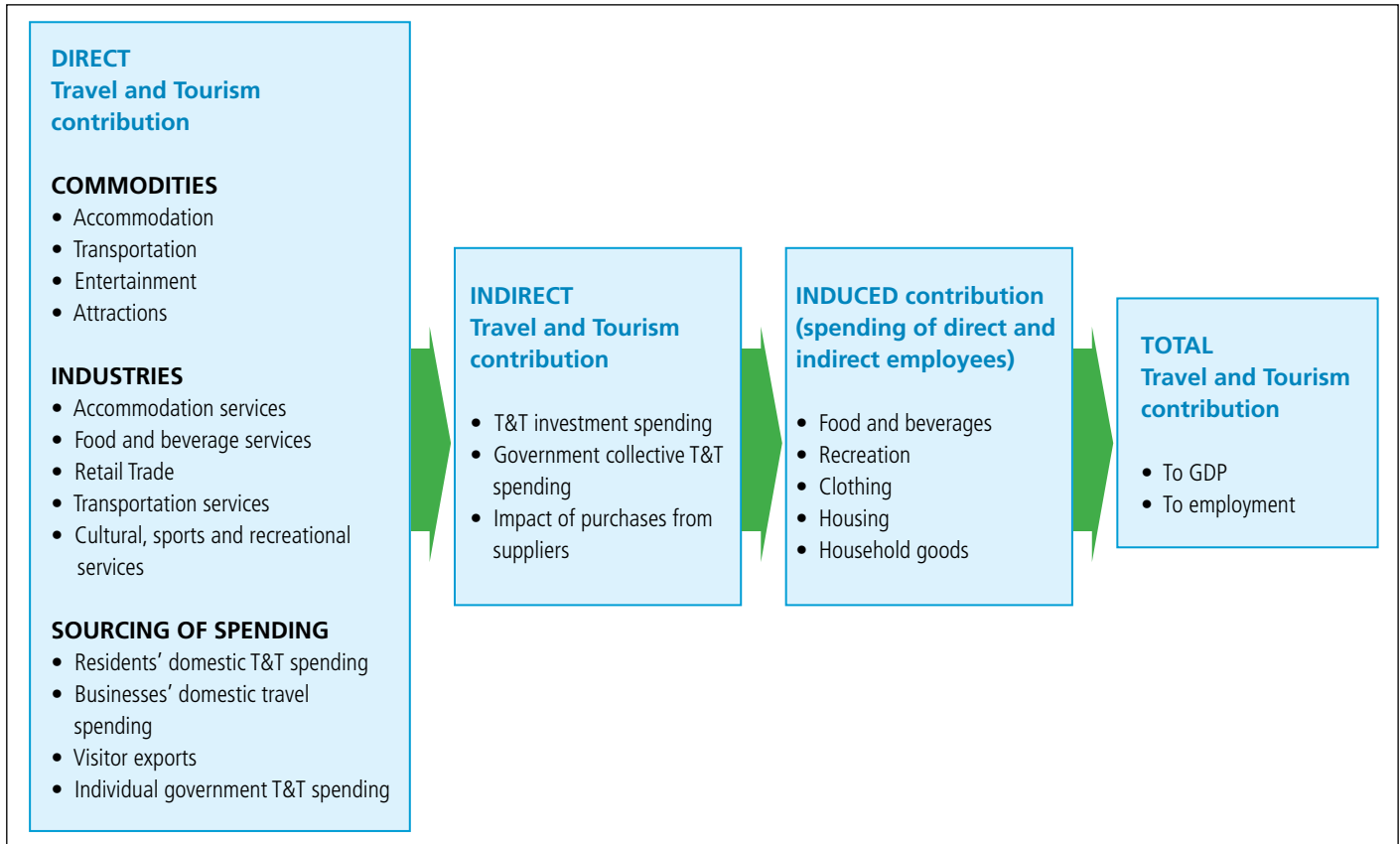
The total direct revenue from tourists in 2017 reached VND 510,900 billion (equivalent to about US\$ 22.6 billion), of which the tourism revenue of 28 coastal provinces and cities accounts for about 70% of total tourism industry revenue. The total revenue in 2018 reached about VND 620,000 billion, an increase of more than VND 109,000 billion from 2017 [47]. **Figure 6.2** shows the tourism revenue trend. Most provinces/cities have implemented tourism promotion and related activities, which attracted the attention of international visitors. Tourism has been greatly contributing directly to national economy and indirectly to other economic sectors (**Figure 6.3**).

Figure 6.2: Tourism Revenues.



Source: General Department of Tourism. 2018.

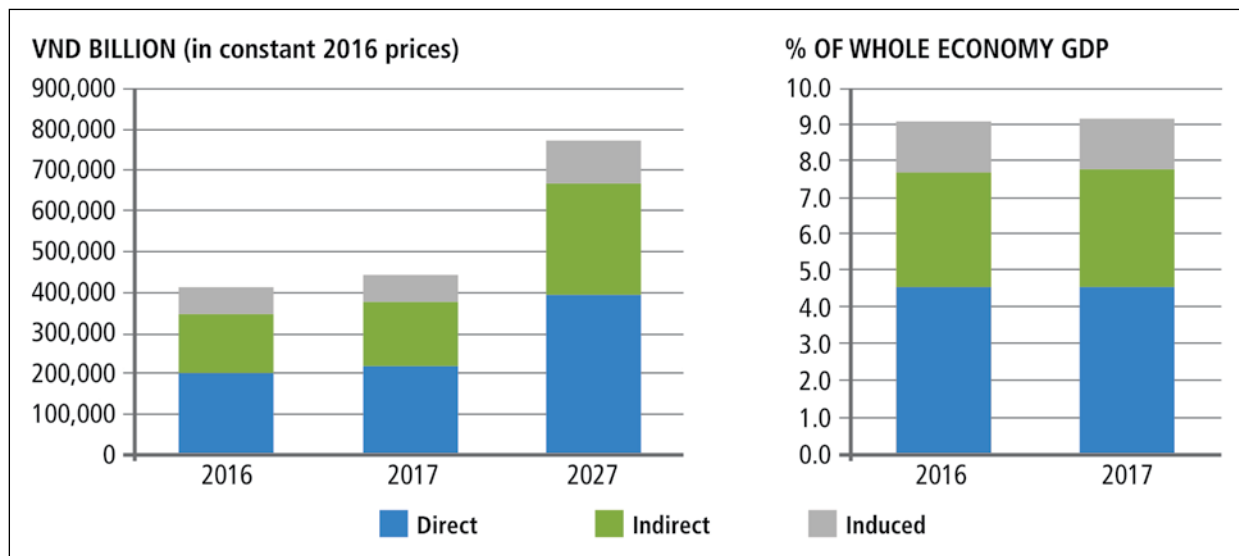
Figure 6.3: Direct, Indirect and Induced Contribution of Travel and Tourism.



Source: WTTC, 2017.

The total contribution of Travel and Tourism to GDP in 2016 was VND 410,008 billion (US\$ 18.4 billion) or 9.1% of GDP in 2016, and it is forecast to grow by 7.4% to VND 440,289 billion (9.1% of GDP) in 2017, and rise by 5.8% per annum to VND 770,786 billion by 2027 (9.2% of GDP) (**Figure 6.4**). (WTTC, 2017).

Figure 6.4: Contribution of Travel and Tourism to GDP of Vietnam.



Source: WTTC, 2017.

6.3 Contribution to Income and Livelihood

According to preliminary statistics of Vietnam's tourism sector, Vietnam currently has about 1.3 million workers directly serving in the tourism sector (accounting for 2.5% of the total labor force in the country), of which only 42% have been trained in tourism, 38% have been trained in other specialties, and about 20% have not been formally trained. Each year the tourism sector needs nearly 40,000 workers, but the number of students who have graduated, and specialized trainees is only about 15,000 people/year, of which just over 12% have college or university degrees or higher. This is a great challenge, but offers opportunity for employment that the Vietnamese tourism industry has created today.

In addition to traditional jobs in coastal provinces/cities, tourism service activities are very important to help communities get more income, in the context of rapidly developing tourism today. In recent years, the type of community-based tourism in coastal districts has begun to take shape, with promising beginnings. The central region (from Thanh Hoa to Binh Thuan) is considered as the golden land to develop community-based ecotourism, attracting the attention of a large number of international visitors.

6.4 Pressures and Issues

Although Vietnam's tourism industry has grown, it is still lagging compared to other countries. Marine and coastal tourism in Vietnam particularly is facing many challenges, such as:

- Limited tourism vision: lack of tourism sustainability and linkage; localism eliminates the strengths of Vietnam's tourism.
- Policies on promoting tourism development are inadequate. There is lack of regulations and mechanisms to enforce sanctions for acts that negatively effect tourism activities and the coastal and marine environment and biodiversity.
- The infrastructure system for tourism is not adequate to ensure quick, safe and convenient movement for visitors. During rush hours, congestion, jostling, pushing occur, causing uncomfortable feeling for visitors.
- Regarding the business culture in tourism service, there is a mindset of self-seeking, particularly in raising room and food prices; there exists an attitude of clinging to ask for money and enticing customers to buy souvenirs.
- Encroaching of scenic space and cultural heritage sites, and over-exploitation of resources for economic purposes have changed the landscape, affected the sacred spaces of monuments, and degraded the environment.
- Poor tourism products: the quality of tourism products to serve tourists is not yet competitive with other countries.

These issues create difficulties in keeping the visitors to stay: many international visitors do not want to return, while domestic tourists tend to travel abroad.

Regarding the environment, in a number of fast-growing coastal tourist destinations, such as Ha Long, Phan Thiet, Vung Tau and Phu Quoc, the inappropriateness of planning and lack of treatment facilities for wastewater and waste in general are causing adverse impacts on the quality of the marine environment. Currently, domestic wastewater, especially from hotels and restaurants located along the coast, is still discharged into stormwater drainage systems in many urban areas, so under heavy rain or prolonged rain, the sewage spills into the coastal waters.

The indiscriminate disposal of plastic waste, especially during the tourist season, is an alarming issue in coastal areas and islands. Data collected from the *Beach Plastic Waste Monitoring Program* in Vietnam conducted at the end of 2018 showed that styrofoam waste accounts for the largest amount of plastic waste.

6.5 Response

The tourism sector continues to improve mechanisms, policies and regulations for developing marine and island tourism, such as: (i) increasing investment and upgrading material infrastructure at ports; (ii) improving technical, hygiene and safety conditions at cargo ports to accommodate cruise ships; (iii) investing in new equipment and improving tourist fleets in accordance with international standards; (iv) providing incentives for tourism businesses to invest in developing marine and island tourism products, travel routes to remote islands, and new and diversified products for cruise ship groups with unique tour program; (v) linking with service companies, restaurants, hotels, as well as localities to reduce service prices, room rates and improve the quality of service to tourists; (vi) enhancing marine culture and marine cuisine; and (vii) supporting people to develop community-based tourism in agriculture and fisheries.

In 2017, the *Tourism Law No. 09/2017/QH14* was issued and replaced the *Law of 2005*. On August 10, 2018, the Vietnam National Administration of Tourism developed *Plan No. 1075/KH-TCDL* which promotes the socialization movement of sanitation and hygiene, and putting in place the toilets in key tourism areas. Many localities have developed and implemented policies and plans to upgrade ships and tourism infrastructure, and to consolidate tourism business mechanisms and activities. Recently, the Ministry of Culture, Sports and Tourism developed a Plan to implement the Project “Restructuring the tourism industry to meet the requirements of developing it into a key economic sector” (*Decision of the Ministry of Government No. 2031/QD-BVHTTDL* dated June 10, 2019).

Box 6.1 Objectives of the Vietnam Tourism Development Strategy to 2030

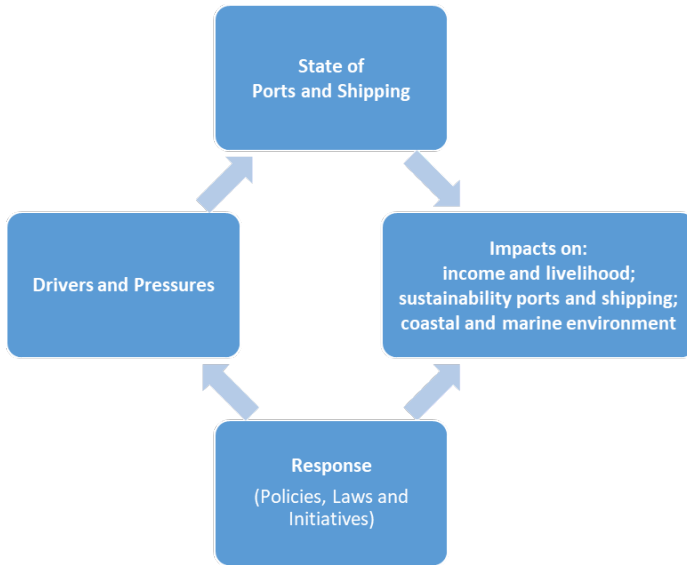
- **By 2025:** Vietnam will become an attractive destination, striving to be among the top three countries in tourism development in Southeast Asia and among 50 countries with the world's leading tourism competitiveness. All 14 criteria of tourism competitiveness will be increased, in line with the requirements of sustainable development.
 - o Total revenue from tourists: VND 1,700 - 1,800 trillion (equivalent to US\$ 77 - 80 billion); average growth: 13-14%/year; direct contribution to GDP: 12-14%.
 - o Creating about 5.5-6 million jobs, of which about 2 million are direct jobs, with an average growth of 12-14%/year.
 - o Striving to receive at least 35 million international visitors and 120 million domestic visitors, maintaining the average growth rate of 12-14%/year for international visitors and 6 - 7%/year for domestic tourists.
- **By 2030:** Tourism becomes a key economic sector and sustainably developed. Vietnam becomes a particularly attractive destination, among the top 30 countries with the world's leading tourism competitiveness, meeting the requirements and goals of sustainable development.
 - o Total revenue from tourists: VND 3,100 - 3,200 trillion (equivalent to US\$ 130-135 billion); average growth: 11-12%/year; direct contribution to GDP: 15-17%.
 - o Creating about 8.5 million jobs, including 3 million direct jobs; average growth: 8-9%/year.
 - o Striving to receive at least 50 million international visitors and 160 million domestic tourists; maintaining the average growth rate of 8-10%/year for international visitors and 5-6%/year for domestic tourists.
- *“To strongly develop a system of regional competitive tourism products on marine and coastal recreation and visits of landscapes; to build marine tourism sites of regional and international scale and high-quality resorts; to additionally develop marine sports activities and ecotourism products.”*

The coastal provinces and cities, especially those having strong tourism activities, such as Quang Ninh and Da Nang, have studied, elaborated and adjusted the plans, and implemented projects on water, drainage and wastewater treatment in urban areas in the direction of separating stormwater from domestic and services wastewater, minimizing negative impacts on the marine environment in general, and on coastal tourism activities in particular.

As pointed out by the World Bank: **“To ensure the long-term sustainability of the sector, strategic choices need to be made regarding the preferred pace, composition, and geographic balance of its future growth, and supported by decisive policy measures and investments in several areas.** Key priorities include: (i) enhancing coordination of destination planning and product development, (ii) diversifying tourism products and visitor source markets, (iii) developing tourism workforce skills, (iv) strengthening local tourism value chain linkages, (v) improving visitor flow management, (vi) boosting destination infrastructure capacity and quality, and (vii) protecting environmental and cultural assets. Implementing these measures will require coordinated efforts by a wide range of public and private stakeholders.”



7 Maritime Industry: Shipping, Ports, and Shipbuilding

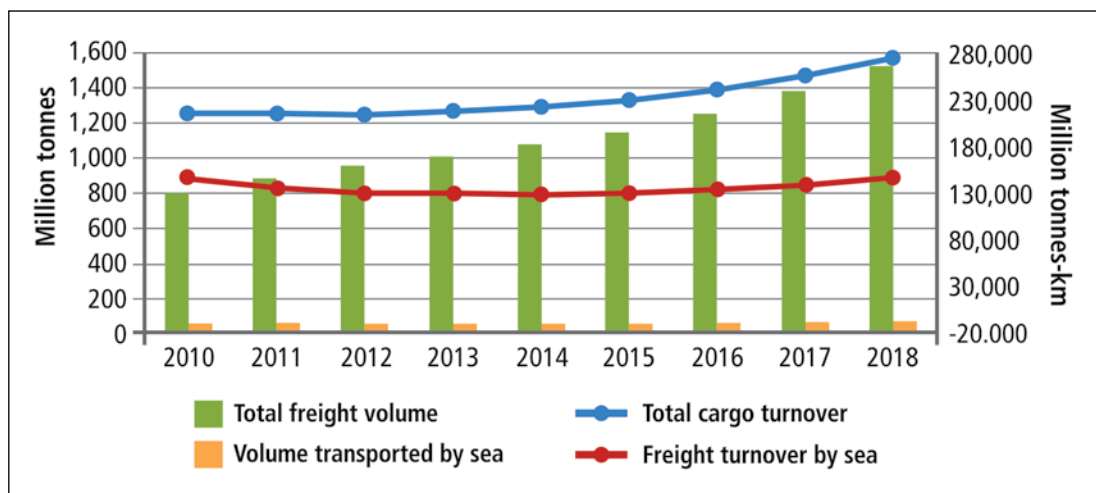


Hai Phong Port.

7.1 Shipping

After Vietnam joined the World Trade Organization (WTO) in 2007, the trade and goods exchanged between Vietnam and other countries has increased strongly, leading to the increase in demand for shipping services. Vietnam shipping has risen accordingly and affirmed the role of the sector not only in domestic freight, but also the transport capacity for importation and exportation of goods to other countries.

Figure 7.1: Volume of Transported and Freight Traffic.



Source: General Statistics Office, 2018.

In 2018, the total transport volume carried out by the Vietnamese fleet was estimated at 74.64 million tonnes, and the volume of rotating cargo was estimated at 148,025 million tonnes, an increase of 10.9% compared to 2017, and accounting for 55.6% of the total cargo turnover of all modes of transport. The Vietnamese national flag fleet has now been able to handle nearly 100% of inland transport by sea, except for some specialized vessels transporting LPG, bulk cement, etc. The total volume of goods transported through the seaport by inland waterway vessels in 2018 was estimated at 171.6 million tonnes, increased by 30.5% compared to 2017.

In 2018, Vietnam's fleet has 1,568 ships (1,128 of which are cargo ships) with a total capacity of about 7.8 million DWT. In particular, the number of ships, by type, is shown below:

- General cargo ships: 819, accounting for over 72.6%
- Bulk ships: 99, accounting for 8.7%
- Oil tankers: 150, accounting for 13%
- Specialized vessels for liquefied gas: 16, accounting for 1.4%
- Container ships: 41, accounting for 3.6%.

According to the United Nations Conference on Trade and Development (UNCTAD), the Vietnamese fleet is the 4th in the ASEAN region (after Singapore, Indonesia, Malaysia) and the 30th in the world.

The structure of Vietnam's fleet in recent years has improved significantly; the fleet has been developed in the direction of specialization to meet the demand for domestic freight. Specifically, Vietnam's container fleet has grown quite well. The number of the container ships increased from 19 in 2013 to 41 in 2019, with an average increase of about 20% per year. However, the fleet can only meet the needs of domestic transport and feeder freight to some countries in the Region, and has to increase the market share of import and export freight. The fleet of oil and liquefied gas tankers increased by 5.6% in 2018. The liner shipping connectivity index for Vietnam was 60.4 in 2018, and it improved to 66.5 in 2019 (maximum is 100) (World Bank, 2020). The Liner Shipping Connectivity Index captures how well countries are connected to global shipping networks. It is computed by the UNCTAD based on five components of the maritime transport sector: number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports (World Bank, 2020).

The average age of the Vietnamese fleet is 15.6 years old, which is 5.2 years younger than that of the world (according to UNCTAD, the average age of the ship in the world is 20.8 years). The vessels with the youngest average age are general cargo ships: 14.2-year-old, while the oldest vessels are liquefied gas vessel: 22.9-year-old. The average age of other vessel types are: 16.3 years for container ships, and 16.4 years for chemical-oil tankers. The upgrading of Vietnam's fleet in recent years is due to the fleet restructuring process and increased investment in new ships.

However, the Vietnam's maritime transport faced a decrease in the number of shipping fleet, which reduced from more than 1,600 vessels in 2018 to 1,568 vessels in 2019. The decline may result in

failure to achieve the target of meeting 100% of domestic cargo transportation. The Vietnam Maritime Administration said that it will put forth solutions to develop river-sea compatible ships to share transport burdens with road transport and boost the efficiency of this kind of transport.

7.2 Seaports

Seaports are an important node in the logistics chain, where goods are moved from road transport to the marine one and vice versa. In Vietnam, marine and inland waterway transport accounts for about 22.5% of the total freight volume. Therefore, the port industry plays an important role in logistics and trade activities. Specifically, in 2018, the volume of transport of the entire port system in Vietnam reached 17.8 million twenty-foot equivalent units (TEU), an increase of 23% compared to 2017. The southern and northern port groups dominate in the freight proportion and freight growth rate in the past years. These are also the two most important port groups in the country.

Vietnam's seaport system is divided into six groups of seaports with 45 active seaports, of which two are IA type ports (international gateway port); 12 are type I (regional general port of hub); 18 are type II (local general port), and 13 are type III (offshore oil port).

In 2019, the total number of harbors is 286 with about 82.8 km long wharves and total capacity of over 550 million tonnes/year. The investments in the Vietnamese seaports have been synchronized with other infrastructure: wharves, buoys, cargo handling equipment. The system of seaports is basically developed, fully functional, of large scale and distributed across regions, thereby maximizing natural conditions, meeting the requirements of transporting goods by sea, and serving the socioeconomic development process in coastal areas and the whole country, and creating motivation to attract and promote related economic and industrial sectors for mutual development. Most of seaports are owned and directly operated by state-owned enterprises and other economic entities. There are four ports invested with the state budget: Cai Lan port (the wharfs 5,6,7), Cai Mep ODA container port, Thi Vai international general port, and An Thoi - Kien Giang port. These four ports assigned Vinamarine as the representative of the state agency to sign contracts for exploitation and leasing in their behalf.

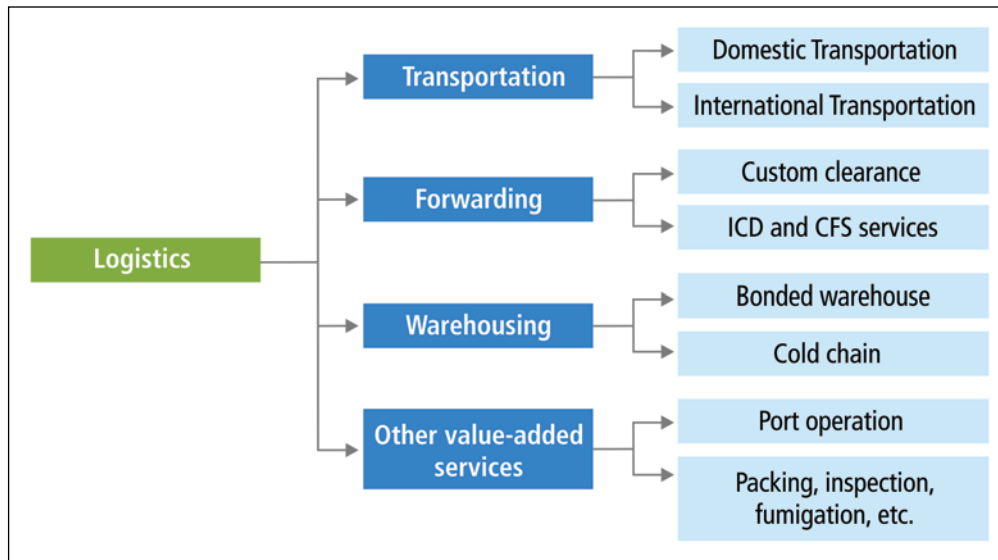
Most of the cargoes in the North is transported by sea via the port system in Hai Phong province. With more than 40 ports for each province, Ho Chi Minh and Ba Ria - Vung Tau are key hubs in the South. Da Nang and Khanh Hoa are the port centers in Central of Vietnam.

Regarding navigational channels, there are 45 public navigational channels nationwide with a total length of 1,105 km, and 34 specialized navigational channels with a length of 159.2 km. The navigational channels are equipped with synchronized signal system, which meet the standards to support the safe navigation of vessels.

Cargo throughput via seaports of Vietnam in 2019 is estimated at 654.6 million tonnes (excluding the volume of transit goods unloaded), an increase of 13% compared to 2018. The volume of container

throughput in 2019 was estimated at 19.35 million TEUs, an increase of 6.5% compared to 2018. The volume of cargo through the ports has grown steadily over the years, contributing to the reduction of the load on roads transport, increase of revenues for the state budget, support to businesses in the maritime sector, as well as making an important contribution to promoting socioeconomic development in coastal provinces/cities.

Figure 7.2: Logistics Sector Structure in Vietnam.



Source: FiinGroup Joint Stock Company (<https://www.slideshare.net/StoxPlusCorporation/vietnam-logistics-market-2019-preview>)

7.3 Logistics Services

According to World Bank rankings, Vietnam currently ranks 64th among 160 countries and 4th in ASEAN after Singapore, Malaysia and Thailand in terms of logistics development. With an annual growth rate of 14-16%, this is one of the fastest growing and most stable service industries of Vietnam in recent years.

It is forecasted that by the end of 2020, Vietnam's import-export turnover will reach US\$ 300 billion; thus, the potential of developing Vietnam logistics service is very big. In the near future, logistics services will become an important economic sector, which can contribute up to 15% of the country's GDP. The container port traffic was 15,325,509 TEU in 2017, and 16,374,195 TEU in 2018 (World Bank, 2020).

However, there is a need for coordinated development of port infrastructure, port management, and port and logistics services and linkages.

7.4 Shipbuilding Industry

The shipbuilding and shipping industries have a close relationship. The shipbuilding industry provides the vessels for the shipping industry, which transports goods and people over waterways and seas.

In the country there are about 97 shipyards (from 1,000 DWT and above) belonging to SBIC, Vinalines, PVN, some military and private enterprises. There are 92 factories in the North, 13 factories in the Central Region and 15 factories in the South. The total designed capacity of newly built factories is 2.6 million DWT/year but could reach only 0.8 million DWT/year (31%), equivalent to 150-200 pieces/year. The export capacity is from 0.5 to 0.6 million DWT but the delivery schedule is slow and the localization rate is low. Currently, there are still about 42% - 46% of Vietnamese fleets having to be repaired at foreign shipyards.

7.5 Pressures and Major Issues

Although the average growth rate of cargo throughput via Vietnam's seaport system has increased continuously over time, the maritime industry developed slowly, and did not achieve the desired targets. The investment for the seaport system has been for construction only. Although it developed rapidly in terms of infrastructure, with the total design capacity of ports in the whole country reaching 534.7 million tonnes/year, the port management system has not been reformed. This lack of synchronization and slow development of port services and behind-port logistics services resulted in excess capacity in many ports. The annual volume of cargo throughput via major seaports (managed by the Central Government) increased slowly, with an average rate of 5.4% during the period of 2007-2017. Road remains the key transportation line for freight in Vietnam, but poor road network also hampers cargo transportation.

Likewise, the connection of seaports with railways and roads is inadequate, and in general the linkage between different modes of transportation is not good. The Vietnamese shipping fleet is of small scale and inappropriate structure, and shipping enterprises have limited financial capacity. Inconsistencies across the transport network - road, railways, airport, shipping and seaports - in terms of extent and quality are one of the factors affecting ease of doing business in the country. Enterprises specializing in providing logistics services only meet part of the needs of the domestic market, have not yet reached the regional and international markets.

There are also threats from oil spills, which could affect marine life. Alien, invasive species due to lack of ballast water management system in the ports is another threat to the marine ecosystems.

Vietnam has experienced a number of small spills. Of the larger spills, the NEPTUNE ARIES (1994) released 1500 tonnes of gas oil after impacting a jetty. Little clean-up was undertaken although the

oil damaged rice paddies. In 2001, the tanker FORMOSA ONE collided with tanker PETROLIMEX 1 in Ganh Rai Bay, Vung Tau City, spilling 615 tonnes of gas oil cargo.

Shipbuilding industry also causes coastal water pollution due to oil and sediment from heavy metal deposition, and directly affects marine aquatic flora and fauna, as well as hinders the development of other sectors, such as salt making, aquaculture and coastal tourism. The main pollutants are heavy metals (Pb_3O_4 , Pb_2O_3 , $PbCrO_3$, CuO , ZnO , Fe_2O_3 , TiO_2 , $ZnCrO_3$), cellulose paints ($-C_3H_7O_2(OH)_2$), epoxy paints ($-CHOCH-$), formaldehyde paints phenol ($-C_6H_5O-$) and oil alkyd paints ($-CHO-$).

7.6 Response

7.6.1 Port Development and Management

In the period to 2020, with orientations to 2030, the focus is on: (i) developing synchronized and modern system of seaports and access channels, and increasing investment in building key seaports in locations of appropriate conditions; (ii) the construction of international entrepot ports, international gateway ports in key economic regions, and deep-water ports specialized in handling large-scale containers, coal and oil, with modern equipment; (iii) renovating and maintaining navigable channels to ensure coordinated and efficient operation of ports; and (iv) synchronized development of the network of rail, road and inland waterways to ensure the connections of seaports with inland ports, cargo distribution centers, economic zones, industrial parks, and wharves.

Implementing the above measures, the Government also issued *Decree No. 159/2018/ND-CP* on November 28, 2018 for the management of dredging activities in seaport waters and inland waterway waters. The Ministry of Transport issued *Circular No. 35/2019/TT-BGTVT* dated 9 September 2019 regulating the dredging activities in seaport waters. The Ministry of Transport also issued *Decision No. 616/QD-BGTVT* dated April 9, 2019 regarding the list of ports belonging to Vietnamese seaports, and *Decision No. 954 / QD-BGTVT* dated May 16, 2019 for the inland port list. Port planning and review of plans have also been carried out in coastal provinces.

7.6.2 Development of Shipping and Shipbuilding

The structure of the Vietnamese fleet is being developed towards specialization, especially focusing on container fleets. Vietnam National Shipping Lines (Vinalines) is studying to invest in a new fleet with modern technology, save fuel, and expand operations on liner routes (cargo

ships run regularly on one route) in the region to meet requirements for mother ships to enter the transshipment port at Cai Mep - Thi Vai area and to other regional transshipment centers.

The Government issued a master plan for Vietnam's shipbuilding industry and adjusted Vietnam's seaport system as directed in the *Decision No. 2290/QD-TTg* of November 27, 2013, approving the master plan of the Vietnam's shipbuilding industry up to 2020, with orientations to 2030. The *Decision No. 1037/QD-TTg* dated April 26, 2014 approved the adjustment of Vietnam's seaport system to 2020, with orientations to 2030 and *Decision No. 1517/QD-TTg* dated August 26, 2014 approving the planning of Vietnam's shipping system to 2020, with orientations to 2030.

Box 7.1 Vietnam's Shipping Development Plan to 2020 and Orientation to 2030 Approved by the Prime Minister Decision No. 1601/QD-TTg dated October 15, 2009

- About shipping: improving the quality of marine transport services, meeting the needs of domestic shipping, improving the market share of import and export goods to reach 27-30%, combined with freight leasing of foreign goods on international transport routes.
- The volume transported by the Vietnamese fleet will be around 215-260 million tonnes by 2020, and by 2030, it should increase by 1.5-2 times compared to 2020. The number of passengers will be about 9-10 million in 2020, and by 2030, it should increase by 1.5 times, compared to 2020.
- Vietnam's fleet will be developed towards modernization, focusing on developing specialized ships (container ships, bulk cargoes, and oil vessels) and large tonnage ships. The total tonnage will be 11.5-13.5 million DWT by 2020. Gradually upgrading the Vietnamese fleet to reach the average age of 12 years by 2020.
- Regarding the shipbuilding industry, by 2020, the country's shipbuilding industry should reach regional advanced level, and build new ships of up to 300,000 DWT as well as passenger ships, petroleum service ships and ships for rescue and maritime security.

Regarding the seaport system development in the coming period, in addition to upgrading by intensive investment and promoting the capacity and efficiency of existing ports, it will be focused on the construction of international transshipment ports, international gateway ports in the key economic areas, and some deep-water ports specialized in loading and unloading containers, coal, ore and oil of large-scale with modern equipment.

7.6.3 Oil Spill Response

a. National

The maritime industry - shipping, ports and shipbuilding sectors - has to include environmental management and climate considerations as priority areas in its development and modernization plans.

The National Committee for Search and Rescue (VINASARCOM) is the lead agency for oil spill response and is responsible for the implementation of the national contingency plan.

The Vietnamese oil spill response system was established based on *Prime Minister Decision No. 129/2001/QĐ-TTg* dated 29 August 2001 approving the **National Plan on Coping with Oil Spill Incidents, 2001-2010**, and *Prime Minister Decision 02/2013/QĐ-TTg* dated 14 January 2013 promulgating the oil spill response regulation. In 2019, Vietnam further developed its national oil spill preparedness and response framework, with support from the International Maritime Organisation (IMO) and International Petroleum Industry Environmental Conservation Association (IPIECA) Global Initiative for South-East Asia (GISEA). In 2020, governmental approval was given to VINASARCOM to implement a new national plan, in collaboration with relevant ministries, localities and other agencies.

The National Plan identified three regional oil spill response centres in Vietnam: the National Northern Oil Spill Response Centre based in Hai Phong; the National Central Oil Spill Response Centre, based in Da Nang and Khanh Hoa; and the National Southern Oil Spill Response Centre based in Vung Tau. These regional centres, organized under the stature of public utility State enterprises, are responsible for responding to oil spills in their respective regions and provide training and instructions to the local provinces on their own oil spill response plans, under guidance from VINASARCOM.

Various regulations regarding oil spill response have been promulgated in the intervening years, including designating the responsibilities of relevant agencies.

MoNRE is responsible for assessing environmental damage and would work closely with VINASARCOM during an incident. It is also responsible for providing guidance on the use of dispersants. In 2019, MoNRE issued a circular to regulate marine oil spill clean-up and recovery efforts. Under this circular, an initial and preliminary assessment on the level of pollution must be

made within the first 10 days after an oil spill is reported. If the investigation shows the level of oil in the water is higher than national standards, a more detailed assessment of environmental damage must be completed within 20 days after preliminary investigation results.

b. International cooperation

To address the oil pollution issue in transboundary waters, an example of good practice is the **Joint Statement on Partnership in Oil Spill Preparedness and Response in the Gulf of Thailand** (GOT Programme). The Joint Statement was initiated by PEMSEA, and signed on January 12, 2006 in Hanoi by Cambodia, Thailand, and Viet Nam. This coordination mechanism aims to enhance national and regional competences on oil pollution prevention, preparedness, and response by exchanging information, research, and conduct of oil spill response exercises for capacity building and Gulf-wide implementation.

The **Environmental Sensitivity Index (ESI) Mapping in the Gulf of Thailand** project is funded by the Korean government through the Korean International Cooperation Agency (KOICA) and implemented by IMO and PEMSEA. This initiative is in support to the **Framework Program for Joint Oil Spill Preparedness and Response in the Gulf of Thailand**. The main output of the project is the **GOT Atlas**, which contains sensitivity maps for planning and response to oil spill incidents covering the coastal and marine resources of the Gulf, existing economic activities along the coast and offshore and gazetted areas, as well as locations of emergency services, spill response equipment and related services.

Another agreement on international cooperation is the **Memorandum of Agreement (MOA) between Vietnam and the Philippines on cooperation in oil spill preparedness and response**, which was signed on 26 October 2010 in Hanoi. The MOA's fields of cooperation consist of the following: mutual assistance, human resource development, information exchange, research and development, and other fields of cooperation (e.g., MARPOL). Based on the MOA Implementation Plan, the national focal points are Vietnam's National Southern Oil Spill Response Center (NASOS) and the Philippine Coast Guard.



Oil spill response.

8 Offshore Oil and Gas

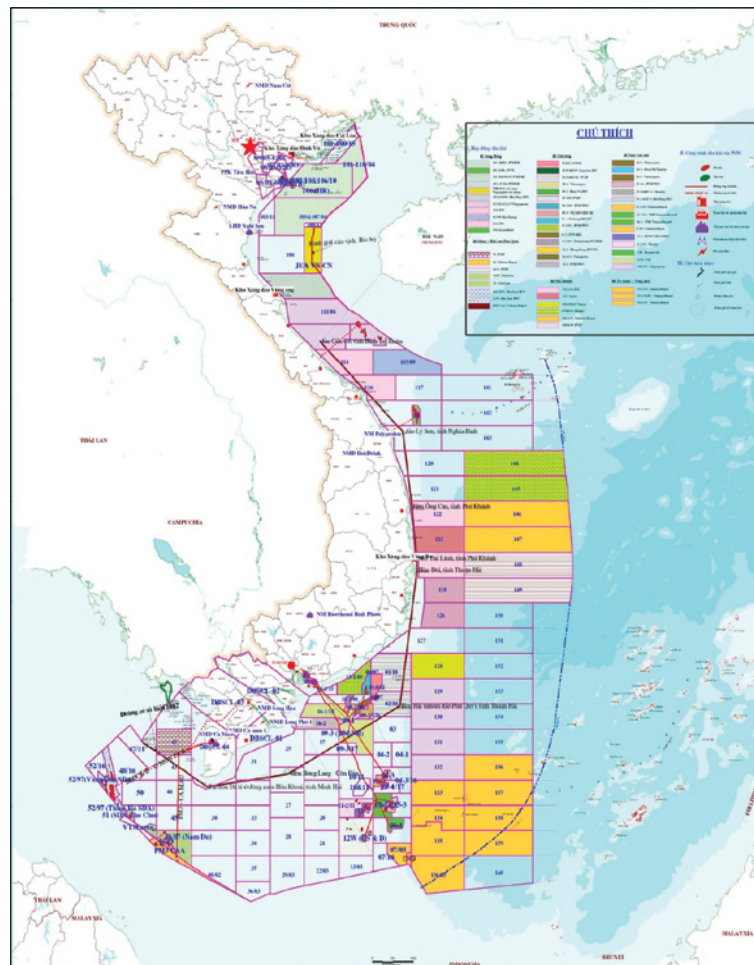
8.1 Status

8.1.1 Oil and Gas Production

Vietnam's oil and gas industry was formed right after the country's unification, but until mid-1986 the first tonnes of crude oil were extracted from the Bach Ho field at the continental shelf of Vietnam, bringing Vietnam in the list of oil and gas producing countries in the World.

Since 2006, many new oil and gas fields have been explored and discovered (such as Dai Hung, White Rhino, Su Tu Nau, White Rabbit, Diamond, Thien Ung). **Figure 8.1** shows the petroleum activities in Vietnam.

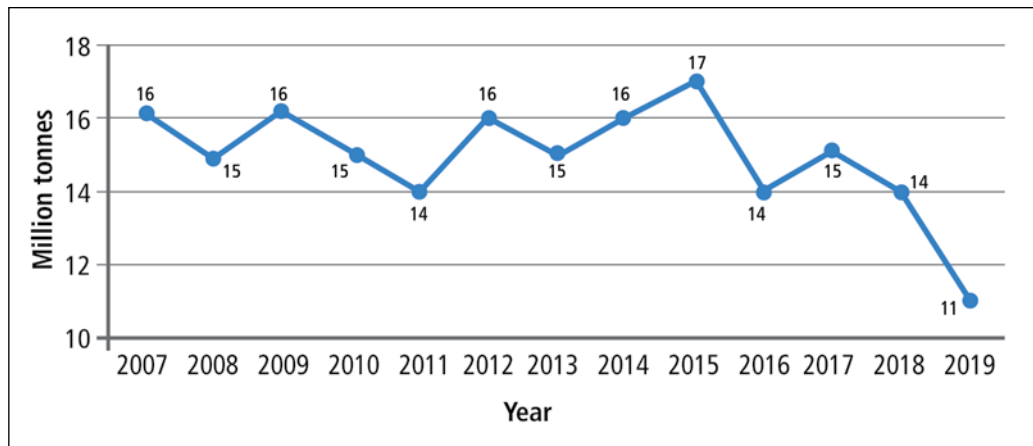
Figure 8.1: Map of Petroleum Activities in Vietnam.



Source: PVN

However, the annual crude oil production has increased slowly and has been decreasing in recent years, as shown in the **Figure 8.2**.

Figure 8.2: Production of Crude Oil Exploited Annually (million tonnes).



Source: PVN, 2020.

8.1.2 Petrochemical Refineries

Vietnam has developed petrochemical refineries:

- Dung Quat oil refinery (put into operation in 2010) has the capacity of 6.5 million tonnes/year;
- Dung Quat polypropylene factory has the capacity of 150,000 tonnes/year
- A number of small-scale processing plants, such as condensate processing plant Cat Lai (Ho Chi Minh City), Cai Mep (Ba Ria - Vung Tau), Nam Viet (Can Tho), Dong Phuong (Can Tho), which annually provide 0.5 - 1 million tonnes of gasoline for domestic demand.
- The plants producing nitrogenous fertilizer from gas, including Phu My and Ca Mau, have total capacity of over 1.5 million tonnes/year, meeting 70-75% of the domestic urea demand annually.
- Nghi Son Petrochemical Complex (NSRP), with a capacity of 10 million tonnes/year (equivalent to 200,000 barrels/day) and a source of material being 100% of heavy crude oil imported from Kuwait, was put into operation in the fourth quarter of 2018.
- Binh Son Oil Refinery of the Petrochemical Joint Stock Company (BSR) is operating safely, stably and efficiently with a processing capacity of 6.5 million tons of crude oil/year, equivalent to 148,000 barrels/day, which could meet more than 30% of gasoline demand nationwide.

Project on upgrading and expanding Dung Quat Oil Refinery (from 6.5 million tonnes to 8.5 million tonnes) is expected to be completed in 2023-2024, and the Southern Petrochemical Complex Project (capacity 2.7 million tonnes of raw materials/year) is expected to be completed in 2022.

8.1.3 Natural Gas Pipelines

The Vietnam Oil and Gas Group has completed the construction and is safely operating the system of gas pipelines in the Southeast region (Rang Dong - Bach tiger - Ba ria Vung Tau pipeline with a capacity of 2 billion m³/year, and Nam Con Son pipeline with a capacity of 7 billion m³/year) connected to Phu My nitrogenous gas industry. It is also completing the construction and safe operation of the Southwest gas pipeline (PM3-Ca Mau) with a capacity of 2 billion m³/year to supply gas to power and fertilizer plants in Ca Mau area. The gas pipeline connecting the mines of Cuu Long basin is being completed by the Vietnam Oil and Gas Group, and it will continue to build the gas collection system in this area to avoid burning gas.

Offshore gas production in the 2006-2014 period reached over 74 billion m³. PVN has been studying and deploying: (i) Nam Con Son 2 gas pipeline projects (operating phase 2), expected to be completed in 2020; (ii) Block B - O Mon gas pipeline project, capacity 6.4 billion m³/year, expected to be completed in 2022; (iii) Son My NNG import terminal project, capacity of 6 million tonnes/year, expected to be completed in phase 1 of 2023; (iv) the project of NNG-Thi Vai import depot project with a capacity of 1 million tonnes/ year, expected to be completed in 2022; (v) blue whale (Ca Voi Xanh) gas mine project chain with a capacity of 7-9 billion m³/year is expected to be completed in 2023.

8.2 Contribution to the Economy

According to the General Statistics Office, the contribution of the oil and gas industry (including oil and gas exploitation and processing) to GDP was quite high and stable in 2008 - 2013, with an average share of over 22% of GDP during this period. This industry's share has since then decreased to 8.35% in 2014-2015, and further declined to 3.79% in 2016, and 2.76% in 2017.

The value of industrial production (at the fixed price of 2010) in 2019 reached VND 519.8 trillion, an increase of 6.3% compared to 2018. The whole PVN contributed to the State budget about VND 108,039 trillion in 2019. This is an increase by 13.23 trillion compared to 2018.

Table 8.1: Contribution of Petroleum Industry to GDP, in Trillion VND.

Year	Contribution to GDP of whole PVN **	GDP*	Contribution to GDP (%)*
2008	121.800	1,477.70	18.9
2009	91.452	1,700.50	16.0
2010	128.700	1,980.80	24.0
2011	60.804	2,537.50	26.6
2012	187.054	2,978.20	25.9
2013	195.380	3,139.60	24.3
2014	178.064	3,937.00	9.3

Table 8.1: Contribution of Petroleum Industry to GDP, in Trillion VND. (cont.)

Year	Contribution to GDP of whole PVN**	GDP*	Contribution to GDP (%)*
2015	115.074	4,192.90	7.4
2016	90.282		
2017	97.536		
2018	121.269		
2019	108.039		

Source: * General Statistics Office and Nangluongvietnam.vn, May 15, 2017.

** PVN, 2020.

8.3 Pressures and Major Issues

Oil and gas are non-renewable resources, and this is one of the main reasons for the declining output in the past few years. Since then, the oil and gas industry has lost the priority position, and it gave way to marine tourism and maritime industry.

Oil and gas exploitation and processing have encountered difficulties in the context of the reduction of world oil prices and have not been developed to meet the requirements. Its contribution to the national economy has decreased significantly in recent years. Oil and gas processing industry developed slowly, and the production capacity for petrochemical refining and processing of products from petrochemical refinery is still very limited.

Oil and gas exploration and exploitation also put pressure on the marine environment. On average, each year, oil and gas exploration and exploitation activities generate about 5,600 tonnes of petroleum waste and over 15,000 tonnes of floating oil and grease, of which 23-30% are untreated hazardous wastes. The amount of waste generated from offshore oil and gas exploration and exploitation activities, which are transported ashore for treatment, is recorded over the years as shown in **Table 8.2**.

Drilling mud (humus) is a mixture of debris and soil removed from the well with the drilling fluid. The volume of drilling mud is large, but it mainly composes of soil and rock and a small amount of adhesion drilling fluid. There are two types of drilling fluids used: (1) water-based drilling fluid (using water as a continuous phase and some other additives): the drilling mud containing water-based drilling fluid discharged into the sea; (2) non-water based drilling fluids (using a continuous-phase solution and some other additives): the drilling mud containing nonwater-based drilling fluids passed through treatment equipment, ensuring the content drilling fluid adhered in the mud less than 9.5% when discharged into the sea. This is the source of waste that needs attention. The amount of non-water-based drilling mud through the years are shown in **Table 8.3**.

Table 8.2: Amount of Waste Generated from Offshore Oil and Gas.

Year	Tonnes
2014	13,371
2015	12,699
2016	8,425
2017	6,298
2018	6,879
2019	2230

Source: PVN, 2020.

Table 8.3: Amount of Non-water-based Drilling Mud.

Year	Tonnes
2014	4,553
2015	3,367
2016	1,739
2017	525
2018	1,207
2019	589

Source: PVN, 2020.

8.4 Response

Oil and gas sector sets out solutions of improving oil recovery coefficient and maintaining optimal oil and gas exploitation output level; intensive investment for dominating the high-tech services market, such as seismic explosion; drilling for exploration and exploitation in deep-water and offshore areas, with complex geological conditions; actively expanding investment activities to exploit oil and gas abroad; diversifying gas consumption market, supplying to electricity, fertilizer, chemical production, industries, transportation and civil industries; building and expanding petrochemical refineries; studying the possibility of connecting the East and Southwest pipelines as the basis for connecting the pipeline network with ASEAN countries, striving to reach the national gasoline reserve level: 60 days of average consumption in 2020 and 90 days in 2025, according to the **National Energy Development Strategy** until 2020, with a vision to 2050.

Many policies and regulations related to ensuring marine environmental safety and security in oil mining and handling of oil mines have been developed and applied effectively. There have been almost no oil spills from oil and gas exploitation and exploration activities. Measures to protect the environment during drilling and oil and gas exploitation are being implemented.

To assess the impact of activities arising from oil and gas exploration and exploitation activities, PVN requires oil and gas companies/contractors to conduct marine environmental monitoring activities (water and sediment) before conducting field development drilling activities and once every 3 years during the mining period.

For drilling fluids and mud: During use, the drilling fluid is always controlled and circulated to be reused to the maximum extent, minimizing the amount of waste discharged into the marine environment. After the end of the drilling campaign, the original synthetic drilling fluid is recovered,

transported ashore and handled by the hazardous waste contractor. Drilling mud discharged from drilling is treated in accordance with *QCVN 36:2010/BTNMT* - Technical regulation on drilling fluids and waste mud from offshore petroleum works.

For wastewater from oil and gas exploitation: The water accompanying the exploited product is treated to reach the standard for oil content in water, <40ppm, before being discharged into the sea, in compliance with *QCVN 35: 2010/BTNMT* on wastewater from oil and gas works. An online oil content meter is installed at the outlet of the extraction water treatment system. If the content exceeds 40ppm, the system's exhaust valve is automatically locked to prevent water discharge into the sea, and the circulation valve will open to bring unsatisfactory water to be circulated back to the system for further treatment.

For domestic waste: Solid waste is classified and strictly managed offshore according to *BD-HSE P-0010* waste management process.

For hazardous waste: After the entire drilling is completed, a large amount of the original synthetic drilling fluid was recovered and transferred to the contractor for hazardous waste treatment, in compliance with the provisions of *Circular 36/2015/TT-BTNMT* on hazardous waste management and *Circular 22/2015/TT-BTNMT* regulating the environmental protection of offshore petroleum activities.

Shifting to innovative renewable energy is also gaining support, with solar power and offshore wind power attracting new investments.



PART 3

**BLUE ECONOMY
DEVELOPMENT**

9 Blue Economy Initiatives

In 2012, ministers of the EAS region adopted the blue economy paradigm, and provided the definition in the Changwon Declaration 2012. The concept of blue economy was developed to respond to the challenge of promoting economic prosperity and poverty alleviation in the coastal and marine areas while ensuring climate resiliency and the sustainability of oceans and the resources therein.

This section provides examples of best practices and initiatives that transform the ocean-based economy to a more sustainable, innovative, resilient and inclusive development, i.e., *blue economy*.

9.1 Sustainable Fisheries

9.1.1 Community-based Conservation and Sustainable Harvesting of *G. lalandii* crab of Cu Lao Cham, Quang Nam province

The Cham Islands belong administratively to Hoi An City, Quang Nam province, and is an MPA with great marine biodiversity. The island's rich biodiversity includes a species of large crab locally named "Cua Da" (*Gecarcoidea lalandii*) of the Cham Island. While *G. lalandii* is a species associated with marine fauna, individuals mainly occur in terrestrial forests and when carrying eggs, females migrate to the coast where they release the eggs in coastal hollows during their breeding season. The Cham Island's *G. lalandii* is considered a "bridge" connecting terrestrial forests with the marine environment and is a biological indicator of the health of terrestrial and marine ecosystems. This is one of the important resources closely associated with local people's lives as it significantly contributes to their livelihoods. Unfortunately, the Cham Island's *G. lalandii* is prone to be severely depleted due to overharvesting and a substantial increase of tourists to the island.

From 2010 to 2013, an initiative of "Community Participation in the Cham Island Nature Rehabilitation and Sustainable *Gecarcoidea lalandii* Crab Harvest" was launched by the Cham Island authority and communities with support given by the Global Environment Facility-Small Grants Programme (GEF-SGP) Vietnam and the Hoi An City People's Committee (PC) in order to conserve, manage and harvest the Cham Island's *G. lalandii* crabs in a sustainable manner. A model of the Cham Island's *G. lalandii* co-management was effectively demonstrated and have good impacts.

Environmental impact:

- The sound conservation and harvest of the Cham Islands' *G. lalandii* crabs has contributed to mitigating and adapting to climate change, and enhancing the protection of Cu Lao Cham natural forest.
- Communities reduced exploitation, thereby protecting the coral reefs and seagrass beds.
- The Cham Islands' community group for sustainable *G. lalandii* crab conservation and harvest has managed the harvest by employing an **ecological labeling tool**. In three years from 2013 to 2015, there have been 14,486 *G. lalandii* crabs including 9,890 males and 4,596 females harvested and ecologically labeled.

Socioeconomic Impacts:

- The sound *G. lalandii* crab conservation and harvest in the Cham Islands have contributed to raising awareness of actions among local communities to protect the environment and wildlife at local and national levels.
- The initiative of sustainable *G. lalandii* crab conservation and harvest in the Cham Island represents a proactive approach to protecting the community's right to access to natural resources.
- For duration of three years, the project involved the participation of local communities and authorities to develop a theoretical framework for mobilizing local people in the protection and sustainable harvest of the Cham Islands *G. lalandii* crab.
- Benefits gained by the group from the harvest of *G. lalandii* crabs are shared with those gained from tourist services.
- The community-based model for sustainable the *G. lalandii* crab conservation and harvest has significantly contributed to the conservation of the species in the Cham Island. This is clearly indicated by the fact that 75% of *G. lalandii* crab populations well protected in the island and the income of the group members (43 members) has increased as the price per kilogram of the crab. The price per kilogram has risen from VND 200,000 prior to the establishment of the group to VND 500,000 in 2013, VND 700,000 in 2014 and 850,000 VND in 2015.

Ecotourism Development:

- The initiative of "community group for sustainable *G. lalandii* crab conservation and harvest in the Cham Island" has contributed to local ecotourism development. The eco-labeling of *G. lalandii* crabs demonstrates the great effort that local community has put into biodiversity conservation and environmental protection. The *G. lalandii* crabs with eco-labels are a tourist product in the Cham Island. Tourists visiting the Cham Island not only enjoy the local natural land/seascapes and culture, but are also being made aware of the local people's sustainable management of the *G. lalandii* crabs. Ecotourism has created opportunities for improving local people's livelihoods and the quality of their lives. In 2013 there were more than 485 people from 169 households among a total number of 560 households, directly involved in ecotourism activities.

- This model has been and is being learnt and replicated by various marine protected areas in other islands, such as Con Co, Ly Son and Phu Quoc.

Policy Impacts:

- Upon the completion of the project (Dec.31, 2012), Tan Hiep communal PC of Hoi An City issued a decision on the establishment of a community group for sustainable *G. lalandii* crab protection and harvest in the Cham Islands on February 2013, and approved its *G. lalandii* crab management regulations and other relevant legal documents in order to ensure all the legalities of the group's operation in the locality.
- The group has now managed the harvest of *G. lalandii* crabs on the island by employing the eco-labeling tool. *G. lalandii* crabs that are harvested according to the regulations should be eco-labeled and legally traded on the local market.
- Community institutions were established and maintained, facilitating the state management agencies to develop and approve community's commitments to serve as a legal basis for supporting conservation and ecotourism development activities in the island.
- The Cham Islands' community model for sustainable *G. lalandii* crab conservation and harvest is now being maintained through coordination between four local partners including authorities, businesses, conservationists/scientists and local people.

Sustainability of the Project:

- In 2014, the Cham Island's community group for sustainable *G. lalandii* crab conservation and harvest under the supervision and advice of the Tan Hiep Communal Association of Farmers, received financial assistance from the program of the Mangroves for the Future (MFF) of the International Union for Conservation of Nature (IUCN) to further consolidate the linkage of the four local partners (Authorities, Businesses, Conservationists/Scientist and Local People) based on responsibilities and benefits in order to further enhance the group's capacity to protect and sustainably harvest *G. lalandii* crabs [15].

9.1.2 Ecological Shrimp Farming Combined with Mangroves Forest Development

The Mangroves and Markets (MAM) project (conservation of mangroves based on sustainable shrimp farming and emission reduction) has been implemented in Ca Mau Province since 2012 with the support of the International Climate Initiative funded by the Ministry of Environment, Nature Conservation, Building and Nuclear Safety of the Federal Republic of Germany (BMUB), and implemented by the SNV Netherlands Development Organization (SNV) and IUCN.

MAM's model of organic shrimp farming in mangroves ensures that shrimp ponds must have 50% coverage of mangroves, the seed are of high quality and farming intensity should not exceed 20 shrimp/m²/year.

After three years of implementing Phase I (2013-2016) in Ca Mau, nearly 800 households have attained Naturland certification, and their shrimps have been paid for with high price by Minh Phu Seafood Group. More than 200 farming households also received payment for forest environment services, totaling VND 300 million. There are 80 ha of mangrove forests that have been additionally planted in the area of shrimp farms by 402 additional farmers, to achieve the required 50% mangrove coverage. Furthermore, 12,600 ha of forest are protected from deforestation and 1,000 households are supported in building standard toilets. The percentage of forest cover increased from 39% in 2013 to 44% in 2015. The young and sparse mangroves in most of this area have become mature. Households participating in the project have planted forests to at least 40% cover rate and they have signed contract with the Forest Management Committee to continue planting to increase the mangrove cover rate to 50% in 5 years.

With the success of phase I, the project (2016-2020) was expanded in phase II to other provinces, such as Tra Vinh and Ben Tre [22].

Since 2016, Ca Mau has become a leading province in piloting payment of forest environmental services at VND 500,000/ha/year for contracted households. This is an income source to help people while enhancing their responsibility in forest protection. It also helps to maintain the environment for shrimp-ecological forest farming, while improving people livelihoods.

At present, 25% of the total shrimp - forest area of Ca Mau has received international certification (nearly 20,000 ha), and about 4,200 households have achieved certificates, such as Naturland, EU, and Silva shrimp.

According to scientists, the ecological shrimp farming system develops independently and self-produces food without affecting the water environment. In addition, the ecological farming model helps to restore mangroves, adapt to climate change, exploit the natural economic value created by mangroves, improve production efficiency, increase income for farmers, and perform the role of linking the farmers with seafood enterprises [26].

In 2017, the shrimp-forest area in the Mekong Delta region was nearly 200,000 ha, the largest compared to other types of farming, such as improved extensive, shrimp-rice, semi-intensive and intensive. The development of shrimp farming in the mangrove forests in the Mekong Delta over the years has shown a potential advantage against impacts of climate change and sea level rise. If the shrimp-forest development goal is achieved, only in Ca Mau and Bac Lieu provinces, with the farming area of 88,526 ha and according to the proportion of forest accounting for 60%, there will be 45,763 ha of forest. Consequently, according to experts' calculations, the carbon sequestration rate is 7.3 million tonnes of CO₂-e/ha/year, while aquaculture production reached 21,956 tonnes worth VND 3,794 billion. In 20 years, if the minimum percentage of 70% mangrove cover is achieved, the sustainability effect would be even greater. That is the goal of shrimp-forest development in line with green carbon growth and green growth. Shrimp farming in mangroves is a good mechanism

to ensure a harmonious benefit between economic development and forest protection, which is considered to be the most effective solution to restore, protect and develop mangrove forests in coastal provinces [33].

Currently the International Cooperation Center for Sustainable Aquaculture and Fishing (ICAFIS) under the Vietnam Fisheries Association (VINAFIS) is working with OXFAM, a Non-Governmental Organization and its local partners on the implementation of the Sustainable - Equitable shrimp production value chain development project in Vietnam (SusV), funded by the European Union. Through the Project, ICAFIS will promote the formation of shrimp chain links, thereby sharing the benefits and responsibilities of the parties in production and resource protection, especially in the context of climate change.

In the coming years, ICAFIS will continue to cooperate with the Directorate of Fisheries (of MARD), universities and research institutes to organize training courses for localities across the country to improve the quality and production of organic shrimp; expanding mangrove-shrimp farming area in association with international certification; building Vietnamese shrimp brand associated with ecological and organic products; promoting trade and expanding markets for mangrove-shrimp products; create equal mechanisms among businesses in the development of international certification; strengthening linkages, publicity and transparency in sharing responsibilities and rights among parties in the shrimp value chain and forest protection; completing the legal corridor to encourage businesses and organizations to participate in the model of organic shrimp farming with international certification [12].

9.2 Conservation of Habitats for Ecotourism

Initiatives to support the development of blue economy are studied and being applied. For example, in the tourism sector, many of the achievements of the EU-funded Environmentally and Socially Responsible Tourism Capacity Development Program (ESRT), 2011-2016 have been replicated and applied. The Sustainable Tourism Blue Lotus label is issued to the accommodation establishments that meet the standards of environmental protection and sustainable development.

9.2.1 Rehabilitation and Conservation of Nyapalms at Cam Thanh Commune, Hoi An City, Quang Nam Province

Nipa palm is a mangrove-associated species found predominantly in the downstream of Thu Bon River, particularly in Cam Thanh commune, Hoi An City. As a World Heritage Site, Hoi An attracts thousands of tourists every year. Nipa palm forest supports a diversity of aquatic organisms and bring in income for local people, who depend on the catching of economically valued species of fish, shrimp and crab. Unfortunately, these resources have been decreasing due to unsustainable nipa palm harvesting, and this has resulted in the decline of income that local people who depend on fishing in nipa palm forests for their livelihoods.

From 2010 to 2013, Cam Thanh Communal Association of Farmers (of Hoi An city) implemented a project on “Rehabilitation and conservation of nyapalms at Cam Thanh Commune, Hoi An City, Quang Nam” with financial assistance provided by the GEF Small Grants Programme (SGP) in Viet Nam to protect land in the Thu Bon River mouth from erosion caused by waves and winds, and contribute to Cam Thanh nipa palm conservation and sustainable natural resource exploitation in this area.

The main results and impacts of the Project include:

Environmental impacts:

- The project has contributed to the conservation of a native species *Nypa fruticans Wurmb* (or “Bay Mau” in local language) over an area of about 84 ha in Cam Thanh commune. Nipa palms are now grown along major rivers and small canals in rows of 3-20 meters wide, providing a rich habitat and breeding ground with high biodiversity and economic values.
- The establishment and development of Cam Thanh nipa palm protected area in Hoi An city, in addition to a cluster of Tam Hai coral reef ecosystem protected area in Nui Thanh and the Cham Island’s MPA, has created a network of marine conservation areas in Quang Nam.

Socioeconomic Impacts:

- Through the implementation of project’s activities, local people and authorities have become aware of the importance of nipa palm forest and as the result, they have taken actions to rehabilitate the forest.
- The project has involved all the stakeholders in effective management and protection of nipa palm forest, especially communities directly exploiting nipa palm, combining conservation of nipa palm forest and developing local ecotourism.
- The conservation of Cam Thanh nipa palm forest has efficiently supported local community’s livelihoods and local socioeconomic development. There were about 20% of households in Cam Thanh commune relying on harvesting of nipa palm leaves for their livelihoods. Nipa palm leaves are used by local people to make thatched rooves for houses.
- During the project implementation and upon its completion, Cam Thanh has developed and provided homestay services for tourists in its nipa palm forest (there are about 50 households engaged in this service). The rowing of coracles has provided another livelihood option for the villagers and increased their income by 21% monthly.

Ecotourism Development:

- In Cam Thanh commune, ecotourism is based on the principles of nipa palm conservation and sharing of benefits among local people. The local community are important players in the conservation of nipa palm forest that serves as base for maintaining local ecotourism.
- Products made of bamboo and nipa palm by Cam Thanh craft village are being sold as unique tourist products. The conservation of Cam Thanh nipa palm forest has created a stockpile of these materials for the craft village. Therefore, the planning of the craft village development also takes into consideration the benefits gained from the conservation of nipa palm forest.

- The rowing of coracles in the Cam Thanh nipa palm forest is a prospective livelihood. In recent years, the number of local households engaged in this tourist service has been increasing and this has resulted in increased income. Average monthly income of households engaged in providing coracle rowing service increased to VND 4.5 million from VND 3.7 million, which they earned before this tourist service was offered.

Policy Impacts:

- A community group of 27 tourism operators operate in accordance with rules discussed and agreed to by the local community. The local ecotourism has been developed based on the principles of nipa palm forest conservation and benefit sharing among local people.
- The project has involved local communities, authorities and businesses participating in the exploitation of resources from the nipa palm forest in a well-coordinated manner to support local livelihoods and ecotourism development.

Sustainability of the Project:

- Upon the completion of the project, there are four community groups established in Cam Thanh commune, which are engaged in aquaculture, bamboo and nipa palm craft, rowing of coracles and tourism service. Every year, the city provides three training courses for local people (about 25-30 participants each of course) in order to improve their capacity in ecotourism operation. In addition, every year the commune also holds three meetings to provide all members of the community groups the opportunity to exchange their experiences in ecotourism operation.
- The local government has proposed a system for charging entrance fee to the Cam Thanh ecological buffer zone in order to diversify financial resources and facilitate the community participation.
- During the project implementation and upon its completion, there were many research projects developed and undertaken. The results produced by the projects are the beginning of ecotourism development in the Cam Thanh nipa palm area contributing to the improvement of local community's livelihoods and socioeconomic conditions as well as regional biodiversity conservation.

9.2.2 Coral Reef Conservation Combined with Developing Community-based Ecotourism in Tam Hai Commune, Nui Thanh district, Quang Nam Province

Tam Hai commune, an island commune in Nui Thanh district, Quang Nam province, boasts a marine ecosystem with over 41 seaweed species, 168 fish species. The coral reefs in the Thuan An village are key breeding grounds for various marine species in region. Tam Hai commune has been planned by the provincial authority to become a special tourist destination located in a non-trade area of Chu Lai open economic zone. From 2010 to 2013, the GEF SGP supported the implementation of the project on "Conservation and sustainable use of coral reef ecosystems in Tam Hai Commune" in order to preserve and use the coral reef ecosystem sustainably and develop community-based ecotourism in that area.

The impact of the Project can be summarized as follows:

Environmental impacts:

- The project successfully established a community-level coral reef ecosystem protection area covering an area of 1700 ha including a core zone of 13.12 ha, a rational exploitation area of 1,537 ha, a community development area of 54.4ha and a tourist development area of 50ha. The remaining area is included in Mui Ban Than (Ban Than Cape), Hon Dua Islet, Hon Mang Islet.
- The establishment and development of the Coral Reef Ecosystem Protection Zone in Tam Hai, Nui Thanh in combination with the Cham Island's MPA and the Cam Thanh Nipa Forest Protected Area in Hoi An constituted a marine conservation network in Quang Nam, contributing to the multiplication of conservation benefits and enriching the marine biological resources, enhancing the abundance of fish, and improving the living conditions of the coastal fishermen.

Socioeconomic Impacts:

- The project successfully encouraged the community to participate in sustainable exploitation of marine resources, in developing ecotourism, enhanced capability in management, protection, reasonable and sustainable exploitation of natural resources, preserving the environment and the biodiversity of the coral reef ecosystem in the locality.
- The project provided support in obtaining capital loans for those women who mainly earned their living in the core zone of the Tam Hai Coral Reef Ecosystem Protection Area so that they could shift to the environmentally friendly jobs, contributing to the conservation and sustainable utilization of the coral reef ecosystem.
- The community has actively collaborated in activities with a number of other organizations and projects.
- The reasonable exploitation and use of fishery resources and natural resources from the coral reef ecosystem and the seaweeds in Thuan An gave over 90% of the fishing households in Thuan An village considerable economic benefits, resulting in an annual income of over VND 8 billion just from catching lobsters.
- The project also organized some pilot eco-tours in the project area for the community to study.

Policy Impacts

- The project worked out regulations for the operation of the coral reef ecosystem protection zone in order to protect all targeted species, such as corals, seagrasses, and seaweeds, to protect the core zone and maintain the exploitation zone in a sustainable way. The project came up with concrete regulations that helped ease the exploitation pressures by banning or limiting types of exploitation that might lead to destruction of species, or by periodic closure to fishing, and banning of some exploiters.
- The project established community-based groups, which included an environmental sanitary group as a key group in the village's solid waste management.

- The project involved the participation and cooperation of the local authority, the border guard unit and the fishery inspectorate in the protection of natural resources.

Sustainability of the Project:

- The project helped establish the Management Unit of the Tam Hai Coral Reef Protected Area and three community-based groups with responsibility for protecting the coral reef ecosystem, managing sustainable fishery exploitation activities, and developing community-based ecotourism. These groups are presently operational on a voluntary basis, joining their efforts in designing the regulations on operation for themselves and the Management Unit.
- Today, the local authority and people are continuing their coordination with concerned agencies and organizations in sharing responsibilities of protecting the environment, the coral reefs and the related resources of potential benefits in order to keep exploiting and using them in a sustainable manner, thus contributing to the local socioeconomic development;
- Currently in place is the scheme of revolving loan valued at VND 100 million (approximately US\$ 4,500), started in 2011 and supported by GEF SGP for investment in food and beverage service, animal husbandry and development of reasonable fishery exploitation managed by the Women's Association of Nui Thanh district, Quang Nam province under the project "Loans to support the livelihood of women in Thuan An village". The beneficiaries of this scheme are those women whose family livelihood mainly depends on the core zone of the Tam Hai Coral Reef Ecosystem Protection Zone in Thuan An. Each loan is valued at VND 5 million per household for a 24-month period with a monthly interest rate at 0.65% (7.8% annually);
- During the implementation and after the completion of the project, many studies were proposed and successfully conducted, resulting in several suggestions and recommendations to support conservation and development schemes in Thuan An village, Tam Hai commune. These included studies on the construction of artificial reefs, the treatment of solid waste, and coral reef ecotourism, thus contributing to the future improvement of the community livelihood, local socioeconomic development, and the regional biodiversity conservation.

9.2.3 Integrated Marine Conservation and Ecotourism Development in Kien Giang

Recently, the Department of Agriculture and Rural Development of Kien Giang held a meeting to collect comments on the implementation of the Coral Reef Protection and Conservation Project in combination with environmentally friendly scuba diving at Bo Dam Islet, Nam Du Commune, Kiên Hải district.

Bo Dam Islet (also known as Bo Tra Islet) is surrounded by rocky or dead corals and outside is a reef. Compared to other reef areas in Nam Du, the reefs around Bo Dam Islet are better (with an average cover of about 23.5% - 31.44%). The sea area for the project is 11.4 ha.

According to local people, there are often a number of marine fish (grouper, rabbit fish, etc.) in the coral reefs. However, at present, not enough attention has been given for the protection of coral reefs here due to many reasons. Often, local people enter this area for illegal exploitation, which affect the condition of corals.

Hien Cong Company wishes to contribute to the protection and conservation of coral reefs at Bo Dam Islet, and at the same time have a solution to attract tourists to the Nam Du archipelago. The PPC has approved the policy allowing this Company to invest in the protection and conservation of coral reefs in combination with sustainable tourism development. The pilot project for the first phase is 2 years [39]. It is projected that this project will contribute to sustainable and inclusive local socioeconomic development.

9.2.4 Ecotourism in Can Gio Mangrove Biosphere Reserve

Can Gio Mangrove Biosphere Reserve in Ho Chi Minh City was recognized by UNESCO as a World Biosphere Reserve on January 21, 2000. It is considered by experts to be the most beautiful mangrove forest in Southeast Asia. It was restored after being completely destroyed by toxic chemicals during the American war.

Can Gio is considered an ecotourism center “playing a very important role in the development of the southern key economic region”, of which mangrove ecotourism is of the highest value. The typical ecosystem of coastal mangroves is a distinctive feature that makes Can Gio different from other destinations.

The Can Gio Mangrove Biosphere Reserve has been planned by Ho Chi Minh City to be developed into an ecotourism area for tourists, and a place for studies by domestic and foreign students and scientific researchers. Ecotourism activities in the Biosphere Reserve of Can Gio are being exploited mainly in the area of Lam Vien Can Gio (sub-zone 17), Vam Sat tourist area (sub-zone 15a), Dan Xay ecotourism area, City youth picnic area (sub-zone 21), and some forest ecotourism areas in An Thoi Dong commune. Coming to Can Tho Mangrove Forest, visitors can immerse themselves in the vast natural space with lush green canopy and enjoy the fresh atmosphere. Moreover, this is an opportunity for visitors to have interesting experiences about nature along with useful lessons in awareness about the role and value of mangroves.

9.2.5 Green Fins, An Environment-friendly Diving Industry Support Tool

The Green Fins is a public-private partnership initiative of the United Nations Environment Programme (UNEP) wherein dive operators are given the opportunity to be involved in helping to reduce the negative impacts of improper diving practices and contribute to the protection of coral reefs. Although

scuba diving promotes the economic growth of the tourism industry, irresponsible diving activities can negatively impact and threaten coral reefs, as well as the marine and coastal environment. The Green Fins approach aims to promote sustainable diving practices to protect coral reefs and marine life.

The Mangroves for the Future (MFF) has been very active in promoting the Green Fins approach, especially in Vietnam, where a regional project supporting the Green Fins approach was implemented in 2014.

With the launch of the Green Fins Toolbox, developed through a public-private partnership initiative working with diving businesses, communities and governments in Southeast Asia and South Asia, the Green Fins approach has become easier to implement for stakeholders in the tourism industry. The toolbox was launched the Asia Dive Expo (ADEX) -- Asia's largest and oldest diving fair.

Green Fins provides guidance on hard and soft coral reefs and know-how in the diving industry. It helps small- and medium-sized businesses to recognize the need for conservation and turn environmental risks into opportunities, ensuring a sustainable industry, protecting the marine ecosystem, creating long-term livelihoods, and contributing to the implementation of the 2030 Sustainable Development Agenda.

Green Fins are deployed and replicated in Nha Trang (Khanh Hoa), Cu Lao Cham (Quang Nam), Quang Binh and many other localities in Vietnam.

9.3 Investment Opportunities in Blue Economy

9.3.1 Development of Green Port Model

Building a green port following the model of balancing environmental protection and the demands of economic development is a strategic trend in the development of seaports around the world. Green port is a port focusing on development that is line with blue economy growth, with a long-term plan to meet current and future needs and achieve the requirements of environmental protection, lower carbon footprint, and port international integration.

Following the Prime Minister's direction on the research and application of the seaport development model towards a "green port", the Ministry of Transport has assigned the Vinamarine to deploy the "Green Port Development Project in Vietnam" by completing the legal and policy corridor and mechanisms to more effectively control sources of impacts, minimize environmental pollution, reduce greenhouse gas emissions, and economically and efficiently use energy in port operation in Vietnam. Lach Huyen Port (Hai Phong) has been chosen as a pilot model of a green port in Vietnam.

Box 9.1 Lach Huyen Port will Develop First Pilot Green Port Model in Vietnam

According to Hai Phong Maritime Port Authority, the current seaport system model does not meet the demands of cargo transport in the period of international trade integration. Therefore, Hai Phong needs a new seaport that applies advanced technology in the port management and operation and balances the objectives of economic development with environmental protection. Hai Phong international gateway port (Lach Huyen port) was chosen to build a pilot model of green port.

In order to build Lach Huyen port according to green criteria, it is necessary to control smoke and dust at the port by promoting the application of science and technology, limiting backward means of transporting goods, encouraging vessels utilizing new technology to use the port. At the same time, a master plan for the installation of energy-saving lights and equipment, and renewable energy supply, management of water resources at the port and a water quality monitoring system must be developed. Wastewater should be strictly controlled to avoid environmental pollution; science and technology applied to determine and manage ballast water; waste reception facilities must be built, and daily waste collected when ships arrive at the ports.

9.3.2 Climate Action and Clean Energy Development (Solar, Wind)

a. Solar power

Status

According to EVN's statistics, more than 4,460 megawatts (MW) of solar power were connected to the grid as of June 2019. Specifically, 82 solar power plants, with a total capacity of about 4,464 MW, have been inspected and successfully energized by the National Electric Net Dispatch Center. These projects are entitled to the electricity purchase price of US\$ 9.35/kWh, for a period of 20 years under *Decision 11/2017/QĐ-TTg* of the Prime Minister. Among them, there are 95 solar power plants under the control at the National level (A0) with a total capacity of 4,819 MW; 10 power plants are under the control of regional dispatch level with a total capacity of 275 MW.

The aforementioned figures show that the installed solar power capacity has far exceeded the targets of the adjusted Power Planning 7 (*Decision No. 428/QĐ-TTg*), in which the solar power capacity in the whole country is to reach 850 MW by 2020 and increase to 4,000 MW by 2025.

In addition to the large solar farms, solar power projects, such as solar panels installed on the roofs and solar panels installed on water surfaces (floating systems), are also developed strongly in the southern areas of Vietnam.

According to the Southern Power Corporation (EVN SPC), in the 21 southern provinces and cities managed by the Company, there are more than 1,200 grid-connected rooftop solar power works with a total capacity of over 20 MW. In Ho Chi Minh City, there are 1,432 sources of rooftop solar power with a total capacity of 17.5 MW. These projects are invested and built by households or different agencies and organizations. Central Power Corporation (EVNCPC) stated that as of April 2019, the Central - Highlands region had more than 330 customers installing rooftop solar power connected to the general power grid with a total capacity of more than 2.1MW.

Da Nhim - Ham Thuan - Da Mi Hydroelectric Joint Stock Company (DHD) under Power Generation Corporation 1 (EVN-GEN1) has invested in building a floating solar power plant with a capacity of 47.5 MWp, on an area of 57 ha of Da Mi hydroelectric lake, belonging to Tanh Linh and Ham Thuan Bac districts, Binh Thuan province. Total investment is about VND 1,500 billion. The project has completed phase 1 and put into operation in May 2019 with capacity of 20.5 MW.

In Binh Dinh, Fujiwara Solar Power Plant has been completed and put into operation in Nhon Hoi Economic Zone with the capacity of 50 MW; and three Phu My solar power plants of Vision Clean Energy Development Co., Ltd are under construction in My Thang and My An communes, Phu My district with a total capacity of 330 MW.

It should be emphasized that solar power has been a reliable alternative source for severe electricity shortage in the first half of 2019, when prolonged hot weather occurred. This also demonstrates that the outstanding advantage of solar power technology is fast installation and safe operation, especially in off-grid locations.

Pressures

The development of solar power in recent years is quite strong and rapid, causing many difficulties for the operation and regulation of the electricity system. The causes of the recent bullish development of solar power are likely to be: (1) The solar power support policy (*Decision No. 11*) provided an attractive price (US\$ 9.35¢/kWh), which has attracted a lot of domestic and foreign investors to develop solar power sources; (2) Solar power is the most advanced technology in current renewable energy technologies (investment rate and electricity price are low and declining, good solar potential in Vietnam, fast and safe installation); (3) The deadline of *Decision No. 11* is June 30, 2019 so the projects raced to complete and put them into operation. The strong and massive development of concentrated solar power projects in some provinces, such as Ninh Thuan, Binh Thuan, Dak Lak has caused the 110 kV, and 220 kV grid overload in these areas.

Technically, the electricity generation capacity is unstable due to the dependence on solar radiation intensity and low power factor (only about 15% to 20%), so when building grid-connected solar power systems, it is necessary to have other backup power sources, such as hydroelectricity.

In addition, Vietnam also has problems related to the lack of trained and experienced human resources and the lack of domestic auxiliary technology (most of equipment and materials in the solar power system are imported).

Solutions

The Government of Vietnam has issued many legal documents that guide and encourage the development of solar power, such as the Prime Minister's *Decision No. 2068/QĐ-TTg* dated November 25, 2015 on the **Strategy for renewable energy development of Vietnam until 2030, vision to 2050**, and *Decision No. 11/2017/QĐ-TTg*, dated April 11, 2017 of the Prime Minister on supporting solar power development. The state currently compensates for solar power and it is forecasted that after 2025, solar power prices will be able to compete fairly with traditional electricity prices.

Decision No. 02/2019/QĐ-TTg dated January 8, 2019 amended and supplemented some articles of the Prime Minister's *Decision No. 11/2017/QĐ-TTg* dated April 11, 2017 on providing incentive mechanism to encourage the development of solar power projects in Vietnam. The Ministry of Industry and Trade's *Decision No. 2023/QĐ-BCT* dated July 5, 2019, approved the Program to promote development of rooftop solar power in Vietnam in 2019-2025.

Solutions on training human resources, developing auxiliary industries and especially the application of new results on the operation of integrated electric systems will be further studied to develop solar power effectively in sustainable way.

b. Wind power

Status

A World Bank study shows that Vietnam has a great advantage in wind due to a long coastline of more than 3000 km and many islands where an average wind speed is of 5m/s or higher at 65m the whole year round, equivalent to a total capacity of 512 GW. In particular, more than 8% of Vietnam is ranked as having very good wind potential (wind speed of 7-8 m/sec at the altitude of 65m), that can generate more than 110 GW.

According to the depth, topography and average annual wind speed (high, medium and low levels) and based on the 10-year data series of NOAA satellite wind measurement, Vietnam's coastal area can be divided into 5 areas as follows (along the coastline):

- Quang Ninh - Quang Tri (gentle slope, shallow sea, moderate wind energy density)
- Quang Binh - Quang Ngai (gentle slope narrow sea, low wind energy density)
- Binh Dinh - Ninh Thuan (narrow and shallow sea, low wind energy density)
- Binh Thuan - Cape Ca Mau (gentle slope shallow sea, high wind energy density)
- Cape Ca Mau - Kien Giang (shallow sea, moderate wind energy density)

The coastal areas of Vietnam, especially in the South, where the depths are up to 30-60 m, have good potential to develop marine wind power. In particular, the sea area with the depth of 0-30 m from Binh Thuan to Ca Mau is about 44,000 km² and has an average wind speed reaching more than 5-8m/s at the altitude of 100 m (according to wind data in Phu Quy and Con Dao). Currently, the first marine wind farm with capacity of nearly 100 MW has been operating, and it is being studied for the scaling up, deployment and increase to 1,000 MW (10 times more) by 2025.

Table 9.1: Potential Capacity of Marine Wind Energy at the Depth of 0-30m.

Region	Area (km ²)	Wind energy density (MW/km ²)	Potential capacity (GW)
Gulf of Tonkin	30,770	400	12,308
Quang Binh - Quang Ngai	4,660	500	2,330
Binh Dinh - Ninh Thuan	2,483	500	1,242
Binh Thuan - Ca Mau Cape	43,770	850	37,205
Ca Mau Cape - Kien Giang	29,390	400	11,756
Total	111,073		64,841

Source: Du Van Toan, Nghiem Thanh Hai, Sea and Islands Research Institute, 2017. Current status of world sea wind energy and the proposal to develop Vietnamese sea wind energy towards the goal of reducing climate change impacts ". Journal of Environment, No. 1, 2017. [13]

Table 9.2: Potential Capacity of Marine Wind Energy at the Depth of 30-60m.

Region	Area (km ²)	Wind energy density (MW/km ²)	Potential capacity (GW)
Gulf of Tonkin	29,240	550	16,082
Quang Binh - Quang Ngai	7,100	500	3,550
Binh Dinh - Ninh Thuan	2,111	500	1,056
Binh Thuan - Ca Mau Cape	67,980	1000	67,980
Ca Mau Cape - Kien Giang	35,980	500	17,990
Total	142,411		106,658

Source: Du Van Toan, Nghiem Thanh Hai, Sea and Islands Research Institute, 2017. Current status of world sea wind energy and the proposal to develop Vietnamese sea wind energy towards the goal of reducing climate change impacts ". Journal of Environment, No. 1, 2017. [13]

The total potential capacity of the 100-meter-layer of all 5 Vietnamese sea areas reaches 64,841 GW in areas with the depth of 0 - 30 m reaches, and 106,658 GW, for the areas with the depth of 30-60 m. In particular, the area of Binh Thuan - Ca Mau (0m-30m, 30m-60 m) of 100m layer has the capacity of 26,262 GW and 67,980 GW respectively (the total is 94,242 GW). In fact, the wind turbines on Phu Quy and Bac Lieu islands have operated well and brought high economic efficiency.

Currently, there are nine wind farms operating with a total capacity of 304.6 MW, of which the largest one is Bac Lieu wind farm with capacity of nearly 100 MW, while the smallest is the Phu Quy wind with capacity of 6 MW connected to independent grid (not to the national grid) on Phu Quy island, Binh Thuan province. The rest are seven wind power plants with capacity of less than 50 MW (Source: EVN).

The major project is the great offshore wind power project Thanglong Wind, Binh Thuan province, with a capacity of 3,400 MW, and with a capital of up to US\$ 11.9 billion. If this project is successfully implemented, it will contribute to providing a huge amount of clean electricity for Vietnam's electricity system, ensuring energy security, climate change mitigation, and environmental protection. In addition, the project employs domestic contractors, so it increases the localization rate and will bring Vietnam to a new step in the field of wind power.

Currently, many wind power projects are being developed and submitted to the Ministry of Industry and Trade for approval, especially in the Central and Southern regions. According to wind energy survey data of the German Agency for International Cooperation (GIZ), there are dozens of wind power projects registered for investment in the southern region, especially in the provinces of Bac Lieu, Tra Vinh and Soc Trang. Similarly for some provinces in the South Central Coast, for example in Binh Thuan, the Phuong Mai 1 Wind Power Plant (capacity of 30 MW); Phuong Mai 3 Wind Power Plant (capacity of 21 MW), Nhon Hoi Wind Power Plant 1 (capacity of 30 MW) and Nhon Hoi Wind Power Plant 2 (capacity of 30 MW) are under construction in the Nhon Hoi Economic Zone. A number of wind power projects in the Central region (such as small capacity projects in Quang Tri) and in the Southern region (such as HBRE Vung Tau project with a capacity of 500MW) are being proposed for approval by the Ministry of Industry and Trade , and these are future investment opportunities.

Vietnam targets for 2030 is to have 6,200MW of wind power. Although Vietnam is a country with great potential for renewable energy, so far, the number of projects implemented is very small and the proportion of renewable electricity in the total amount of electricity produced is negligible.

Pressures

The cost of investing in wind power is still quite high; administrative procedures are one of the major barriers. At present, policies on investment procedures, contracts/prices of electricity trading between the project investor and Vietnam Electricity Corporation (EVN) have not been fully issued.

The turbines are mostly imported and are designed to last about 20 years. Therefore, usually a wind power project is planned to develop over a period of 20-30 years. However, at present, wind power projects have not been properly supported to meet this life cycle of turbines.

Information on geography, tides and wind speed in many regions are lacking, inconsistent and are of low reliability, leading to difficulties for the initial (pre-feasibility) evaluation of a wind power project.

In terms of human resources, Vietnam does not have any specialized training school in the field of “green” energy, so the shortage of leading experts is a major concern.

Solutions

The Government has issued *Decision No. 39/2018/QĐ-TTg* amending and supplementing some articles of *Decision No. 37/2011/QĐ-TTg* dated June 29, 2011 on the mechanism to support the development of wind power projects in Vietnam, with the purchase price of US\$0.085/kWh for inland projects and US\$ 9.8¢/kWh for offshore ones. This is the price that many investors consider to be quite attractive and will be valid until November 1, 2021. The Government is also formulating a price policy to attract more investors in the wind power sector, especially for the offshore wind power projects.

In addition, the Government focuses on the development of training programs in this field in universities and research institutes. Initially, associations and specialized energy organization, with experience were established to advise the Government in the crafting of policies and procedures and identifying technologies to promote the development of the wind power industry in Vietnam. Moreover, the government supports related agencies/organisations to organize the implementation of research projects of high quality, large scale and high applicability and provide the necessary data and information for the wind power development. On February 11, 2020, the Party Central Executive Committee signed *Resolution No. 55-NQ/TW* on the orientation of **Vietnam’s National Energy Development Strategy until 2030, vision to 2045**, which includes the formulation of supporting policies and breakthrough mechanism for offshore wind power development in association with the implementation of **Vietnam Sea Strategy**.

9.4 Orientation and Policies on Blue Economy

In recent decades, Party and Government of Vietnam have set out directions and policies on blue economy or the sustainable development of the ocean economy, as reflected in the important documents below:

- Politburo's *Resolution No. 03-NQ/TW* dated May 6, 1993 on marine economic development tasks in the coming years
- Party Central Committee's *Resolution No. 36-NQ/TW* dated October 22, 2018 on Vietnam's Ocean Economy Sustainable Development Strategy
- *Resolution No. 26-NQ/CP* dated March 53, 2018 of the Government promulgating the Government's Master Plan and 5-year plan for implementation of *Resolution No. 36-NQ/TW* on Vietnam's Ocean economy Sustainable Development Strategy.
- *Directive No. 20-CT/TW* on promoting the development of ocean economy in the direction of industrialization and modernization
- *Directive No. 399/TTg* dated August 5, 1993 on a number of marine economic development tasks in the coming years and *Directive 171/TTg* in 1995 on implementing the *Resolution 03-NQ/TW*.
- *Decision No. 1393/QD-TTg* dated September 25, 2012 approving the National Green Growth Strategy
- *Vietnam's Sea Strategy to 2020 (Resolution 09-NQ/TW* dated September 9/2/2007) and the resolutions and decisions of the Government on the implementation of the Strategy.
- *Integrated Coastal Management Strategy for Viet Nam* until 2020 with a vision to 2030 [10].
- Action plan to implement the *National ICM Strategy* until 2020, vision to 2030 [11].
- Plans related to the exploitation and use of natural resources and the protection of marine and island environment, including those at national, regional and local levels, by sectors and fields.

Relevant policies and laws are analyzed in detail in *Part 5 - Ocean Governance for Blue Economy* of this report.



Can Gio protected area. (Photo by VAS)



Nha Trang. (Photo by M. Ebarvia)

PART 4

STATE OF OCEAN HEALTH
UNDERPINNING THE
BLUE ECONOMY

10 Physical Features, Marine Water Quality, and Key Habitats

10.1 Natural Conditions

10.1.1 Meteorological Features

a. Temperature

From north to south, the climate in coastal areas of Vietnam tends to change from tropical monsoon with cold winters to typical humid tropics with two distinct seasons. The northern coastal region has an average annual temperature of about 23°C. Central and south-central has the hottest and driest weather due to the influence of west wind. The southeast and the south delta have an annual average temperature of 26°C - 27°C.

In the southwest part and the Gulf of Thailand, the average annual air temperature is 27°C - 27.5°C. According to the monitoring data from 1979 to 2019, the maximum air temperature reaches 37.0°C and the lowest temperature was 17.3°C.

All the waters of Vietnam are affected by the northeast monsoon (November-March) and the southwest monsoon (May - October). The effect of the northeast monsoon decreases from north to south and the southwest monsoon is the opposite.

b. Wind

Northern sea: In the northern sea, the northeast winds prevail with frequency of 70% (Hon Ngu Station) up to 80% (Co To Station). Other wind directions have frequency of occurrence ranging from few to 20%. The frequency of occurrence of winds with speed level 5 (>8 meters per second or m/s) is about 20-25 %. In the summer, the wind blows from the south, with frequency of 40% in the north (Co To station), and 35% at Hon Ngu station. However, the frequency of south-easterly winds in the area is quite high (20-25%) while the level 5 wind speed has a relatively high frequency of 15-20 %.

Central waters: In the winter (from November to April), the wind at the seas from Quang Binh to Son Tra tend to move north, with frequency of 70% at Hon Ngu station), and northwest, with frequency of 45% at Dong Hoi station and 32% at Con Co station. Other wind directions have few frequencies up to 20%. Frequency of occurrence of winds with speed level 5 (> 8 m/s) is about 20-25 %. At the

sea from Son Tra to Ca Na, the wind regime in winter is quite complicated due to the presence of high mountains along the coast. In the area from Da Nang to Nha Trang, the wind direction is southeast with quite high frequency (Ly Son: 50%, and Nha Trang: 37%), while the frequency during the calm wind period ranges from 11.4% at Ly Son to 40% at Quy Nhon. The remaining prevailing wind directions are southwest and west, with the frequency of about 30-40 %.

Southern sea: In the southern Vietnam, in the rainy season, the prevailing wind direction is in east and northeast. The wind frequency in the Northeast is 88% at Phu Quy station and 67.6% and at Con Dao Island. At Phan Thiet Station the east wind is 48%, Bac Lieu station: 57%. Maximum wind speed is usually in the northeast and east direction with the speed up to 12 m/s (Vung Tau station), 20 m/s (Phu Quy station), 10 m/s (Bac Lieu station) and 14 m/s (Con Dao Island). In dry season, the prevailing wind direction is west, southwest, the average wind speed is 3-4 m/s, the highest wind speed of more than 20 m/s usually occurs in thunderstorms or storms.

Southwest sea and the Gulf of Thailand: The winds in these sea areas have some main directions: west, southwest, northeast and east, and divided into two distinct seasons. In the rainy season, the wind direction is west, southwest. The northeast wind season lasts from November to April. East and northeast winds have frequency of 62%, and maximum velocity of 14 m/s. During the southwest monsoon, the winds move southwest and the west, with the high frequency (Phu Quy station: 93%, and Phu Quoc station: 80%) and the maximum wind speed reaches 16 m/s (Phu Quoc station).

c. Precipitation and humidity

Northern sea: The rainfall in the summer is about 80% of the total annual rainfall, occurring mainly in July, August and September. During these months, the number of rainy days accounts for about 70%, and regular humidity is over 80%. In winter, although the rainfall is not high (20% of the whole year), it lasts for many days, causing the air humidity to rise to 100% (end of January to mid-March). Due to the influence of hot dry tropical west wind (Laos wind) in the summer, the areas of Ha Tinh and Nghe An are subjected to dry droughts (no rain) lasting from 3 to 7 days, with humidity below 50%.

Central waters: The rainy season is from May to October; dry season is from November to April. Rainfall in the rainy season throughout the Central Region always reaches over 75% of total rainfall throughout the year. Due to the effects of hot, dry westerly winds (Laotian winds) in the summer, the areas of Ha Tinh and Nghe An suffer from drought lasting from 3 to 7 days, with humidity below 50%.

Southern sea: During the rainy season, average rainfall is about 1,200-1,800 mm/year, accounting for over 90% of the annual rainfall. In the dry season, rainfall accounts for only 7%

of annual rainfall. The period of low rainfall or no rainfall usually occurs from January to March, especially in February. The rainfall in the southern sea increases from land to sea, from Ninh Thuan to Bac Lieu. Average rainfall in the sea and coastal areas is 1,200-1,400 mm at Ninh Thuan - Vung Tau; and 1,400-1,600 mm in Ho Chi Minh City - Bac Lieu.

Southwest region and Gulf of Thailand: The precipitation varies between land and islands. On the mainland, annual rainfall is 1,600-2,000 mm. On the islands, it is usually over 2,400 mm. Precipitation patterns have distinct seasonal variations. The rainy season starts from April to November with an average of 130 rainy days, and the total rainfall in this season accounts for about 90% of the total annual rainfall. The dry season starts in December, and ends in April of the following year. The total rainfall in the dry season is only several hundred millimeters.

10.1.2 Oceanographic Features

Tides: The tide regime along the coast of Vietnam is diverse. There are four types of tides: (1) regular diurnal, (2) irregular diurnal, (3) irregular semi-diurnal, (4) semi-diurnal tide. The tidal regime of Vietnam's waters changes from regular diurnal at the northern coast to irregular diurnal and irregular semi-diurnal at the central coast, and to semi-diurnal at the southern coast and the Gulf of Thailand.

Currents: The currents in coastal water areas are influenced by the monsoon regime. In the summer, under the influence of the southwest monsoon, strong southwesterly currents have formed along the southeastern and south-central coasts to the north. In the winter (from October to March), under the effect of the northeast monsoon, there is strong southern flow at the Central and Southern coasts, with maximum velocity of 60-70 cm/s.

Waves: In the summer, the prevailing wave is south-southeast, dragging from Mong Cai to Son Tra, with the average wave height of 0.5-1.2 m. The west-southwest wave extends from Son Tra to Ha Tien, with the average wave height of 0.8-1.1 m. Especially in the waters of Hai Phong - Nga Son, wave height can reach 3.5-4.5 m. In winter, the prevailing wave direction in the whole sea of Vietnam is northeast-east, and wave height is 0.7-1.2 m.

10.2 Marine Water Quality

10.2.1 Status

Coastal water monitoring program is implemented in the Coastal Marine Environmental Monitoring Stations in the North, Central and South regions, and respectively managed by the Institute of Marine Resources and Environment, the Institute of Mechanics, and the Institute of Oceanography, under the Vietnam's Academy of Science and Technology (VAST). Water samples

are collected at least twice a year at 22 stations along the coast of Vietnam. Monitoring parameters for coastal waters include:

- Basic indicators for field measurements: salinity, temperature, pH, dissolved oxygen (DO), turbidity, and total suspended solids (TSS)
- Nutrients: nitrogen dioxide (NO₂-), nitrate (NO₃-), ammonium (NH₄⁺), phosphate (PO₄³⁻)
- Total coliform
- Heavy metals: copper (Cu), lead (Pb), mercury (Hg), cadmium (Cd), iron (Fe), manganese (Mn), arsenic (As), copernicium (CN)
- Oil and grease

In general, the quality of coastal water in Vietnam is still quite good with most of the typical parameters of seawater quality being within the permitted limits of *QCVN 10-MT: 2015/BTNMT*. The RQ is calculated according to the *Circular No. 26/2016/TT-BTNMT*, and classified as follows:

- $RQ \leq 1$: Low pollution risk level
- $1 < RQ \leq 1.25$: Average pollution risk level
- $1.25 < RQ \leq 1.5$: High pollution risk level
- $RQ > 1.5$: Very high pollution risk level

Calculation results of the risk quotient (RQ) during the period 2015-2018 show the relatively low pollution levels in coastal waters (**Table 10.1**):

- Northern region: 85.5% of low pollution level (with $RQ < 1$)
- Central region: 97.5% of low pollution level
- Southern region: 75% of low pollution level

Table 10.1: Value of Environmental Risk Quotient in Coastal Environmental Monitoring Stations.

Site	Dry season				Rainy season			
	2015	2016	2017	2018	2015	2016	2017	2018
Monitoring stations in the Northern region								
Tra Co	0.19	0.13	0.15	1.44	0.25	0.16	0.29	1.75
Cua Luc	0.24	0.18	0.16	0.79	0.24	0.2	0.3	0.49
Do Son	0.26	0.23	0.23	0.48	0.37	0.27	0.27	0.56
Ba Lat	0.33	0.37	0.28	0.57	0.41	0.37	0.29	0.74
Sam Son	0.18	0.19	0.15	0.24	0.26	0.21	0.16	0.43
Cua Lo	0.16	0.2	0.18	0.26	0.25	0.23	0.19	0.43
Monitoring stations in the Central region								
Deo Ngang	0.07	0.10	0.14	0.09	0.10	0.10	0.12	0.10
Dong Hoi	0.07	0.11	0.11	0.08	0.11	0.08	0.09	0.10
Thuan An	0.08	0.08	0.12	0.09	0.10	0.07	0.10	0.12
Da Nang	0.09	0.07	0.10	0.09	0.10	0.08	0.09	0.11

Table 10.1: Value of Environmental Risk Quotient in Coastal Environmental Monitoring Stations. (cont.)

Site	Dry season				Rainy season			
	2015	2016	2017	2018	2015	2016	2017	2018
Monitoring stations in the Central region (cont.)								
Dung Quat	0.09	0.07	0.12	0.09	0.10	0.08	0.10	0.11
Sa Huynh	0.08	0.07	0.11	0.09	0.08	0.07	0.09	0.11
Quy Nhon	0.08	0.07	0.11	0.09	0.10	0.07	0.09	0.11
Monitoring stations in the Southern region								
Nha Trang	0.09	0.11	0.11	0.11	0.10	0.14	0.12	0.14
Phan Thiet	16.87	0.14	0.19	0.14	0.15	0.16	0.66	2.66
Ganh Rai	0.19	0.56	0.84	0.26	0.15	0.32	34.10	0.33
Dinh An	0.55	8.76	0.63	0.95	0.66	2.41	1.07	0.95
Song Doc				0.47				0.55
Rach Gia	0.31	0.62	0.52	1.03	0.79	0.66	0.86	1.04

Source: Report on Marine Environment Status in 2020 (draft).

In particular, the coastal water monitoring results in the period 2015-2018 show the following results:

- **Northern region:** The northern coastal waters have low level of risk from pollution. However, in some areas with strong aquaculture development, such as in Hai Phong, Nam Dinh, Thanh Hoa, there have been some records of $N-NH_4^+$ and TSS content exceeding QCVN for aquaculture and conservation areas.
- **Central region:** Coastal waters in Central region have also low level of risk from pollution. However, there are localized pollution problems in aquaculture areas, and port areas with shipping and boat operations. There are also localized problem in some sea areas. Sometimes during summer, spilled oil can be observed on seawater surface, causing impact on the quality of marine environment. This could be due to traffic incidents at sea or from unknown sources.
- **Southern region:** Coastal waters in the southern region has a lower risk of pollution than the two regions above. The parameters exceeding the QCVN with quite high frequency are mainly TSS, Fe (in the rainy season), NH_4 , NO_2-N , NO_3-N , and coliform (only localized), making the RQs in the South to increase. The coastal environment in the south of Vietnam is often influenced strongly by riverine flow, with some areas affected locally by aquaculture activities.

The result of general assessment of the quality of coastal waters of Vietnam is described in **Table 10.2**. The parameters of likely concern are the nutrients, heavy metals, oil and grease, and coliform, which are rated as 'good', and TSS, which is rated as 'fair'.

Table 10.2: General Assessment of Vietnam Coastal Waters.

Parameters	Level
DO, pH	Very good
PO ₄ ³⁻	Very good
Heavy metals	Good
NO ₂ ⁻ , NO ₃ ⁻ ,	Good
TSS	Fair
NH ₄ ⁺	Good
Coliform	Good
Oil and grease	Good

Source: Data of Coastal Monitoring Stations, Viet Nam Academy of Science and Technology, 2016-2018.

Quality of offshore water and water around island areas is monitored by the Center for Marine Environment Monitoring and Analysis of the Naval Forces at 180 points in areas, such as oil and gas exploitation areas including DK1, Western Spratly Islands, Western Paracel Islands, Spratly Islands (Big Truong Sa Island, Da Tay beach clusters, Song Tu Tay Island), Colin - Sinh Ton - Nam Yet Island, West of Song Tu Tay Island. The monitoring results show that the quality of offshore water and water around islands is quite good. Specifically, the concentrations of parameters are relatively stable with little changes over the years. The values of the monitoring and analysis parameters all meet the allowable standards according to *QCVN 10-MT: 2015/BTNMT*.

10.2.2 Major Challenges and Pressures

The greatest pressure and threats to the quality of the marine environment are urban and industrial activities related to discharges of untreated domestic and industrial wastes, both solid and liquid, to the sea. Organic waste from industrial activities is a waste that has a significant impact on the marine environment, degrading the quality of fish and other marine organisms, causing toxicity particularly in bays and estuary areas with waste discharge. Other environmental issues that affect sea quality are environmental degradation in the coastal zone due to the narrowing of mangrove ecosystems, the loss of coastal biodiversity, the pollution of surface water from waste and surface-borne toxins, coastal erosion and loss of water absorption. At the same time, saline intrusion is still a danger in coastal areas.

Especially, the pollution and degradation of the marine environment due to ocean plastic waste in Vietnam are quite serious. A large amount of plastic waste is swept into a system of rivers and canals drifting to the sea. In addition, the disposal or loss of fishing gears in fishing operations and the disposal of plastic waste in other socioeconomic activities taking place at sea have not been

strictly managed and controlled. The management of plastic waste in islands, marine tourism areas, especially beaches is still inadequate. Currently, there are a lot of studies and reviews giving recommendations on the situation of plastic waste discharged into the sea and it can be said that Vietnam is among the top 20 countries in the world discharging plastic waste into the sea, with an average of about 0.5 million tonnes per year [18].

Some coastal areas have been polluted locally, specifically by nutrients (NH_4^+ , NO_2^- , NO_3^-), coliform and TSS, exceeding the *QCVN* due to farming activities in coastal and estuarine areas.

Marine environmental incidents are also one of the causes of sea water pollution. For example, environmental incidents led to a series of dead fish in four coastal provinces in Central Vietnam in 2016 (Ha Tinh, Quang Binh, Quang Tri and Thua Thien Hue) and several hot spots of environmental pollution at the same time broke out in many provinces and cities nationwide.

10.3 Coastal and Marine Ecosystems

The key coastal and marine habitats are mangrove forests, coral reefs and seagrass beds. In addition, there are also island ecosystems. Most of the more than 3000 islands are located in the waters of Quang Ninh province, forming the World Heritage Site of Ha Long Bay. Some of the other big islands are Cu Lao Cham (Quang Nam), Phu Quoc (Kien Giang), Con Dao, Tho Chu, which are characterized by many endemic ecosystems and endemic species. In particular, some forests have been included in the list of national parks that require special biodiversity protection.

10.3.1 Mangrove Forest

Vietnam has coastal mangrove forests stretching from Quang Ninh (in the North) to Ha Tien (in the South) and in some bays of large islands. Of the 621,162 ha of coastal salted wetlands, 209,741 ha are mangroves. The Mekong Delta has the largest area of mangroves and the Southeast region has the highest mangrove cover in the country.

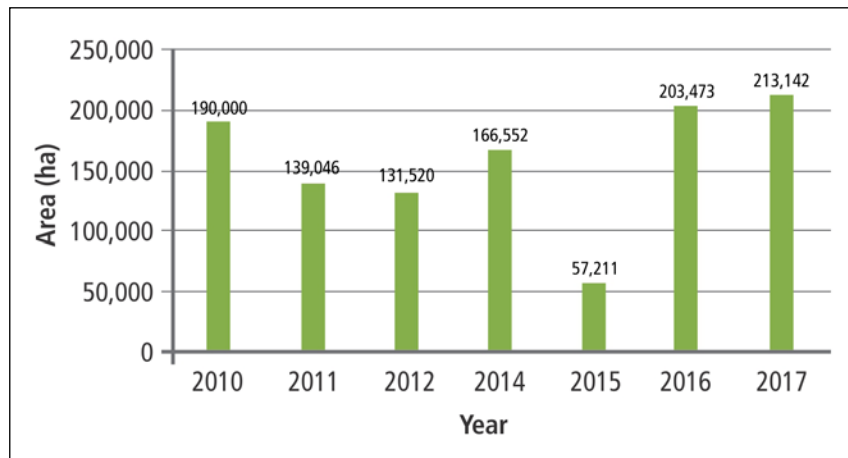
The area of mangroves has been seriously reduced due to the conversion of forest areas to agricultural production, aquaculture, and sea dykes as well as coastal erosion. The area of mangroves in Vietnam has decreased significantly from 1943 to the present: over the past 70 years, it has decreased by about 219,000 ha or 54%. Over the past two decades, tens of thousands of ha of mangroves have been destroyed to raise shrimp.

Loss of mangroves can cause serious consequences: loss of abundant biodiversity of the ecosystem, loss of habitat and reproduction areas of many species, acidification, environmental pollution, coastal and estuary erosion and loss of shoreline protection and carbon sequestration services. For example, in southwestern Ca Mau, after one year, conversion of mangroves to

shrimp ponds caused the reduction of 20 species of benthic animals, while birds in Bac Lieu and in the Dam Doi Bird Sanctuary migrated to other places. In Tien Hai (Thai Binh), the conversion of 2,500 ha of mangroves to shrimp ponds caused great damage to the environment. Hydrogen sulfide (H_2S) and chemical oxygen demand (COD) were found to be in excess of the permitted standards. Other consequences include saline intrusion in large area, erosion of surrounding areas, and loss of habitat for migratory birds. The life of the local people was affected, with many poor fishermen losing their livelihood.



Figure 10.1: Mangrove Area Changes in 2010-2017.



Source: Ministry of Agriculture and Rural Development, 2018.

In recent years, the application of more radical policies has resulted in the restoration of mangroves in many coastal localities. In 2016 and 2017, the area of mangroves has increased significantly compared to 2015.

10.3.2 Coral Reef

Coral reefs are a typical marine ecosystem in Viet Nam, with high biodiversity, high primary yields and striking seascapes. Vietnam has more than 200 coral reefs, widely distributed in coastal waters from the north to the south on an area of about 1,222 km², mainly around the islands Co To, Ha Long - Cat Ba, Bach Long Vi, Cu Lao Cham island, Van Phong Bay, Nha Trang, along the coast of Ninh Hai (Ninh Thuan), Ca Na Bay, Phu Quy Island, Con Dao Islands, Phu Quoc, Nam Du) and two archipelagos of Hoang Sa, Truong Sa (**Table 10.3**). These are potential areas for biodiversity conservation, and sustainable, marine resources and ecotourism development.



Table 10.3: Coral Reef Distribution on Coastal Islands.

Region	No.	Island	Coral reef area (ha)	Average coverage (%)
Northern	1	Dao Tran	64	17,56
	2	Co To	369	9,72
	3	Ba Mun	88	16,26
	4	Bach Long Vi	1.578	18,75
	5	Cat Ba	74	16,90
	6	Hon Me	69	15,70
	7	Hon Mat *	8	16,13
	8	Hon La *	50	20,26
	9	Con Co *	274	21,98
Central	10	Hai Van - Son Cha	103	19,49
	11	Son Tra *	46,9	23
	12	Cu Lao Cham	139	16,95
	13	Ly Son	1.704	7,40
	14	Nha Trang Bay	731	20,94
	15	Nam Yet	250	11,00
	16	Hon Cau *	50	18,25
Eastern Southern	17	Phu Quy	1.858	20,45
	18	Con Dao	914	24,63
Western Southern	19	Phu Quoc	220	24,67
		Tho Chu *	128	18,35
Total			8.671	17,65

Source: Institute of Ecology and Biological Resources, 2017.

Note: (*) Additional survey data from 2015 – 2016; for the remaining islands: survey data from 2010 - 2011.

There are around 350 species of reefs and about 3,000 other species that are associated with the coral reefs. Of these, there are about 2,000 species of benthic species, 500 species of fish and many economically valuable species, such as *Panulirus*, *Haliotis diversicolor*, *Pteria martensi*, *Holothuria*, living in direct close relationship with the corals.

The coral reef ecosystem is complex, and very sensitive, especially to threats from humans, such as fishing with explosives, toxic chemicals, uncontrolled coral exploitation, tourism and other socioeconomic development activities. Climate change -- higher sea temperatures and ocean acidification -- also threaten the health of coral reefs.

In the period 2000-2015, about 15-20% of the area of coral reefs has been lost, mainly in inhabited areas, such as Ha Long Bay - Cat Ba, central coastal provinces from Ha Tinh to Binh Thuan and some inhabited islands of Truong Sa archipelago. The coral reef coverage is decreasing over time and has been reduced by over 30% in many places. This reduction in area and the damage to many coral reefs have caused biodiversity loss, and degradation of ecological conditions and marine environment quality, as well as loss of livelihood of coastal communities, especially from tourism and fisheries.

Despite successful restoration and regeneration of coral reefs in the wild, the restoration area is still very small. The coral reefs at Hon Mun Marine Protected Area in Nha Trang Bay have been preserved and maintained in a stable state.

10.3.3 Seagrass Beds

According to Morton and Blackmore (2001), about 40% of all known seagrass species in the world are found in the South China Sea.⁶ There are about 50 shallow coastal water species in the Indian Ocean - Western Pacific, including 16 species in Southeast Asia, of which 14 species are found in Vietnam. Seagrass beds are distributed in the coastal tidal areas, island coastal areas, estuaries, mangroves, bays, and brackish water swamps. Seagrasses usually live at depths ranging from 0 to 20m and within a wide salt level range of 5-32%. Preliminary estimation of the area of identified seagrass beds to date in Viet Nam is approximately 16,000ha. The areas having high diversity of species are: (a) Con Dao island: 10 species, (b) Phu Quoc island: 9 species, (c) Khanh Hoa: 9 species, (d) Binh Thuan: 8 species, (e) Phu Quy island: 7 species, (f) Tam Giang - Cau Hai lagoon and Lap An swamp in the central region: 6 species, and (g) Ha Long, Cat Ba: 5 species.

⁶ Morton B, Blackmore G. 2001. "South China Sea," *Marine Pollution Bulletin*, Dec 2001; 42(12): 1236-63. (doi: 10.1016/s0025-326x(01)00240-5).

Table 10.4: Distribution of Seagrasses in Some Areas of Vietnam.

No	Provinces	Area (ha)
1	Quang Ninh	1,864
2	Hai Phong	58
3	Nghe An	189
4	Quang Tri	24
5	Binh Thuan	286
6	Ba Ria- Vung Tau	2,619
7	Ca Mau	9,821
8	Kien Giang	3,125

Source: Project "Preventing the environmental degradation trends in the East Sea and the Gulf of Thailand," Hai Phong Institute of Oceanography, 2003.

Seagrass ecosystems, however, are highly sensitive and very vulnerable to environmental change. At present, seagrass beds in Vietnam have been seriously degraded due to environmental pollution, dynamite fishing, and seagrass exploitation activities for agricultural purposes and aquaculture production, resulting in loss of habitat for valuable aquatic resources as well as loss of shoreline protection and carbon sequestration services. Significantly, in many places seagrass has been completely lost, such as Dong Rui, Chuong Ca, Tuan Chau (Quang Ninh), Trang Cat, Gia Luan (Hai Phong) or nearly lost as in Vung Bau (Phu Quoc).

The decline and loss of seagrass beds in our country remain at risk of increasing, seriously affecting the marine ecological environment leading to: deteriorating water and sediment quality, nutrient balance, and ecological and biodiversity balance; reduce fish stocks and sources of fish eggs and juvenile fish in this ecosystem; reduced supply of raw materials for industry and agriculture, and reduced estuary accretion affecting land expansion.

10.3.4 Rare, Threatened and Endangered Species

Distribution area of many varieties of precious and rare aquatic species, such as fish (*Semilabeo notabilis*, *Pangasianodon gigas*, squirrel tea), lobster, squid; sea turtles (green turtles, *Eretmochelys imbricata*, *Caretta caretta*, *Chelonia mydas*, leather turtles, all five species are now included in the Vietnam's Red Book) has been identified, almost located in Vietnam's marine protected areas and fisheries protection areas, such as Ha Long, Cat Ba, Cu Lao Cham, Nui Chua, Quy Nhon, Con Dao and Phu Quoc. Specifically, the shallow water areas, such as the Gulf of Tonkin, the South China

Sea (East Sea), and Gulf of Thailand (Southwest Sea), are home to the distribution of species of angelfish, threadfin bream, Goatfish, Largehead hairtail, *Priacanthidae*, *Leiognathidae*, *Carangidae*, *Nemipteridae*, cuttlefish and squid. In the central marine area and the center of the East Sea, there are tuna, swordfish, pigskin, buzzard, bat fish, sword fish, etc. Shrimp, crabs and sea turtles are found in many waters, especially in the Gulf of Tonkin and Southeast regions. In many areas, many mollusks (oysters, mussels, snails, etc.) are popular with reserves being second after fish.

Many marine species have decreased in number, some species have been locally extinct. There are 236 species of rare and endangered species, including more than 70 marine species listed in Vietnam's Red Book.

According to the evaluation of Vietnam Research Institute for Aquatic Resources, in recent years, the varieties and species of natural aquatic products have been seriously reduced both in quantity and quality, especially in the coastal and inland water fisheries resources. In particular, there are some rare and endangered species, such as sea turtles, snails (distributed mainly in Ha Long Bay, Khanh Hoa coastal area, Con Dao and Phu Quoc islands); some fishes (at Cu Lao Cham - Quang Nam); and snails (at Tho Chu island, Con Dao island).

The Government has issued many policies to protect aquatic resources as well as the conservation and regeneration of precious and rare marine and aquatic species, such as the *Fisheries Law 2017*; *Decision No. 742/QD-TTg in 2010* on planning and setting up 16 marine protected areas, and *Decision No. 1479/QD-TTg in 2008* on planning and establishing 45 inland fisheries protected areas; *Decree No. 33/2010/ND-CP* on management of fishing operations; *Circular 19/2018/TT-BNNPTNT* guiding the protection and development of aquatic resources, and most recently the *Decree No. 26/2019/ND-CP* detailing a number of articles and measures to implement the *Fisheries Law 2017*, including content on management of endangered precious and rare aquatic species.



11 Major Natural and Man-Made Threats

11.1 Degradation of Water Quality

In the mining and processing areas, copper, mercury and radioactive substances pollute the water and marine sediments. At present, the hot spots of seawater pollution are Hai Phong - Quang Ninh, Da Nang - Dung Quat, Ganh Rai - Vung Tau, Rach Gia - Ha Tien.

Coastal water pollution is partly due to the use of agricultural pesticides and fertilizers, spills and the dumping of waste into the sea.

The development of coastal urban areas and tourism activities is expanding in many localities, contributing to the generation of untreated waste pouring to the sea. This is a serious source of pollution to the coast, as the waste will produce toxic substances to the environment and organisms.

Aquaculture activities also significantly increase the amount of waste discharged directly into the sea, mainly fertilizer and artificial feed. With total area of shrimp farming of over 600 thousand ha, there are nearly 3 million tonnes of solid waste discharged into the environment every year.

Almost all waste from the fishing village is discharged into the sea without treatment, including cooking coal slag, which is very difficult to collect, leading to marine pollution, and several blocked canals.

In addition, oil spill is also one of the main causes affecting the marine environment. According to statistics of the MONRE, in the period of 1992-2015, there were 54 serious oil spills in Vietnam sea waters. From 2010 to 2017, there were over 100 oil spills from large and small ships and many large scale oil leaks, such as from Onnekas One cargo ship (Malaysian nationality) crashed in the coastal area of Thua Thien Hue province on December 23, 2012; incident of AZ Beijing barges sinking in Kien Giang in 2012, an incident of 10 cargo ships due to the storm No. 12 in Quy Nhon waters in November 2017 [9].

11.2 Degradation of Biological Resources

The deterioration of the quality of marine and coastal environments has adverse impacts on marine life and loss of biodiversity. The decline in biodiversity has led to a decline in the number of economically valuable species.

The fishery resources are being exploited in an unsustainable manner, so it is gradually depleted, with decline in both quantity and quality. Fish stocks were reduced, from 4 million tonnes in 1990 to less than 3 million tonnes at present. Fish stocks of high economic value have been significantly reduced. The average size of fish and species diversity are also reduced.

The main reason is the increase in the export of fisheries, which results in the annual catch of fisheries in excess of available reserves. In addition, illegal and destructive fishing methods, such as explosives, cyanide, electric pulses, are not controlled, and these methods not only deplete marine resources, but also damage the fish habitats. It is important to mention the effects of residues of pesticides in water sources, which accumulate through the different levels of the food chain.

Some important fish species living on reefs are seriously reduced, such as shrimps, lobsters, sea cucumbers, and butterfly fish, particularly in Hai Phong, Quang Ninh, Binh Dinh, Ca Na, Nha Trang, Con Dao and Phu Quoc. This is due to the exploitation of corals, the use of chemicals in fishing, navigation, tourism, and partly due to storms.

Similar to coral reefs, the degradation of seagrass beds and mangrove forest due to human activities resulted in environmental damage in many coastal areas of Vietnam.

11.3 Coastal Erosion and Coastline Instability

The development of economic and social activities in the coastal zone has affected the stability of the coast. Some of the main activities that have caused the instability of the coastal system may be land reclamation, land conversion with lack of scientific basis; construction of works, architectural infrastructure (roads, houses and architectural works) located too close to the edge of the water, violating the function of buffer zone between sea and land of the coastal system; dredging canals and unreasonably exploiting coastal areas; construction of coastal protection works, breaking the natural coastal processes. The destruction of coastal habitats, such as mangroves, coral reefs, and protected forests, reduce and eliminate coastal protection and their aesthetic value. Mineral extraction in sandbanks and coastal sand dunes disturbs the natural balance of coastal terrain and destroys vegetation cover. Coastal instability is increased by the effects of natural disasters, such as typhoons, floods, tide and sea level rise, including sea level rise due to climate change. In addition,

the safety of coastal livelihoods is also threatened by the fact that the development is too close to the sea with a lack of understanding of the natural coastal processes.

Specifically, coastal erosion is a common phenomenon along the coast of all three regions of the country, with 397 sections having a total length of over 920 km, of which, the erosion with weak intensity accounted for 196.82 km (21.4%), with average intensity: 179.90 km (19.6%), with strong intensity: 260.67 km (28.3%), and with very strong intensity: 282.81 km (30.7%). The length of eroded coast ranges from a few hundred meters to several tens of kilometers. The average erosion speed is about 5-10 m/year, but can reach 50-100 m/year, even 200-250 m/year in short time. There are areas of erosion that last for a century or nearly a century, but there are also areas of erosion that happened recently with extreme speed. There are also areas of erosion alternating with accretion. In any case, it can be affirmed that the intensity and the irregularity of coastal erosion have increased recently and the damage caused by erosion is enormous [41].

In the North, coastal erosion is strongest in Hai Trieu, Hai Ly and Hai Thinh communes (Hai Hau district) with an average speed of 20-30 m/year.

In the Central region, erosion occurred in 233 sections with a total length of up to 492 km. Particularly, the coastline from Quang Nam to Phu Yen has 65 areas with 105 eroded sections; recently, erosion has occurred more severely, leading to many serious consequences.

In the South, most of the coastline in the Mekong Delta are eroded at different degrees. The coastal sections with strong erosion speed (from 30-100 m/year) are in Tan Thanh commune (Tien Giang); Dong Hai (Tra Vinh); Ganh Hao (Bac Lieu). In Soc Trang province, the coastline from Bien Tren hamlet, Vinh Chau town, Vinh Chau district to the area adjacent to Bac Lieu province is being strongly encroached. Along the coastal strip of Ca Mau province, some coastal sections are severely eroded, especially the area from the mouth of Trang Tram river to Tan An commune, Ngoc Hien district, where a land area of nearly 4890 ha was lost. In the area from Ong Doc estuary (Tran Van Thoi district) to Tieu Dua canal (U Minh district), an average of 22 ha of land is lost annually [23].

In addition, the coastal instability, as well as the decline of coastal ecosystems, is also caused by the encroachment activities in coastal localities for the purpose of urbanization and infrastructure development.

11.4 Coastal Vulnerability from Natural Hazards and Climate Change

Increased exposure to more intense and unpredictable natural hazards and climate change-related weather events is a key challenge to Viet Nam's impressive socioeconomic achievements. Economic losses are estimated at 1-1.5% of GDP per annum, approximately US\$ 900 million (MARD and Vietnam Disaster Management Authority 2018).

Storms, floods are the most common types of natural disasters in Vietnam. The annual typhoon season is in June - November, the most in July - October. The other phenomena are flash floods, landslides, riverbank erosion, and sea level rise. Flooding shows an increasing trend. Coastal provinces are also vulnerable to droughts. Although not long lasting, some droughts lead to lack of water for cultivation and living. Most of the southern central plains are affected by drought. Droughts also increase forest fire, increase salinity intrusion and cause shortage of water for daily life and production.

Vietnam is one of the countries severely affected by climate change and its related disasters. Factors vulnerable to the Vietnamese coast include geodynamic hazards (erosion, accretion, earthquakes, landslides), hazards related to meteo-hydrological conditions (storm, storm surge flood) and catastrophic intensification factors (faults in geological background).

The most vulnerable sectors are: agriculture, natural ecosystems, biodiversity, water resources, public health and infrastructure; and the most vulnerable regions are the Mekong Delta, the Red River Delta, the Central Coast, especially, the Mekong Delta is one of the deltas in the world most susceptible and vulnerable to sea level rise; and the most vulnerable objects are the poor, ethnic minorities, the elderly, women, children and people with disabilities. In 2017, Typhoon Damrey caused more than 120 fatalities, damaged over 300,000 houses and heavily impacted agriculture, livelihoods and the economic sector.

The vulnerable areas identified from the coastal vulnerability assessment of coastal natural resources (wetlands, aquatic resources, biodiversity) and man-made resources (residential areas, infrastructure, etc.) are shown in **Table 11.1**.

Table 11.1: Vulnerable Coastal Areas in Vietnam.

North	
Relatively high	Coastal land of Quang Ha, Hai Ninh, Ha Long (Quang Ninh), Do Son (Hai Phong), Quynh Luu, Nghi Loc (Nghe An); Coastal land of Ha Tinh province and part of coastal water of Thanh Hoa province.
High	Coastal strip from Hai Phong to Ha Tinh, part of Yen Hung, Ha Long, Quang Ha, Hai Ninh (Quang Ninh).
Central	
Relatively high	Scattered distribution: coastal land of Quang Trach, Bo Trach and Le Thuy districts (Quang Binh); Duc Pho district (Quang Ngai); Hoai Nhon, Phu My; Tuy Hoa City; Ninh Hoa district and Cam Ranh bay (Khanh Hoa).
High	Dong Hoi, Da Nang, Hoi An, Tam Ky, Quy Nhon cities; Vinh Linh, Gio Linh; Quang Dien, Phu Vang; Phu Cat, Tuy An district; Cam Ranh peninsula.
South	
Relatively high	Ninh Hai district, northeast of Ninh Phuoc district, Bac Binh (Ninh Thuan province), Phan Thiet city, coastal area of Binh Thuan province and coastal waters up to 5m from the shore.
High	Coastal land of Vung Tau City, Nhon Trach District (Dong Nai Province), Can Gio District (Ho Chi Minh City), Go Cong Dong District (Tien Giang Province), coastal districts of Ben Tre, Tra Vinh, Soc Trang, Bac Lieu provinces.
South West and Gulf of Thailand	
Relatively high	Coastal waters from 0-10 m water from Hon Dat district to Ca Mau cape and coastal land from Ha Tien district to U Minh district.
High	Coastal land Tran Van Thoi, Cai Nuoc, Ngoc Hien and Dam Doi districts (Ca Mau).

11.4.1 Observed Climate Changes

Climate change has made hazards, especially storms, floods and droughts, more intense (MONRE, 2008). The results of analysis of observed data indicated the changes of climate parameters and sea level with the following noticeable features:

- **Temperature:** During the last 50 years, the annual average temperature in Vietnam increased about 0.5 to 0.7°C. Winter temperatures increased faster than those of summer and temperatures in Northern climate zones increased faster than those of Southern climate zones. The annual average temperature for the last four decades (1961 to 2000) was higher than that of the three previous decades (1931 to 1960). Annual average temperatures for 1991 to 2000 in Hanoi, Da Nang and Ho Chi Minh City were all higher than the average for 1931-1940 by 0.8; 0.4 and 0.6°C respectively. In 2007, the annual average temperatures at these three locations were all higher than the average for 1931-1940 by 0.8-1.3°C and similarly higher than the average for 1991-2000 by 0.4-0.5°C (MONRE, 2008).
- **Rainfall:** At every location, the change of annual average rainfalls for the nine decades (1911-2000) was not distinct and not consistent with each other. There were ascending and also descending periods. The annual rainfall decreased over Northern climate zones while increased over Southern ones. On average for the whole country, the rainfall over the past 50 years (1958-2007) decreased by about 2% (MONRE, 2008).
- **Cold fronts:** In the last two decades, the number of cold fronts affecting Vietnam was reduced remarkably. Anomalous events, however, take place more frequently, such as the most recent extremely and damaging cold surge lasting consecutively 38 days during January and February 2008 in Northern Vietnam (*National Target Program on Climate Change*, MONRE, 2008).
- **Typhoons:** In recent years, there were more typhoons with higher intensity affecting Vietnam. Typhoon track has a tendency of moving southward and typhoon season tends to end later. There were more typhoons with abnormal movement (MONRE, 2003).
- **Drizzles:** the average number of drizzle days in Hanoi gradually decreased since the decade of 1981-1990 and in the last 10 years, there was only half (15 days/year) of the long-term average number [30].
- **Sea level:** Data from tidal gauges along Vietnam coasts show that sea level rise was at the rate of about 3 mm/year during the period of 1993-2008 which is comparable with the global tendency. In the past 50 years, sea level at Hon Dau station rose about 20cm (MONRE, 2008).

11.4.2 Extreme Weather Phenomena

According to statistics, from 1949-2018 there were 453 storms/typhoons/tropical depressions that affected the Vietnam coast (average 6-7 every year) [55].

The highest frequency of tropical cyclone and typhoon activity is in the middle part of the North Sea.

Typhoons land in all coastal areas of Vietnam, but at different times:

- Quang Ninh - Thanh Hoa waters: storms hit in June - September.
- Nghe An - Quang Binh: July - October.
- Quang Tri - Quang Ngai Coastal Region: August - November.
- Binh Dinh - Ninh Thuan and Binh Thuan - Ca Mau: October - December.

The parts of coast Quang Ninh - Thanh Hoa and Nghe An - Ha Tinh are at highest risk from storm surges with water levels rising over 6 m.

11.4.3 Impact of ENSO on the Coast of Vietnam

- **Storm and Tropical Depression activity:** In 45 years (1956-2000), there were 150 El Niño months with 63 direct tropical cyclones (with an average of 0.42 per El Niño month), which is 28% less than the average for many years. Meanwhile, on average, La Niña has 0.80 incidents (86 incidents/107 months), 38% more than the average for many years.
- **Frequency of cold fronts:** In the years of El Niño and La Niña, number of cold fronts affect Vietnam less than normal; end of cold air in Vietnam has become earlier than usual.
- **Temperature:** the average temperature of the months in El Niño conditions is higher than normal, the winter is markedly different than the summer, the southern areas are more affected than the north. On the contrary, the average temperature in the months of La Niña conditions, is lower than normal, the north is more affected than the south.
- **Rainfall:** In El Niño conditions, rainfall in most parts of the country (most notably North Central) decreases, but La Niña only causes rainfall decrease in North, Central Highlands and Southeast. However, the La Niña causes more rainfall than average in the coastal provinces of Central and Southwest regions.
- **Sea level in coastal areas:** El Niño causes a negative effect ($\Delta h < 0$), whereas La Niña has a positive effect ($\Delta h > 0$) on sea level in coastal areas and islands.
- **Salinity of coastal waters:** In general, the influence of El Niño increases the salinity, while the La Niña reduces the salinity of the coastal areas.
- **River flow:** During the El Niño year, most annual flows of rivers are 10% less than the average for many years; in the strong El Niño years, it can be reduced by 50-60%. During the La Niña years, the annual flow of rivers is usually higher than the average for many years; there are some cases of 80 to 100% higher.
- **Agricultural production:** Under El Niño conditions, the average yield of the winter-spring crop is lower than that of the previous crop, especially in the midland in the north, while the yield of the summer-fall crop increased, especially in the North Central. Under La Niña conditions, the average yields of winter-spring crop and summer-fall crop are higher than that of the previous crop, with the most obvious winter-spring crop in the Northern Delta

and summer-fall crop in the Mekong Delta.

- **Human life and health:** From 1997 to 2000, the total number of deaths and badly effected by natural disasters was 14,962, of which 64% occurred in ENSO (43% in El Niño and 21% in La Niña).

11.4.4 Vietnam's Climate Change Scenarios

MoNRE developed and published scenarios for climate change and sea level rise for Vietnam in 2009, updated in 2011 and 2016. The most updated climate change scenarios at the end of current century can be summarized as follows:

- **Temperature:** For the Representative Concentration Pathway (RCP) 4.5 scenarios, surface temperatures would increase by 1.9÷2.4°C in the North and 1.7÷1.9°C in the South. For the RCP8.5 scenarios, temperature would increase by 3.3÷4.0°C in the North and 3.0÷3.5°C in the South. Extreme temperatures would have an upward trend.
- **Rainfall:** For the RCP4.5 scenarios, annual rainfall would generally increase in a range of 5÷15%. For the RCP8.5 scenarios, the greatest increase would increase by over 20% in most of the North, Central Coast, a part of the South and Central Highlands. Average maximum 1-day rainfall would increase all over Vietnam (10÷70%) compared to the reference period.
- **Monsoon and climate extremes:** The number of strong and very strong typhoons has an upward trend. The time of the beginning of the summer monsoon would start earlier and end later. Monsoon rainfall would have an increased trend. The number of extreme cold and damage cold days would reduce in the provinces of the North, the Red River Delta, and the North Central. The number of hot days ($T_x \geq 35^\circ\text{C}$) would increase, the largest increase would be in the North Central Coast, South Central Coast and Southern Vietnam. Droughts would become more severe due to rising temperatures and rainfall deficit in the dry season.

11.4.5 Vietnam's Sea Level Rise Scenarios

Sea level rise in Vietnam by late 21st century can be summarized as follows:

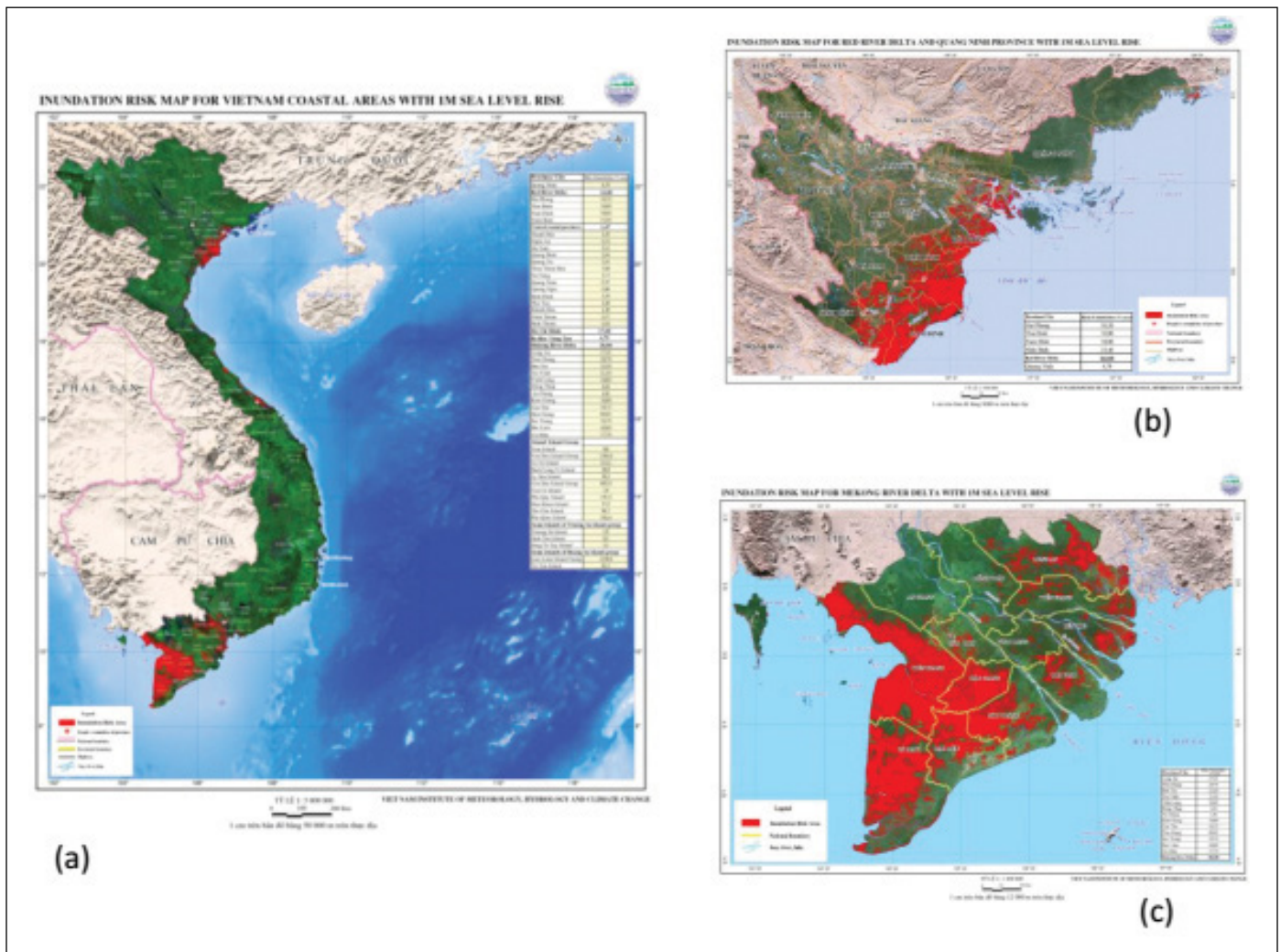
- Sea level rise in the Southern coastline would be higher than in the Northern coastline.
- For the RCP4.5 scenarios: The highest sea level rise would be at the regions of Hoang Sa and Truong Sa archipelago, with rising values of about 58 cm (36÷80 cm) and 57 cm (33÷83 cm) respectively; sea water level would rise about 55 cm at Ca Mau - Kien Giang regions; about 53 cm at Mong Cai - Hon Dau and Hon Dau - Deo Ngang regions.

For the RCP8.5 scenarios: The Hoang Sa and Truong Sa archipelago would have the highest sea level rise, with rising value of about 78cm (52÷107 cm) and 77cm (50÷107 cm), respectively; sea water level would rise about 75 cm (52÷106 cm) at the Ca Mau - Kien Giang region; about 72 cm (49÷101 cm) at the Mong Cai - Hon Dau and Hon Dau - Deo Ngang regions.

Sea level rise of 100 cm can cause severe inundation as follows:

- About 16.8% area of Red River delta, 1.47% area of the Central coastal provinces from Thanh Hoa to Binh Thuan, 17.8% area of Ho Chi Minh City, 38.9% area of the Mekong Delta would be at risk of inundation;
- Van Don Island group, Con Dao and Phu Quoc Island have high inundation risk. There is a low inundation risk for Truong Sa archipelago. Hoang Sa archipelago has higher inundation risk, especially the Luoi Liem Island group and Tri Ton Island.

Figure 11.1: Inundation Maps with the Sea Level Rise of 100 cm.



(a) Coastal area; (b) Red River Delta and Quang Ninh; (c) Mekong Delta

11.4.6 Disaster Risk Reduction and Climate Action

Climate change projections point to a trend of more frequent and intense weather events. Disaster risk reduction (DRR) is a key long-term strategy for sustainable and resilient development in Vietnam (See **Box 11.1**).

Box 11.1 Vietnam's Progress Toward the Sendai Framework on Disaster Risk Reduction 2015 - 2030

FOUR PRIORITIES FOR ACTION:

1. **Understanding disaster risk.** Viet Nam has strengthened both institutional and community level understanding of disaster risk. It has improved its communications systems and capacity to enhance understanding of natural disasters and to promote community-level resilience. The Central Committee for Natural Disaster Prevention and Control has led the development of a **National Communication Strategy on Disaster Risk Reduction** (DRR) using various communication methods, including a Facebook page and series of events on the National Day on Natural Disaster Prevention and Control. Innovative data collection tools have been developed, notably a climate risk platform using Geographic Information Systems (GIS), a climate and disaster risk dashboard for 15 disaster-prone provinces, independent real-time evaluation of emergency responses, impact assessments and recovery strategies employed by affected communities and a survey to develop a Drought Index. A gender lens was utilized to identify gender equality issues during emergency responses and to improve gender equality during resilience building and future programming.
2. **Strengthening disaster risk governance to manage disaster risk.** The Viet Nam Disaster Management Authority was established in 2017 with a mandate to coordinate international humanitarian assistance, propose national strategies and plans on disaster management and to communicate to raise public awareness on natural disaster preparedness and response. The government has also improved its DRR policy and legal framework, including the integration of DRR into sectoral and socio-economic plans, a review of legislative implementation and the development of a decree to improve the effectiveness emergency assistance and disaster recovery.
3. **Investing in risk reduction for resilience.** The Government is going to amend the *Decree on the Disaster Prevention Fund*, which will provide for the establishment of funds at national and local levels as well as the regulation on eligible spending items within the framework of funds to create more funds to enhance the work on DRR. Viet Nam is also strengthening public-private partnerships in science and technology and supporting research and innovative technology application in DRR, especially in the fight against landslides, flash floods and coastal erosion control.
4. **Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation, and reconstruction.** Viet Nam has developed procedures for timely, equity-based emergency assistance, prioritized resources for early warning systems and the development of online disaster monitoring systems. These include nutrition guidelines and plans by the Ministry of Health, and the distribution of an Assessment and Preparedness Toolkit to 1,004 schools in 60 provinces by the Ministry of Education and Training. The Ministry of Culture, Sports and Tourism facilitated the integration of DRR action plans into site management plans for all World Heritage sites in Viet Nam, notably Hue Complex, Thang Long Citadel, and Hoi An Ancient town.

Source: Ministry of Agriculture and Rural Development and Vietnam Disaster Management Authority (https://uninfo.org/sites/default/files/documents/vnm/Brochure-4-page_VN%27s_Progress_to_Sendai_Eng-1548128819.pdf)

PART 5

**OCEAN GOVERNANCE FOR
BLUE ECONOMY**

12 Policies and Legal Framework Supporting Blue Economy Development

12.1 Key Policies

12.1.1 Sustainable Development Policy

In recent decades, Party and Government of Vietnam have set out important directions, policies and measures to manage, protect and exploit the sea. Significant for marine economic activities was the Politburo's *Resolution No. 03-NQ/TW* dated May 6, 1993 on a number of marine economic development tasks in the coming years, which affirms that the ocean economy must be promoted in parallel with strengthening the protection of national sovereignty and interests, protecting marine ecological resources and environment, and striving to make Vietnam become a strong country based on the sea by 2020. After this Resolution, the Prime Minister issued implementing instructions, such as the *399 Directive* dated August 5, 1993 on a number of marine economic development tasks in the coming years and *Directive 171/TTg* in 1995 on implementing the *Resolution 03-NQ/TW*.

On September 22, 1997, the Politburo issued *Directive No. 20-CT/TW* on promoting the development of a sustainable and modern ocean economy. The instruction of this directive is: "To carry out industrialization and modernization of the ocean economy with a strong emphasis on export, based on scientific and technological advances as a driving force through effectively promoting research, management and exploitation of marine potentials, in parallel with regenerating marine resources, protecting the marine environment and training human resources." This view was concretized by specific solutions. In implementation of this Directive, a series of strategies and plans for marine economic development have been adopted, such as the **Fisheries Development Strategy 2010; Tourism Development Strategy 2010; Transport Development Strategy 2010**, etc.

Entering the 21st century, the 9th Party Congress (2001) affirmed its goal: "*Develop a strategy on sea and island economy development, promoting the unique strengths of over 1 million km² of continental shelf; Strengthen basic surveys to serve the marine economic development planning; Promote aquaculture, fishing, and seafood processing; oil exploration, exploitation and processing; shipping and shipbuilding; tourism; environmental protection for advancing to the sea and mastering the sea; Integrate development of marine and coastal economies, taking advantage of seaports and coastal areas to form highly developed regions, promoting the development of*

other regions; Build logistics bases in a number of islands to advance to the open sea; and Closely combine economic development with security protection at sea". The above contents continue to be affirmed at the Tenth Party Congress (in 2006).

From the above viewpoints and goals, it is clear that the very important direction is to put the ocean economy in the overall economy of the country, in relation to interaction between regions and in the trend of economic integration with the Region and the world.

In order to implement the above-mentioned directions and policies, at the Fourth Conference of the 10th term Central Party Committee, the *Resolution 09-NQ/TW* dated 2 September 2007 on *Vietnam's Sea Strategy to 2020* was approved. The guiding viewpoint of this strategy is: "we will become a strong country based on the sea, enriching from the sea on the basis of promoting all potentials from the sea, comprehensively developing marine industries with diverse and modern structure, creating a fast, sustainable and efficient development with long-term vision ". The objective by 2020 is that the ocean economy will contribute about 53-55% of GDP and 55-60% of export turnover of the whole country; and help solve social issues, significantly improving the people's life in the coastal areas and on islands.

It can be said that the Resolution on the **Vietnam Sea Strategy to 2020** has inherited the views on the development of ocean economy and other sea-related fields issued earlier, but it is the first comprehensive Resolution of the Party Central Committee on the sea, opening a new chapter in thinking about the sea for the cause of nation development and defense in the first decades of the 21st century.

On September 25, 2012, the Prime Minister issued *Decision No. 1393/QĐ-TTg* approving the **National Green Growth Strategy**, not directly addressing marine economic activities, but orienting the socioeconomic development activities in "greening" direction. The strategy sets out 3 specific goals:

- Restructuring and improving economic institutions towards greening the existing sectors and encouraging the development of economic sectors that have high added value to use energy and resources efficiently;
- Conducting researches and application of more advanced technologies for sustainable use of natural resources, reducing greenhouse gas emissions, and contributing to effective response to climate change;
- Improving people's lives, building environmentally friendly lifestyles through creating jobs from various sectors, including industry, agriculture, and services, investment in natural capital and green infrastructure development.

The main tasks set out in the Strategy include:

- Reducing the intensity of greenhouse gas emissions and promoting the use of clean and renewable energy;
- Greening production;
- Greening the lifestyle and promoting sustainable consumption

In the 2011-2020 period, the Strategy focuses on:

- Raising public awareness and developing human resources;
- Developing policies and management mechanisms to implement the strategy.
- Developing data/information system and management tools, set of standard indicators and regulations on green growth.
- Identifying key projects on green growth/low carbon and greening of manufacturing industries; some pilot projects on overall planning and socioeconomic development plans on “green growth orientation” at province and city level.

After 10 years of implementing *Resolution 09*, there have been fundamental positive changes in thinking, awareness and investment, both domestic and foreign, for the ocean economy, creating a driving force for development and international integration, and contributing to national GDP. However, there are also limitations and weaknesses that made some objectives and targets set out in the Resolution difficult to be achieved by 2020.

There are 117 plans related to the exploitation and sustainable use of natural resources and environmental protection of the sea and islands, including planning at the national, regional, local and sectoral levels, of which 115 have been issued following the Vietnam Sea Strategy. However, the core role of promoting economic development along the direction of marine economic development includes 15 plans, including five regional plans; seven sector plans, and three marine and island resource protection plans.

12.1.2 Orientation on Blue Economy Development: Ocean Economy Sustainable Development Strategy

The Party Central Committee's *Resolution No. 36-NQ/TW* dated October 22, 2018 on Vietnam's **Ocean Economy Sustainable Development Strategy** was issued on the basis of evaluating outstanding results and problems in the field of marine economic development over the past time. It points out 5 guiding views, targets to 2030 and vision to 2045, and 5 major directions, 3 breakthrough stages and 7 key solutions. It can be said that the viewpoints, objectives to 2030 and Vision to 2045 of the *Resolution 36/NQ-TW* are all consistent with the approach to the blue economy, although this term is not explicitly used in this Resolution.

The **main guiding views** of *Resolution 36-NQ/TW* are:

- Unify thoughts and awareness of the special role and importance of the sea in the building and defence of the Fatherland in the whole Party, the whole army, and the entire people. The sea is a part of the sacred sovereignty of the Fatherland, the living space, the gateway of international exchanges, closely associated with the building and defence of the Fatherland. Vietnam must become a strong nation on the sea, become rich from the sea, develop sustainably, ensure prosperity, security and safety; sustainably develop the ocean economy associated with ensuring national defence and security, independence, sovereignty and territorial integrity, strengthening external relations and international cooperation related to the sea, and contributing to maintaining a peaceful and stable environment for development. Sustainable development of the ocean economy is the responsibility of the entire political system, the rights and obligations of all organizations, enterprises and people of Viet Nam.
- Sustainably develop the ocean economy on the basis of green growth and conservation of biodiversity of marine ecosystems; ensure harmony between economic and natural ecosystems, between conservation and development, between the interests of localities with and without sea access; strengthen linkages and restructure sectors to improve productivity, quality, efficiency and competitiveness; bring into full play the potential and advantages of the sea to create a driving force for national economic development.
- Keep and promote the value of historical tradition and the marine cultural identity coupled with building a sea-linked and sea-oriented society; guarantee the right to participate and receive benefits, and the responsibility of the people for the sustainable development of ocean economy on the basis of fairness, equality, and compliance with the Constitution and legislation.
- Strengthen integrated management of natural resources, protect the marine natural environment, conserve biodiversity and natural marine ecosystems; respond actively to climate change and sea level rise. Promote investment in conservation and development of biodiversity values, and restoration of marine ecosystems; protect the integrity of the ecosystems from the inland to the sea. Link the protection of marine natural environment with the prevention of pollution and environmental incidents. Enhance regional and global cooperation.
- Take advanced science and technology, and high-quality human resources as a breakthrough factor. Priority is given to state budget investment in research, studies, baseline surveys, and human resources related to the sea with mobilization of domestic and foreign resources. Improve the efficiency of international integration and cooperation, give priority to attracting the world's best strategic investors with source technologies and advanced management, on the principles of equality, mutual benefit, and respect for the independence, sovereignty and territorial integrity of Viet Nam.

Targets to 2030 with a vision to 2045 of Resolution 36-NQ/TW are determined in stages, with specific roadmaps, targets and steps in accordance with the objectives of the United Nations,

international treaties Viet Nam has signed and joined, and with the conditions and situation in the country. The targets also encompass the three pillars of sustainable development which are economic, social and environmental.

Accordingly, the **general objective to 2030** is: “Make Viet Nam a strong maritime nation; meet the basic criteria for sustainable development of the ocean economy; form a marine ecological culture; actively adapt to climate change and sea-level rise; prevent the trend of pollution and degradation of the marine environment, coastal erosion, and sea incursion; and restore and preserve important marine ecosystems. Make new, advanced scientific achievements as direct factor in promoting the sustainable development of the ocean economy”.

Specific and highlighted targets to 2030:

- a. General indicators of sea and ocean governance, management of coastal areas following international standards to reach the level of high- or middle-income countries in the world.
- b. On the ocean and coastal economy: The pure-ocean economy to contribute about 10% of national GDP; the coastal economy of the 28 coastal provinces and cities to reach an estimated 65-70% of national GDP.
- c. On the society: The Human Development Index (HDI) of the coastal provinces and cities to be higher than the national average; per capita income of the coastal provinces and cities to be at least 1.2 times higher than the national average.
- d. On science, technology, and marine human resources development: full access to and utilization of advanced scientific and technological achievements, to be in the group of leading countries in ASEAN. Several advanced marine science and technology sectors to be at world-class level.
- e. On the environment, response to climate change and sea level rise: Evaluate the potential and value of important marine resources and ecosystem services. A minimum of 50% of the sea area of Viet Nam to be under the basic survey of natural resources and environment with a map scale of 1: 500,000, and large-scale in some key areas. Pioneering in the area of minimizing oceanic plastic waste. Increase the area of marine and coastal protected areas to at least 6% of the national marine area, restore coastal mangrove forests at least equal to the level of the year 2000. To take measures to prevent, avoid, and limit impacts of tides, salinity intrusion, and coastal erosion.

Vision to 2045 is: “*Viet Nam becomes a strong sea nation, develops sustainably, achieves prosperity, security, and safety; ocean economy contributes significantly to national economy, contributes to building the nation into a modern industrial country in accordance with the socialist orientation; participate actively and responsibly in solving international and regional issues related to the sea and ocean*”.

Some major guidelines and breakthroughs to achieve targets are:

- Develop the ocean (marine) and coastal economy.
- Develop sea areas based on the advantages of natural conditions, and harmonizing conservation and development.

- Ensure environmental protection, conservation and sustainable development of marine biodiversity.
- Actively respond to climate change, sea level rise and work to prevent natural disasters.
- Improve the people's life, building a culture of the sea, and a sea-friendly society.
- Ensure national defense, security, with good external relations and international cooperation.

New policies across the marine and coastal industries should consider ecosystem-based approaches and solutions, and ensure that these industries develop harmoniously with nature; moving from economic exploitation and environmental pollution to a green ocean economy, investing in natural capital, and utilizing achievements of science and technology.

The development of the sea must also be based on marine spatial planning. Accordingly, the “protection-conservation zones, buffer zones and socioeconomic development areas are categorized for sustainable marine economic development on the basis of maximizing the comparative advantages of natural conditions, geographical location, cultural identity, diversity of ecosystems, ensuring regional connectivity, and connectivity between localities with and without sea access”.

This Resolution is in line with the blue economy paradigm. It emphasizes the development of a sustainable, inclusive, resilient and green ocean economy based on preserving marine natural resources and biodiversity, and aims to: (i) demonstrate international commitments to expand the area and establish new marine protected areas, rehabilitate natural ecosystems, especially coral reefs, seagrass beds, mangroves and coastal protection forests; (ii) ensure the prevention of environmental incidents, minimize and effectively treat the sources of pollution to the marine environment; (iii) develop strict criteria and technical requirements in accordance with international environmental standards for investment projects in coastal areas that are prone to high environmental pollution; (iv) raise the capacity of forecasting, early warning, and reduction and management of risks from natural disasters, earthquakes and tsunamis, and adapting to climate change and sea level rise on the basis of the application of advanced science and technology, especially the application of intelligent models; and (v) promote measures to prevent sea incursion, coastal erosion, flooding and salt water intrusion.

On the improvement of people's living conditions, building of a sea-oriented culture, and a cohesive and sea-friendly society, the Resolution sets out the policy of: (i) improving living standards and ensuring social security for people living on the coast, for islanders and for laborers at sea; (ii) raising awareness about the sea and ocean; (iii) building a sea-conscious society, a way of life with cultural activities that are close and friendly to the sea; (iv) promoting the spirit of mutual affection of communities living in coastal areas; and (v) ensuring equal access, participation, benefit and responsibility of the people towards the sea.

On national defense, security, foreign affairs and international cooperation, the Resolution continues to set out the basic principles that affirm the views, objectives and tasks to protect and maintain independence, rights, sovereignty, jurisdiction and national interests in the sea of Vietnam.

Continuing to affirm the approach throughout in foreign affairs, and international cooperation to persist in building and maintaining a peaceful, stable and legal environment on the sea, creating the basis for safe and effective sea exploitation and use. To intensify and broaden external relations and international cooperation so as to actively participate in and contribute positively to the international community's common efforts in the conservation and sustainable use of the sea and the ocean; at the same time, to make full use of resources and international support to improve the management and exploitation of the sea, focusing on the fields of science, technology, knowledge and human resource training.

Resolution 36-NQ/TW aims to achieve three breakthroughs:

- Complete the institutional arrangements and supporting mechanisms for the sustainable development of the ocean economy: Give priority to the improvement of the legal framework, innovation, development of green growth models, environmental protection, and improvement of the productivity, quality and international competitiveness of marine industries; Establish the integrated ocean or marine management mechanism. Review, adjust, supplement and establish plans related to the sea, ensuring the linkage between sectors and localities. (inter-sectoral and spatial integration).
- Develop science, technology, and high-quality human resources, promote innovation and creativity, make full use of advanced scientific and technological achievements, and new technology, and attract leading experts, scientists, and high-quality human resources.
- Develop multi-purpose infrastructure and transportation networks connecting major economic centers, industrial zones, urban areas and sea areas with seaports based on economic and natural ecosystems, strategically connecting North - South, East – West, between the domestic and international regions.

On March 5, 2020, the Government issued *Resolution No. 26-NQ/CP* promulgating the Government's Master Plan and 5-year plan for implementation of *Resolution No. 36-NQ/TW* on the **Ocean Economy Sustainable Development Strategy by 2030, Vision to 2045**. The 5-year plan addresses important contents related to the blue economy development. The plan has launched 24 project, and tasks for the period from now to 2025 and 9 projects for the period 2026-2030.

12.1.3 Integrated Ocean and Coastal Governance

- Improving the system of integrated and unified State management agencies from the central to local levels to ensure modernity and synchronism; strengthening the inter-sectoral coordination agency to direct the unification of the implementation of the Ocean Economy Sustainable Development Strategy, headed by the Prime Minister; and establishing the Standing Office at VASI.

- Consolidating inter-sectoral coordination agencies to direct the unification of the implementation of the **Ocean Economy Sustainable Development Strategy** in coastal provinces/cities headed by the Chairman of the provincial/city People's Committee.
- Developing decrees and other legal documents on management of sea encroachment activities, island management and coastal wetland management; formulating a set of national criteria and statistical indicators on sustainable ocean economy development, a set of general criteria and indicators for the management of marine areas in coastal provinces/cities according to international standards.
- Reviewing, adjusting, supplementing and formulating strategies and plans related to the sea to ensure compliance with *Resolution No. 36-NQ/TW*; focusing on development of the **National Marine Spatial Plan for the period of 2021-2030, vision to 2045** and the **Master plan for the sustainable exploitation and use of coastal resources for the period of 2021 - 2030, vision to 2045**.
- Establishing and putting into operation stably and smoothly the cooperation in preventing ocean dumping and discharging wastewater into the marine environment and allocating sea areas for use in order to improve management effectiveness and efficiency for the exploitation and use of resources and protection of the marine environment.
- Developing and putting into operation the Fund promoting the sustainable development of Vietnam's ocean economy with the broad participation of domestic economic sectors and international partners; study and formulate a national target program on sustainable marine economic development.
- Developing and deploying a pilot model of innovative marine governance, applying modern technology in some large coastal cities and islands, including: Hai Phong, Da Nang, Ba Ria - Vung Tau Ships, Kien Giang and Ca Mau; building data and communication systems on the basis of smart and advanced technology to serve the islands.

12.1.4 Coastal and Marine Economic Development

- **Tourism and marine services:** developing tourism to become a key economic industry; adding to the list of preferential investment projects on tourism sustainable development in coastal areas and islands; completing the national standards of tourism compatible with the standards in ASEAN; reviewing and improving the system of national standards and regulations on tourism towards international integration with high regional and international standards; piloting sustainable ecotourism development in some offshore islands.
- **Maritime industry:** developing services to support marine ports, shipping and multimodal transport, especially improving the quality of logistics services in a synchronized and coordinated way; reforming policies and institutions to create a transparent and open legal framework; restructuring administrative procedures in the direction of creating conditions, removing difficulties and barriers, and creating incentives to encourage all economic sectors to participate and invest in the development of marine fleet and green ports.

- **Exploitation of petroleum and other marine resources and minerals:** applying and updating high technologies in studying, exploring, exploiting, processing and distributing petroleum products, gas and other marine minerals, ensuring high efficiency; improving oil and gas recovery coefficients, especially for small and near-sea mines and save other resources; effectively protecting ecological resources.
- **Aquaculture and aquatic product exploitation:** Transforming small-scale and backward-scale aquaculture models into industrial and large-scale aquaculture with modern, sustainable and environment-friendly technologies; relocating fishing grounds from coastal areas, where there are specific and sensitive ecosystems or fisheries resources tending to decline and overlaps with other economic activities, to the offshore areas; developing and operating models of artificial habitat for marine species, high-tech membrane house model in sea and islands, with resiliency toward climate change and taking advantage of products for environmental treatment to improve economic efficiency and increase income for fishing communities on islands; restoring coastal habitats and applying energy saving technologies for fishing to improve production efficiency and contribute to climate action.
- **Coastal industry:** Promoting investment attraction and developing high-tech and environmentally friendly industries; adjusting the plans of industries that use fossil fuels, which may cause environmental pollution and increase greenhouse gas emissions.
- **Renewable energy and new marine economic sectors:** Prioritizing investment to renewable energy development on islands in service of production and daily life, ensuring national defense and security; formulating mechanisms and policies to encourage domestic and foreign individuals and economic organizations to cooperate in investment to exploitation of new and renewable marine energy sources; promoting investment in building and exploiting wind power, solar power and other forms of renewable energy on marine areas and islands.
- **Development of marine areas:** Building a sustainable development model to adapt to climate change and sea level rise, and a model of sustainable ecosystems for the marine areas and islands in the North-Central, Central and Southwest marine and coastal areas.
- **Improvement of the people's life and marine culture building:** Supplementing and building adequate socioeconomic infrastructure, especially on electricity, freshwater, communication, health care and education on inhabited islands; promulgating a set of criteria on health of people and health of ocean and ecosystems for marine areas and islands;
- **Science, technology and development of marine human resources:** Formulating a national-level science and technology program on sea and islands in the direction of promoting innovation and applying advanced scientific technology; promoting research and establish scientific arguments for the formulation and completion of policies and laws on blue economy or the sustainable development of ocean economy; focusing on training and developing high quality human resources for innovative, resilient, inclusive and more prosperous blue economy development.

- **Environment and response to natural disasters, climate change and sea level rise:** Investing and consolidating integrated infrastructure and equipment that follow environmental standards for the system of collecting and treating hazardous waste, wastewater, and domestic solid waste in coastal areas; building a closed model of collecting, classifying, treating and reusing wastewater, domestic solid waste, plastic waste, and hazardous waste on islands; implementing the plans of economic zones, industrial parks, industrial clusters and coastal urban areas in sustainable and ecosystem-based manner, smartly adapting to climate change and sea level rise; implementing the *National Plan of Action on ocean plastic waste management by 2030*; continuing to improve the establishment of marine protected areas; implementing programs and projects on restoration and development of important ecosystems, including coral reefs, seagrass beds, lagoons, tidal flats, estuaries, mangrove forests and coastal protection forests nationwide, prioritizing the areas with fast degradation; investing in upgrading natural disaster forecast and warning systems.

12.1.5 Integrated Coastal Management Strategy

The *Integrated Coastal Management Strategy for Viet Nam until 2020 with a vision to 2030* has the following specific objectives:

- Strengthening policy and legislation to create the legal basis for effective ICM implementation in Vietnam
- Rational use of coastal natural resources; assuring the harmonious benefits between socio-economic development and environmental protection, conserving and restoration of coastal habitat, ecosystems, resources and other values; mitigation of adverse impacts from human activities, natural disasters and climate change
- Enhancing knowledge and awareness of stakeholders on ICM, values of and threats to the coastal resources and environment
- Strengthening the participation of civil societies and communities in the process of policy development and implementation related to ICM.

In the Strategy, it is required that coastal provinces would develop and implement ICM program, which specially focuses on establishment and institutionalization of multi-sectoral coordinating mechanism for ICM, and development and implementation of coastal function zoning.

The *Action Plan on Implementing National ICM Strategy until 2020, vision to 2030* brings out a set of actions for the period from now until 2020, divided into 5 areas as follows:

- I. Development and promulgation of policies and legal documents on ICM
 - 1) Complete the institutional framework and policies on ICM
 - 2) Complete the integrated information management system for ICM

- II. Sustainable exploitation and use of coastal resources, and coastal biodiversity conservation
 - 3) Coastal zoning
 - 4) Develop guidelines on contemporaneous coastal resources management and pilot application in a number of coastal localities
 - 5) Develop and deploy scientific research programs for ICM
- III. Pollution prevention and monitoring, mitigation of damages caused by natural disasters, and response to global warming and sea level rise
 - 6) Develop guidelines on community-based environmental pollution monitoring and apply pilots in a number of coastal localities
 - 7) Perform assessment and inventory of pollution sources from the land and the sea
- IV. Training, capacity strengthening and awareness rising for ICM
 - 8) Develop and implement plans on human resource strengthening for ICM
 - 9) Develop and deploy the training programs and curriculums on ICM at the undergraduate and postgraduate levels
 - 10) Develop and deploy media communication programs on ICM
- V. Development and deployment of ICM in coastal localities
 - 11) Develop and deploy ICM programs in 28 coastal localities according to Section IV.5 of the Plan

In supporting the development of blue economy, there are also many other policy documents, especially:

- Sustainable development strategy of Vietnam for the period 2011-2020 (*Decision No. 432/QĐ-TTg* dated 12/04/2012 of the Prime Minister)
- Strategy of sustainable exploitation and use of natural resources and environmental protection until 2020, vision to 2030 (*Decision No. 1570/QĐ-TTg* dated 06/9/2013 of the Prime Minister)
- National strategy on biodiversity until 2020, vision to 2030 (*Decision 1250/QĐ-TTg* dated July 31, 2013 of the Prime Minister)
- Vietnam's tourism development strategy until 2030 (*Decision 147/QĐ-TTg* dated February 22, 2020 of the Prime Minister)
- Vietnam fisheries development strategy to 2020 (*Decision No. 1690/QĐ-TTg* dated September 16, 2010 of the Prime Minister)
- National Strategy for Environmental Protection up to 2020 with a vision to 2030 (*Decision No. 1216/QĐ-TTg* dated 5/9/2012 of the Prime Minister)
- National Strategy on Biodiversity up to 2020 with a vision to 2030 (*Decision No. 1250/QĐ-TTg* dated 31/7/2013 of the Prime Minister)
- Master plan of Vietnam biodiversity conservation until 2020, orientation to 2030 (*Decision No. 45/QĐ-TTg* dated 08/1/2014 of the Prime Minister);

- Vietnam Marine protected areas planning until 2020 (*Decision No. 742/QĐ-TTg* dated 26/5/2010 of the Prime Minister).
- Renewable Energy Development Strategy up to 2030 with a vision to 2050 (*Decision No. 2068 / QĐ-TTg* dated 25/11/2015 of the Prime Minister).
- National Action Plan to implement the 2030 Agenda for Sustainable Development (*Decision No. 622/QĐ-TTg* dated 10/5/2017 of the Prime Minister).
- Plan for implementation of the Strategy on marine natural resources sustainable exploitation and use, and environmental protection to 2020, vision to 2030 (*Decision No. 798/QĐ-TTg* dated 11/5/2016 of the Prime Minister).
- National Green Growth Action Plan for period 2014-2020 (*Decision No. 403/QĐ-TTg* dated March 20, 2014 of the Prime Minister).
- Master plan for development of Viet Nam's tourism up to 2020 with a vision to 2030 (*Decision No. 201/QĐ-TTg* dated 22/01/2013 of the Prime Minister).

ICM implementation at local level

Over the past two decades, the former Ministry of Science, Technology and Environment and the current MoNRE have made great efforts in introducing and applying ICM in Vietnam. Despite many difficulties, it can be seen that ICM has been contributing to promoting the blue economy development in Vietnam. In addition to the legal and policy documents that create a legal corridor, technical bases and guidelines for implementing ICM at the local level, ICM has also been implemented in practice. Starting from the pilot activities, such as the PEMSEA National ICM Demonstration Site Project in Da Nang City, 2000-2007, the Vietnam-Netherlands Project on integrated coastal zone management, piloting in provinces Nam Dinh, Thua Thien Hue and Ba Ria - Vung Tau, 2000-2005, NOAA Project for ICM on Ha Long Bay, Quang Ninh, 2005-2008 and MONRE ICM Project in Quang Nam, 2004-2007, ICM is still being implemented in most coastal provinces/cities, although it has not been implemented continuously and systematically in some places. Some provinces/cities that have regular ICM activities are:

- Provinces and cities participating in the PEMSEA-VASI Project on ICM scaling up in Vietnam, including Quang Ninh, Hai Phong, Thua Thien Hue, Da Nang, Quang Nam and Kien Giang
- Ba Ria - Vung Tau Province - the key province implementing the KOICA Project "Setting up the foundation for integrated coastal management in some coastal provinces of Vietnam.
- Nghe An province, which continuously implement 2 ICM projects in Nghe An province for the periods of 2011-2015 and 2016-2020.
- Quang Ngai Province, which implemented ICM project in Quang Ngai province in the period of 2012-2015 and is implementing the Quang Ngai ICM Plan for the period 2016-2020.

The total length of the coastline of the above provinces/cities with ICM accounts for about 40% of the entire coastline of Vietnam (this is a relative estimate, due to the fact that calculation of the length of the coast of provinces and cities as well as of the whole Country is not based on the same scale).

12.1.6 Climate Change Response

Vietnam now has some major documents codifying policy responses to climate change:

- *National Target Program on Climate Change*
- *National Strategy on Climate Change*
- *Resolution 24* of the Party Central Committee on active response to climate change, strengthening natural resources management and environmental protection
- The *Law on Environmental Protection* having a separate chapter on climate change response.

From these documents, Vietnam further develops basis and action to respond to climate change at the national, ministerial, sectoral and provincial levels. Some major relevant activities are:

- On October 27, the Prime Minister issued *Decision No. 2044/QĐ-TTg* approving the SP-RCC Program 2016-2020 with three components: policy, investment and capacity building for the response to climate change.
- The Prime Minister has also approved the *2016 Policy Framework (supplement); Policy Framework 2017*, Policy orientation for the period 2018-2020 under the SP-RCC program for ministries and branches to implement.
- On 26/8/2016, the Government issued *Resolution No. 73/NQ-CP*, approving the policy of investment in climate change adaptation and green growth target program.
- On July 13, 2017, the Prime Minister approved the *Policy Framework for Climate Change Support Program (SP-RCC) 2018* at *Decision No. 1028/QĐ-TTg*.

12.2 Legislation

There are numerous legal documents related to ocean economy development and marine and coastal natural resources and environmental management of Vietnam. Some recent important documents related to blue economy development of Vietnam can be summarized as follows:

Law of the Sea of Vietnam No. 18/2012/QH13

Article 44 on *Marine economic development planning* stipulates that marine economic development planning must be based on:

- National socioeconomic development strategy and master plan; and national environmental protection strategy.
- Orientations for sustainable development strategies and marine strategies.
- Characteristics, geographical locations and natural conditions of the seas, coastal areas and islands.
- Results of basic surveys on marine resources and environment; state and forecasting demand on exploitation and use of marine natural resources and protection of marine environment of the whole country, regions and coastal provinces and cities.

- Value of resources and vulnerability of the marine environment.
- Resources to implement the plans.

The contents of a marine economic development planning include:

- Analysis and assessment of natural and socioeconomic conditions, and current situation of marine exploitation and use.
- Identification of directions, objectives and guidance for rational use of marine resources and protection of marine environment.
- Zoning for use of the sea for socioeconomic development, national defense and security purposes; identifying areas where exploitation is prohibited, areas subject to conditional exploitation, areas in need of special protection for national defense, security, environmental management and conservation of ecosystems and artificial islands, equipment and structures at sea;
- Determination of position and area and mapping of all coastal and marine areas including sea surface, seabed and the islands.
- Determine specific vulnerable coastal areas, such as accretion lands, erosion coast, protective forests, wetlands, sand beaches; identification of buffer zones and the appropriate management and protection measures.
- Solutions and schedule for implementation of the plans.

Law of the Sea and Island Resources and Environment No. 2/2015/QH13

This Law addresses principles of integrated management of natural resources of sea and islands in the Articles 5 as follows:

- Natural resources of sea and islands must be managed in agreement with strategy for exploitation and sustainable use and protection of natural resources and environment; planning and plans for use of sea; master planning for exploitation and sustainable use of natural resources in littoral zones; protection of national sovereignty, assurance of National defense and security.
- Integrated management of natural resources of sea and islands must be based on ecosystem approach ensuring natural resources of sea and islands are exploited and used in agreement with function of each sea area and within load capacity of environment, ocean ecosystem and islands.
- Integrated management of natural resources of sea and islands must have close coordination between sectors and levels; creating favorable conditions for residential communities, relevant organizations or individuals to get involved actively and effectively during the management, ensuring rights of residents to get access to the sea.

The participation of residential communities, relevant organizations or individuals in the sea and island integrated management of natural resources and environment protection is required as stated in the Article 6.

In the Chapter II. *Strategy for exploitation and sustainable use of natural resources and environment of sea and island*, the principles, basis, time frame and content of the strategy, as well as its appraisal and approval mechanism are stipulated at the articles 10, 11 and 12. Specifically, it is stated that the strategy is established at national level for a 20-year period with a vision for 30 years.

The Chapter IV presents regulations related to Master planning for sustainable exploitation and use of coastal resources and Integrated coastal management Program.

The master planning of sustainable exploitation and use of resources coastal area shall be established for the whole coastal area of the country and its principles, basis, scope, content, time frame, appraisal and approval procedures and implementation mechanism are regulated by the Articles 26-33.

Regarding the integrated coastal resources management program, its principles, basis, scope and content, as well as its development, appraisal and approval processes are addressed Articles 34, 35 and 36. As for implementation, MONRE shall take the lead in organizing the implementation of integrated coastal resources management programs at interprovincial level, while the People's Committees of coastal provinces and coastal cities shall undertake the implementation of the programs at local level.

Law on Planning No. 21/2017/QH14

According to this Law, the Government shall organize formulation of the national marine spatial planning, assigning MONRE to act as the focal point to realize it and regulate the integration of relevant plans into national marine spatial planning. The contents of national marine spatial planning are specified in Article 23 and include:

- Analysis and assessment of factors, natural conditions, resources, conditions directly affecting and use of spaces for carrying out activities within coastal areas, islands, archipelagoes, territorial waters and airspace that belong to sovereignty, sovereign rights and national jurisdiction of Vietnam;
- Areas where extraction is prohibited, conditional extraction areas, areas where development is encouraged, areas that need to be provided with special protection for the purposes of national defense, security, environmental protection and preservation of ecosystem within coastal areas, islands, archipelagoes, territorial waters and airspace that belong to sovereignty, sovereign rights and national jurisdiction of Vietnam;
- Forecasting of trends in fluctuation of natural resources and environment, effects of climate change on natural resources and environment; demand for extraction and use of natural resources and requirements for protection of environment within coastal areas, islands, archipelagoes, territorial waters and airspace that belong to sovereignty, sovereign rights and national jurisdiction of Vietnam during the planning period;

- Forecasting of developmental context and scenarios; assessment of opportunities and challenges to activities requiring marine space;
- Viewpoints and objectives for development;
- Orientation for provision and use of spaces for carrying out activities within coastal areas, islands, archipelagoes, territorial waters and airspace that belong to sovereignty, sovereign rights and national jurisdiction of Vietnam;
- Zoning of land within coastal areas, islands, archipelagoes, territorial waters and airspace that belong to sovereignty, sovereign rights and national jurisdiction of Vietnam;
- Solutions and resources for planning implementation;
- List of nationally important projects and their execution in order of priority.

Law on Fisheries No. 18/2017/QH14

The principles of fisheries activities are stipulated in Article 5, showing the relation to resource protection, climate change adaptation, ensuring sharing benefits and meeting the needs of international integration:

- Commercial fishing shall depend on reserve of aquatic resources in combination with protection, recreation and development thereof and shall not exhaust aquatic resources and affect biodiversity; according to ecosystems and scientific indicators, carefully approach to ensure sustainable development.
- Fishery activities shall adapt to climate change, actively prevent and control natural disasters, ensure safety for people and means of fishery activities; prevent and control aquatic epidemics, ensure food safety and environment safety.
- Organizations and individuals that enjoy benefits from catching and use of aquatic resources or are involved in sectors producing direct effects on aquatic resources shall their interests and responsibilities ensured.
- Fishery activities shall meet requirements of international integration and comply with international treaties to which the Socialist Republic of Vietnam is a signatory.

The Prohibited actions in fisheries activities are stipulated in Article 7 and co-management activities for protecting aquatic resources are stipulated in Article 10.

In Chapter II. Protection and development of fisheries resources, the Article 11 regulates that aquatic resource protection and exploitation planning must be based on:

- Strategies for sustainable exploitation and use of marine and island resources and environmental safety; strategies for preserving biodiversity;
- The national marine spatial planning;
- The master plan for environmental protection; the master plan for preserving biodiversity;

Regarding marine protected areas, the Article 16 stipulates that the Ministry of Agriculture and Rural Development shall request the Prime Minister to issue decisions on establishment of MPAs

located in at least 2 provinces or central-affiliated cities; while the People's Committee of each province shall request the Prime Minister to issue decisions on establishment of MPAs located in the province after getting written permission from the Ministry of Agriculture and Rural Development.

In addition, the Law also stipulates regulations on Aquatic resource protected areas (Article 17), Management of aquatic resources and aquatic ecosystem in reserve forests and protection forests (Article 18) and Management of aquatic resources in wetland reserves (Article 19).

Law on Tourism No. 09/2017/QH14

The principles of tourism development are clearly stated in Article 4, that includes:

- Develop targeted and sustainable tourism through strategies, master plans and plans
- Developing tourism in association with preserving and promoting the value of national cultural heritage, natural resources, exploiting the advantages of each locality and strengthening regional linkages.
- Ensuring national interests, community interests, legitimate rights and interests of tourists, organizations and individuals engaged in tourism business.

The Law has specific regulations on policy of investment in new tourism product development that have a positive impact to the environment, attracting the participation of the community and investment in developing marine, island tourism, ecotourism, community tourism and cultural tourism (Article 5), on participation of population communities in tourism development (Article 6) and on tourism environment protection (Article 8).

Tourism planning is stipulated in Chapter 3, Section 3, which clearly states the principles of planning tourism, in association with environmental protection, sharing benefits and socio-economic development requirements and international integration of the country:

- Properly and effectively use tourism resources and preserve historical - cultural relics, natural heritages towards sustainable development associated with environmental protection and climate change adaptation.
- Minimize negative impacts of tourism development on economy, society and environment.
- Ensure the participation of organizations, local communities and individuals during formulation of master plans; protect both interests of the State and those of communities, interests of regions with those of areas therein.
- Ensure scientific soundness and apply modern technology during formulation of master plan; meet standards and regulations and conform to national socioeconomic development and international integration requirements.

Vietnam Maritime Code No. 95/2015/QH13

In this Code, Acts causing environmental pollution are strictly prohibited in maritime activities. The regulations on Environmental Protection in maritime operations are outlined in (Article 128) as follows:

- Construction of a ship or seaport must entail installation of environmental protection equipment in accordance with laws and regulations; have oil and hazardous chemical spill response plans.
- Seaport must have plans and solutions to receive and treat wastes discharged from ships in accordance with applicable laws.
- The ship owner, seaport owner and organizations or individuals involved must comply with laws and regulations on environmental protection.

Law on Environmental Protection No. 55/2014/QH13

The Law stipulates the Renewable energy development at the Article 43 as follows:

- Renewable energy refers to energy that comes from resources such as water, wind, sunlight, geothermal heat, tides, waves, biological fuels and other resources that can generate renewable energy.
- Promote the production, importation and employment of renewable energy-driven machinery, equipment and means of transport.

The Law reserves whole Chapter V to present the regulations on marine and island environmental protection with the general provisions (Article 49) as follows:

- Strategy, planning and proposal for the socioeconomic development, national defense and security relating to sea and islands must include environmental protection and response to climate change.
- Waste sources discharged from mainland, islands and marine activities must be controlled, prevented, mitigated and disposed in accordance with laws.
- Prevention and response to environmental emergencies that take place on the sea and islands require the close cooperation between regulatory bodies, rescue teams and other relevant entities.
- Organizations or individuals operating on the sea and islands must take the initiative in responding to environmental emergencies and bear their responsibility for working with regulatory bodies and other interested entities to respond to environmental emergencies that occur on the sea and islands.
- Strategy, planning and proposal for the extraction of natural resources from marine zones, islands, wildlife sanctuaries, mangrove forest, natural and island heritage sites must align with the strategy and planning for environmental protection.

There are also a number of other important documents related to the blue economy, especially:

- **Directive No. 20/CT-TTg dated 27.07.2015 of Prime Minister on strengthening of planning and investment to development and management of coastal construction projects:** The Prime Minister directs MONRE to review, revise and improve the policy and legal system related to land resources management, including land allocation and conversion for development in the coastal area, and management and protection of coastal land resource and environment. This Directive requires People's Committees of coastal provinces check and assess the appropriateness of the approved investment projects in the coastal areas; review all the projects for improving the construction plans and land use plans to ensure the benefits for local communities and investing companies; rationally exploit marine spaces, adapting climate changes and ensuring the national security.
- **Decree No. 51/2014/NĐ-CP, dated 21.05.2014 of Government, stipulating the assigning individuals and organizations to use the coastal water areas:** According to this Decree, PCs of coastal provinces will decide the entrusting the individuals and organizations to use coastal water areas within 03 miles, except for the areas managed by Government and MONRE.
- **Decree No. 40/2016/NĐ-CP dated 15.05.2016, stipulating in detail some articles of the Law of Sea and Island Natural resource and Environment:** The Decree regulates the contents addressed in an ICM program and other requirements, such as the ICM program effectiveness assessment.
- **Circular No. 49/2017/TT-BTNMT dated November 30, 2017 of MONRE on technical regulations for formulation and adjustment of integrated coastal resource management program:** The Article 4 of the Circular stipulates the programming process. Articles from 5 to 15 guide all activities related to the program development. In Article 19, the Circular stipulates that VASI is responsible for assisting MONRE to develop and adjust the programs of inter-provincial scope and guide, monitor and inspect the implementation of this Circular; People's Committees of provinces and cities directly under the Central Government are responsible for developing and adjusting the program within the scope of management of the province or city and allocating sufficient resources to ensure that the program is successfully developed in accordance with the regulations.

It is clear that major contents of national legislation/regulations on ICM cover the following management aspects:

- Integrated marine and coastal management
- Inter-sectoral coordinating mechanism for coastal management
- Marine spatial planning/coastal use zoning
- Ecosystem-based management of coastal areas
- Climate change adaptation and mitigation
- Economic instruments in support of coastal and marine management policies/regulations
- Empowerment of local governments to manage marine and coastal resources
- Multi-stakeholder consultation and participation in decision-making

- Integrated environmental monitoring, evaluation and reporting
- Information management and sharing
- Capacity development/competency requirements of responsible managers and personnel

Related laws on Climate Change

Climate change issues are addressed in many legislative documents, such as:

- *Environmental Protection Law, 2014* has a separate chapter on climate change.
- A number of other important legal documents have been issued to implement the *Law on Environmental Protection* in this field: the *Law on Water Resources*, the *Law on Natural Disaster Prevention and Control*, etc.
- Ministries and provinces have also developed a number of legal documents that support the implementation of Vietnam's climate change policy, strategy, and action plan.

12.3 Institutional Arrangements

Apart from policy and legislation development as presented above, the activities on consolidation of organizational mechanism and capacity development have been carried out at different levels.

12.3.1 Ministry of Natural Resources and Environment (MONRE)

MONRE was established on August 5, 2002, on the basis of consolidating the General Department of Land Administration, the General Department of Meteorology and Hydrology and the organizations performing the state management of water resources, mineral resources and environment under the ministries of Agriculture and Rural Development, Industry, Science, Technology and Environment. Accordingly, the MONRE performs state management functions and tasks in the fields of land, water resources; mineral resources, environment, meteorology and hydrology and cartography.

On March 4, 2008, the Government issued *Decree No. 25/2008/ND-CP* defining the functions, tasks, powers and organizational structure of the MONRE (replacing the *Decree No. 91/2002/ND-CP* of November 11, 2002), later amended and supplemented in *Decree No. 19/2010/ND-CP* of March 5, 2010 and *Decree No. 89/2010/ND-CP* August 16, 2010. The organizational structure of MONRE continued to be strengthened and consolidated, clarifying the functions and tasks of state management in some fields and adding functions and tasks on river basin management, climate change, integrated and unified management of the sea and islands.

On March 4, 2013, the Government issued *Decree No. 21/2013/ND-CP* defining the functions, tasks, powers and organizational structure of the MONRE (replacing *Decree No. 25/2002/ND-CP*). Consequently, MONRE has been more comprehensively strengthened from functions, duties, powers to organizational structure.

On April 4, 2017, the Government issued *Decree No. 36/2017/ND-CP* defining the functions, tasks, powers and organizational structure of MONRE (replacing *Decree No. 21/2013/ND-CP* March 4, 2013). According to this Decree, MONRE is a government agency that performs the function of state management in the fields of land, water resources, mineral resources, geology, environment and hydro-meteorology, climate change, measurement and mapping, integrated management of natural resources and environment of sea and islands, remote sensing, and public services in fields under its management. In the Decree, the state management function of remote sensing is added and the phrase “natural resources and environmental protection” is revised for the state management functions on the sea and islands to comply with the Law on Natural Resources and Environment of Sea and Islands; some contents which are no longer suitable are abolished; and some tasks are updated and supplemented to ensure compliance with newly issued legal documents.

Thus, the Ministry currently has 23 units, of which the Vietnam Administration of Sea and Islands (VASI), Vietnam General Department of Geology and Minerals, Vietnam Environment Administration, Department of Hydrometeorology, Department of Water Resources Management, Department of Information Technology and Natural Resources and Environment Data, Department of Survey, Cartography and Geographic Information of Vietnam, Department of Climate Change, Department of National Remote Sensing, Institute for Natural Resources and Environment Strategies and Policies, Center for Water Resources Survey and Planning, Department of Legal Affairs and Inspectorate are closely related to marine natural resources and environment activities.

12.3.2 Vietnam Administration of Sea and Islands (VASI), MONRE

VASI, which is under MONRE, is the national focal point for unified and integrated management of marine and island natural resources. VASI was established on August 27, 2008 under the Prime Minister's *Decision No. 116/2008/QĐ-TTg*. VASI has made a number of changes in its organizational structure in 2015 and 2018, focusing on strengthening its focal point role in the implementation of ICM and in Vietnam.

Currently, VASI has 14 affiliated units, all with functions and tasks directly or indirectly related to ICM:

- Department of Policy and Legislation.
- Department of International Cooperation and of Science, Technology.
- Department of Planning and Finance.
- Department of Organization and Personnel.
- Administration Office.
- Agency for basic survey of sea and islands.
- Agency for Sea and Islands Utilization and Management.
- Agency for Sea and Island Natural Resources Control and Environmental Protection.
- Sea and Islands Research Institute.
- Oceanology Center.

- Center for Marine Geodesy and Mapping.
- Center for Planning and Investigation of marine natural resources and environment in the Northern region.
- Center for Planning and Investigation of marine natural resources and environment in the Southern region.
- National Center for Sea and Island Information and Data.

12.3.3 Department of Natural Resources and Environment

At the local level, the Department of Natural Resources and Environment (DONRE) is defined as a body that advises and assists the provincial people's committees to perform the function of integrated management of the sea and islands. To date, 25 out of 28 coastal provinces have established sea and island sub-divisions directly under their respective DONRE, and the rest have Marine and Island Divisions or Marine and Islands unit integrated into some division of their DONRE.

Therefore, the Sub-Department of Sea, Islands or Division/Unit of Sea and Islands Management is the focal point for unified and integrated management of natural resources and environment of sea and islands, including ICM at the local level.

12.3.4 Vietnam Environment Administration (VEA), MONRE

VEA under MONRE is the agency, performing the function of state management of environmental protection nationwide, including the sea and island environment.

Participated in exploitation, use and management of Vietnam's seas and coastal areas, there are many other ministries, agencies and agencies at central and local levels. Specifically:

12.3.5 General Department of Fisheries, MARD

The *General Department of Fisheries* under the MARD performs the function of advising and assisting MARD in the management and organizing of the implementation of legislation on fishery nationwide.

The General Department has following relevant tasks:

- Submitting to the MARD the relevant strategies, master plans, long-term, medium-term and annual development plans, programs and projects;
- Guiding, inspecting and organizing the implementation of relevant legal documents, strategies, plans, programs and projects;
- Planning and decentralizing the management of inland water protected areas and marine

- protected areas; developing regulations on management of inland water protected areas and marine protected areas related to aquatic resources according to the provisions of law;
- Guiding and inspecting the implementation of regulations on fishing, fishing ports, fishing wharves, fishing ships shelter anchoring areas;
 - Planning concentrated aquaculture areas; making list of aquatic breeds; list of chemicals used and banned from use in aquaculture; certifying aquatic breeds and feeds according to regulations;
 - Directing, guiding, and inspecting the implementation of regulations on the protection of the habitats for aquatic species; preserving, regenerating and developing aquatic resources; implementing environmental protection measures for aquatic ecosystems; conserving gene funds and aquatic biodiversity;
 - Guiding and inspecting activities of environmental monitoring, warning, supervision and treatment in aquaculture.

12.3.6 Vietnam National Administration of Tourism

The *Vietnam National Administration of Tourism* under the Ministry of Culture, Sports and Tourism has the function of advising and assisting the Minister of Culture, Sports and Tourism in performing the state management and organizing the enforcement of tourism legislation over the whole country. The Administration has the following relevant tasks:

- Submitting to the Minister the regulations on protection, embellishment, development, exploitation and promotion of the values of tourism resources, and protection of tourism environment; tourism development strategies and master plans; national tourism promotion programs; national action programs on tourism; important national projects on tourism; and draft decisions and directives of the Prime Minister on tourism.
- Assisting the Minister in directing, guiding, inspecting and organizing the implementation of legal documents, strategies, programs, plans and projects on tourism already approved by competent authorities;
- Organizing the implementation of scientific research and technological, application on environmental protection in the field of tourism and tourism resources as delegated by the Minister.

12.3.7 Vietnam Maritime Administration (VINAMARINE), Ministry of Transport

The *Vietnam Maritime Administration* (VINAMARINE) is an organization directly under the Ministry of Transport, performing the function of advising and assisting the Minister of Transport in state management and organizing the implementation of specialized maritime laws over the whole country.

The VINAMARINE has the following relevant tasks:

- Assuming the prime responsibility for elaborating and submitting to the Minister strategies, long-term, medium-term and annual plans, national programs and projects in maritime field nationwide;
- Organizing the implementation of legal documents, strategies, plans, standards, technical regulations and marine economic-technical norms promulgated or approved by competent authorities;
- Organizing the management and supervision of the implementation of the planning on seaports, dry ports, coastal information systems, navigational channels, systems of maritime signals, water areas, and shipbuilding, repair and destruction facilities in accordance with the approved plans, ensuring maritime safety and environmental pollution prevention;
- Developing and submitting to the Minister draft legal documents on prevention of environmental pollution in the maritime field;
- Organizing the implementation of environmental pollution prevention in the maritime field for vessels operating at seaports, navigational channels and Vietnamese territorial waters according to the provisions of law;
- Guiding, inspecting and supervising the compliance with the regulations on environmental protection in maritime activities according to regulations.

12.3.8 Security Forces

The forces playing key role in the enforcement of the sea related legislation include Navy, Coast Guard, Fishery Control Force and Border Guard. These forces participate in rescue and salvage at sea, in natural disaster prevention and control on islands and coastal areas. They have been assigned, coordinated, advised and directly carried out their duties and struggled to defend Viet Nam's sovereignty and jurisdiction over the sea. The maritime legislation enforcement agencies also coordinate with other countries and international organizations to combat piracy; prevent smuggling, trade frauds, and illegal exploitation of marine products, protect fishermen against invasive objects, and at the same time verify cases of violations of fishing grounds by fishermen captured by functional forces of the countries in order to have legal aid facilities for the fishermen following international practice.

12.3.9 National Inter-Ministerial Coordination Committee for ICM

Regarding the inter-sectoral coordination mechanism, in the field of ICM, the **National Inter-Ministerial Coordination Committee** to implement the *Integrated Coastal Management Strategy of Vietnam to 2020 with a vision to 2030* was established at *Decision No. 975/QĐ-TTg* dated May 31, 2016 of the Prime Minister. The Coordination Committee has the function of assisting the Prime Minister in studying, directing and coordinating the implementation of the Integrated Coastal Zone Management Strategy in interdisciplinary and inter-regional way. Members of the Coordination Committee include: Head of the Committee is the Minister of Natural Resources and Environment; 3 deputy heads, including: Vice Minister of Natural Resources and Environment; Vice Minister of Finance and Vice Minister of Planning and Investment. Members include representatives of leaders of the Ministry of Transport, Education and

Training, Science and Technology, Agriculture and Rural Development, Culture, Sport and Tourism; and representatives of People's Committees of 28 coastal provinces.

In many coastal provinces, such as Hai Phong, Da Nang, Quang Nam, Nghe An, Quang Ngai, Kien Giang, the inter-sectoral coordination boards have been established to implement ICM.

12.3.10 Organizations Coordinating and Directing the Management of Climate Change and Natural Disasters

Regarding climate change and natural disaster, there are other interdisciplinary organizations, such as:

National Committee on Climate Change: has the function of advising and assisting the Government and the Prime Minister in studying, proposing, directing, regulating, coordinating and urging the settlement of important interdisciplinary issues in the field of climate change; directing and coordinating the implementation of national climate change strategies and programs; directing and organizing international cooperation on climate change.

National Committee for Natural Disasters and Incident Response and Search and Rescue: is an interdisciplinary coordinating body, responsible for assisting the Government and the Prime Minister in directing and organizing the coordination of responses to incidents, natural disasters and search and rescue nationwide and the relevant regional and international cooperation; directing the Steering Committees for Disaster Prevention and Search and Rescue of ministries, sectors, provinces and the units, specialized on or concurrently performing the natural disaster and incident response and search and rescue.

12.4 Research and Development (R&D) Consolidation

Since 1975, the Government has allowed the implementation of programs on marine survey and research every 5 years, and the present program is "Scientific and technological research for sea and island management and economic development", code KC.09/16-20. Since 2007, the Government has invested in the implementation of the Master Plan on basic surveys and management of marine resources and environment until 2010, vision to 2020, with the participation of many ministries, sectors and provinces. After 2000, the marine survey and research activities has been focusing on the coastal areas, estuaries, bays and lagoons.

Recent marine survey and research activities have provided important information for understanding the natural conditions of the sea, the situation of marine resources, basic marine processes, international marine practices, and capacity building in marine research. However, attention has not been adequately paid to socioeconomic and marine archeology surveys; the direct contributions to the state management of the sea, islands and development of ocean economy and protection of maritime sovereignty are still limited.

Stemming from such practical needs, the **Vietnam Sea Strategy to 2020** requires to step up the basic surveys and scientific researches on Vietnam's marine waters, islands and continental shelf; requires technological innovation and application of scientific advances to improve the quality of surveys, monitoring and forecasts on marine resources and environment in service of socioeconomic development and assurance of national security and defense. Particular priority is given to investigating and researching activities serving the establishment of scientific bases for the formulation, amendment and supplementation of the system of legal documents, and policies on marine natural resources and environmental management towards sustainable development.

Priority directions and policies on marine surveys and research to 2020 are: (i) promoting basic and integrated surveys of sea and islands; (ii) building a national marine database; (iii) investigating and evaluating the potential and prospect of marine minerals in the continental shelf of Vietnam; (iv) studying and formulating marine policies and laws; (v) strengthening the capacity of marine science and technology and state management of sea and islands at both central and local levels; (vi) implementing integrated marine and coastal management program; (vii) investigating and researching to evaluate and apply adaptation measures to minimize the impacts of climate change and sea level rise on coastal areas, marine environment and resources; and (viii) investigating the sea-continent-atmosphere interaction in different seas.

On April 25, 2017, the Prime Minister signed *Decision No. 562/QĐ-TTg* approving the Program on development of basic sciences in the fields of chemistry, life sciences, earth sciences and marine sciences, period 2017 - 2025. Accordingly, marine science (including oceanography and ocean - atmosphere - continent interaction; marine chemistry; marine biology and ecology; marine geography, geology, geophysics; and marine construction) will be prioritized for implementation. The State will place national-level tasks in the direction of priority research for specialized scientific and technological organizations. The goal of this is to address the products applied in production and daily life. The young doctors will also be tasked with basic researches.

The Prime Minister emphasized that the training of high quality postgraduate human resources should be focused. Besides, it is necessary to reward scientists who have high quality products, as well as invest in large, modern and specific equipment with common use mechanisms. The decision stated: "There will be plans for investment and hiring of research ships for marine scientific research." Marine Science will be given priority to receive funding from the National Science and Technology Development Fund through the Specialized Councils.

On October 24, 2018, the Ministry of Science and Technology issued *Decision No. 3238/QĐ-BKHCHN* on the approval of the List of scientific and technological tasks ordered under the **National Key Science and Technology Program, 2016-2020**: "Scientific and technological research for the management of the sea and islands and development of ocean economy", code: KC.09/16-20.

Accordingly, the Ministry of Science and Technology approves the List of 7 scientific and technological tasks ordered under the above-mentioned National Key Science and Technology Program, including:

- For the field of marine island management and ocean economy development: 4 tasks with 31 expected outputs.
- For the field of natural conditions, natural disasters and marine exploitation technology: 3 tasks with 25 expected outputs.

Areas under focus for research include coastal areas of eastern Mekong Delta, Hai Phong and Quang Ninh port group, island districts of Ly Son and Phu Quy, marine waters from Tuy Hoa to Vung Tau and Tu Chinh - Vung May marine area. The researches will focus on natural features, economic benefits, and urgent issues for each region. University research teams and scientists can be tapped to aid in the process of planning. Such solicitation of research can be observed in the planning of Cát Bà National Park in Vietnam.

12.5 International and Regional Cooperation

12.5.1 Meeting International Commitments

Vietnam has been engaged in global efforts to address marine-related environmental issues and is a member of international and regional agreements in the marine field. Below are some international conventions related to marine natural resources and environment, of which Vietnam is a member:

- Convention on wetlands of international importance, especially as a habitat for waterfowl (Ramsar Convention), 1971 (September 20, 1988).
- Protocol supplementing the Convention on wetlands of international importance, especially as a habitat for waterfowl, Paris, 1982.
- International Convention for the Prevention of Pollution from Ships or MARPOL Convention (August 29, 1991).
- United Nations Convention on the Law of the Sea or UNCLOS (July 25, 1994).
- Copenhagen Supplementary Document, 1992.
- Agreement on the Network of fishery centers in Asia – Pacific region, 1988 (February 2, 1989).
- Convention on Biological Diversity, 1992 (November 16, 1994).

Vietnam has also committed to the implementation of Sustainable Development Goals (SDGs) related to the sea, such as SDGs 14, 6, 7, 8, 12 and 11; implementing international commitments within the framework of ASEAN and bilateral international treaties that Vietnam has signed, especially with countries of the EAS region, in the marine fields.

Regarding the *climate change response*, Vietnam has performed many international obligations:

- Ratified the UNFCCC in 1994 and the Kyoto Protocol in 2002.
- Approved the Doha amendment to the Kyoto Protocol on June 8, 2015

- Issued a number of important documents as the basis for the implementation of the UNFCCC and the Kyoto Protocol in Vietnam (Prime Minister's Directive on the Organization of the Implementation of the UNFCCC, the Protocol Kyoto and Clean Development Mechanism; Implementation Plan of the Kyoto Protocol under UNFCCC; National Target Program on Climate Change response; National Strategy on Climate Change; the National Green Growth Strategy, the National Action Plan on Climate Change 2012-2020).
- Fulfilling the obligations of a member of the UNFCCC, Vietnam has developed the Initial and Second National Communications (INC and SNC), and the Bi-annual Update report submitted to the UNFCCC Secretariat in 2003, 2010 and 2014.
- In 2016, the Government issued *Resolution 93/NQ-CP* approving the *Paris Climate Agreement* to implement the UNFCCC and the Prime Minister issued Decision No. 2053/QD-TTg approving the Implementation Plan of the Paris Climate Change Agreement.

In addition, Vietnam is also in the process of preparing to ratify a number of other conventions. **Table 12.1** shows the international environmental agreements and the status of adoption by Vietnam.

Table 12.1: Multilateral Environmental Agreements, IMO Conventions and Other International Instruments Adopted by Vietnam.

INTERNATIONAL CONVENTIONS AND AGREEMENTS		Status
Ocean	United Nations Convention for the Law of the Sea (UNCLOS)	R, A
	International Maritime Organization (IMO Convention 1948)	R
Maritime Safety	Convention for the Safety of Life at Sea (SOLAS)	R
	• SOLAS Protocol 78	R
	• SOLAS Protocol 88	R
	• SOLAS Agreement 96	-
	Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972	R
International Waters	Convention on the Law of the Non-navigational Uses of International Watercourses (Watercourses Convention)	A
Habitat and biodiversity conservation		
	Convention on Biological Diversity (CBD)	R
	• Cartagena Protocol on Biosafety	A
	• Nagoya Protocol on Access and Benefit-Sharing	A
	• Nagoya – Kuala Lumpur Supplementary Protocol	A
	Convention on International Trade in Endangered Species (CITES)	A
	Convention on Migratory Species (CMS)	-
	Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar)	A
	World Heritage Convention (WHC)	Ac

Table 12.1: Multilateral Environmental Agreements, IMO Conventions and Other International Instruments Adopted by Viet Nam. (cont.)

INTERNATIONAL CONVENTIONS AND AGREEMENTS		Status
Pollution and waste management		
Marine pollution	UNCLOS (Part XII: Protection and Preservation of the Marine Environment)	R
	London Convention - Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	-
	• London Protocol	-
	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997 (MARPOL)	
	• MARPOL 73/78 (Annex I/II)	R
	• MARPOL 73/78 (Annex III)	R
	• MARPOL 73/78 (Annex IV)	R
	• MARPOL 73/78 (Annex V)	R
	• MARPOL Protocol 97 (Annex VI)	R
	International Convention on Civil Liability for Oil Pollution Damage (CLC), 1969	-
	• CLC Protocol 1992	R
	International Convention on Civil Liability for Bunker Oil Pollution Damage (Bunkers Convention), 2001	R
	International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), 1990	-
	International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001	R
International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004	-	
Hazardous waste and pollution	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	A
	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	A
	Stockholm Convention on Persistent Organic Pollutants	R
	Minimata Convention on Mercury	Ap
Air pollution	Vienna Convention	A
	• Montreal Protocol	A
Fisheries management		
	UNCLOS	R
	UN Fish Stocks Agreement	-
	FAO Compliance Agreement	-
	FAO Code of Conduct for Responsible Fisheries	Ac
	UN Convention on Migratory Species	-
	UN International Whaling Convention	-
	FAO Agreement on Port State Measures	Ap
	Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean	A

Table 12.1: Multilateral Environmental Agreements, IMO Conventions and Other International Instruments Adopted by Viet Nam. (cont.)

INTERNATIONAL CONVENTIONS AND AGREEMENTS		Status
Land degradation	UN Convention to Combat Desertification (UNCCD)	A
Climate change and disaster risk reduction		
Climate change	UNFCCC	R
	• Kyoto Protocol	R
	• Paris Climate Agreement	Ap
Natural hazards	Sendai Framework for Disaster Risk Reduction 2015-2030	Ap

Note: R – Ratification; A – Accession; Ac – Acceptance; Ap – Approval; S – Signed

Source: UN: <https://www.informea.org/en/countries/VN/parties>

IMO: <https://www.imo.org/en/About/Conventions/Pages/StatusOfConventions.aspx>

FAO: <http://www.fao.org/liuu-fishing/international-framework/en/>

12.5.2 Joining International and Regional Marine Environment Institutions

Viet Nam actively participates in the regional marine environment organizations, such as PEMSEA (UNDP) and COBSEA (UNEP). Besides, Vietnam participates in the Steering Committee of the Global Ocean Forum (GOF), the ASEAN Working Group on Coastal and Marine Environment (AWGCME), the ASEAN Marine Science and Technology Sub-Committee (SCMSAT), Intergovernmental Commission on Oceanography (IOC), IOC Sub-Commission for the Western Pacific (IOC-WESTPAC), and, World Oceans Network (WON).

Over the past years, Vietnam participated in many international and regional projects and programs related to the East Sea, such as PEMSEA's project on ICM scaling up for implementing the Sustainable Development Strategy of the East Asian Seas; IUCN's Mangroves for the Future (MFF) program, UNEP's marine environment and climate change projects; cooperated with World Bank and UNCTAD to implement programs for improving capacity in the management of marine and coastal resources, to improve marine legal regulations for promoting the ocean-based economy development and the ocean-related industries.

Viet Nam is a member of:

- The Food and Agriculture Organization (FAO) of the United Nations
- World Trade Organization (WTO)
- World Organization for Animal Health (OIE)
- Global Environment Facility (GEF)
- Association of Southeast Asian Nations (ASEAN)
 - ASEAN Ministerial Understanding on Fisheries Cooperation (1983)
 - ASEAN Free Trade Area (AFTA)
- Network of Aquaculture Centres in Asia-Pacific (NACA)
- Agreement on the Cooperation for the Sustainable Development of the Mekong River, which establishes the Mekong River Commission.
- Southeast Asian Fisheries Development Center (SEAFDEC)

12.6 Issues and Challenges

Despite great efforts in improving the governance in marine management, many issues and challenges remain for Vietnam. They are:

- The system of policies and laws on environmental protection, marine conservation, adaptation to climate change and sea level rise and ICM is slowly concretized and put into practice. There are still shortcomings and some things not suitable with reality. Many policy and legislative document still focus on developing single sector; the issues on marine environmental protection, and climate change and sea level rise are still formally addressed; the integration of climate change and sea level rise into strategies and plans meets difficulties due to the lack of specific guidelines... National marine spatial planning, Master plan for sustainable exploitation and use of coastal natural resource has not yet been developed and approved, that does not give sufficient legal basis to perform the functions and tasks of integrated and unified management of the sea and islands. A number of sub-law documents, especially the management and technical guidelines related to ICM, are lacking and inadequate, and therefore unable to assist effectively the ICM implementation at local level. All these require continued review and systematization of policies and laws to ensure their effectiveness and efficiency.
- The intersectoral coordination mechanism for the unified and integrated state management of sea and islands has not been clearly and specifically institutionalized in laws, so its effect has not been achieved in practice.
- The cooperation between departments, sectors, agencies and local governments sometimes and in some places is not appropriate and synchronized, does not promote the synergy required, advisory work is still limited; cooperation between enforcement forces at sea are still inadequate, and funding for the operation of these forces is lacking.
- The capacity of the officials in the state management of the sea and islands and public servants performing the state management of the sea and islands is currently limited in both quantity and quality. Capacity and resources on natural and man-made disaster prevention and response, and climate change response do not meet the requirements. The capacity of inspection, examination, supervision and handling of violations is still very limited. The technical tools for ICM have not been well introduced and delivered to the local governments.
- Awareness on environmental protection and sustainable development of ocean economy of a part of people and businesses is not high. There is a lack of dissemination to the general public of the demand for ICM, blue economy development and sustainable development, as well as the responsibilities and benefits of stakeholders in ICM implementation and blue economy development.
- The contribution of scientific research to ocean economy and ICM is limited and inefficient; there is a limitation in conducting management-orientated researches to provide the reliable inputs data and practical tools for solving specific issues related to ocean economy development and marine environment protection.
- International cooperation and sharing of information and experience in state management of sea and islands are inadequate; the international and regional integration are not really deep.
- The investment capital for the sea and island filed, especially for the assessment of the current state of the marine environment and the preparation of islands profile, is still very limited.

13 Efforts to Protect Ocean Health and Support Blue Economy

13.1 Marine Biodiversity Conservation

Given the strong impact of climate change on marine ecosystems in Vietnam, the development of adaptation measures to reduce vulnerability to climate change and the restoration of these ecosystems is of great importance. On May 26, 2010, the Prime Minister of Vietnam issued *Decision No. 742 / QĐ-TTg* approving the planning of the MPA system up to 2020, comprising 16 zones with an area of 169,617 ha. MPAs help to restore marine biodiversity, creating a spillover effect, and contributing to sustainable socioeconomic development.

The concerns in marine conservation towards Aichi goals and SDG 14 targets are addressed in the **National Strategy for Biodiversity until 2020, vision to 2030**.

As of 2020, a network of MPAs has been established, but only reaching 55.8% of the target. These MPAs include: (1) Cat Ba, (2) Bai Tu Long, (3) Bach Long Vy, (4) Con Co, (5) Cu Lao Cham, (6) Ly Son, (7) Nha Trang Bay, (8) Nui Chua, (9) Hon Cau, (10) Con Dao, and (11) Phu Quoc (**Table 13.1**), and four MPAs belonging to the system of Four National Parks: (1) Cat Ba National Park (Hai Phong), (2) Nui Chua National Park (Ninh Thuan), (3) Con Dao National Park (Vung Tau) and (4) Bai Tu Long National Park (Quang Ninh). Currently, detailed planning has been completed and submitted for approval for three MPAs: Co To - Dao Tran (Quang Ninh), Hon Me (Thanh Hoa) and Phu Quy (Binh Thuan).

Table 13.1: Marine Protected Areas Established in Vietnam.

No.	MPA name	Province	Area (ha)	Typical species
1	Cat Ba	Hai Phong	10,900	Coral, seaweed, seagrass
2	Bai Tu Long	Quang Ninh	96,500	Coral, seagrass
3	Bach Long Vi	Hai Phong	10,900	Coral, abalone
4	Con Co	Quang Tri	2,140	Red coral, seagrass
5	Cu Lao Cham	Quang Nam	6,716	Coral, seaweed, seagrass
6	Ly Son	Quang Ngai	7,925	Coral, seagrass
7	Nha Trang Bay	Khanh Hoa	12,000	Coral, seagrass
8	Nui Chua	Ninh Thuan	7,352	Coral, sea turtles
9	Hon Cau	Binh Thuan	12,390	Coral, seagrass, rock crab, shrimp
10	Con Dao	Ba Ria-Vung Tau	23,000	Dugong, sea turtle, coral
11	Phu Quoc	Kien Giang	18,700	Coral, seagrass

Moreover, there are other nature reserves along the coast of Vietnam, such as the Cat Ba Biosphere Reserve (Hai Phong); Red River Delta inter-provincial World Biosphere Reserve Tien Hai wetland nature reserve with the Xuan Thuy Ramsar Site in Nam Dinh; Nam Hai Van - Natural History and Culture Protection Area, Son Tra Nature Reserve (Da Nang city); Nui Chua National Park (Ninh Thuan province); Binh Chau - Phuoc Buu Nature Reserve (Ba Ria - Vung Tau province); Can Gio Biosphere Reserve (Ho Chi Minh City); and Mui Ca Mau National Park (Ca Mau province). A number of other coastal wetland conservation areas were also studied, planned and established, such as Dong Rui wetland conservation area (Tien Yen district, Quang Ninh province), Thai Thuy wetland conservation area (Thai Binh province) or Tam Giang - Cau Hai wetland nature reserve (Thua Thien Hue).

Vietnam's coastal area has high biodiversity: 13 out of 28 national parks, 22 out of 55 nature reserves and 17 out of 34 forests of cultural, historical and environmental significance are located in coastal areas and islands. However, the total area of coastal and marine protected areas currently accounts for only **0.46%** of the Vietnam exclusive economic zone and territorial sea [51]. Moreover, the status of these MPAs is another concern due to the inadequate appreciation of biodiversity values and ecosystem services derived from them. Therefore, it is necessary to expand the network of MPAs and manage them well to achieve the goals of Aichi and sustainable development. These concerns are addressed in the **National Strategy for Biodiversity to 2020, vision to 2030**, although the criteria for MPAs remain with their area below 10%.

The threats to marine biodiversity in Vietnam are summarized by Konstantin (2016) as follows: scattered distribution, habitat degradation and area reduction (especially mangroves is destroyed, coral reefs lost, changes in the landscape of wetlands, estuaries, sandy beaches and mudflats); global climate change including sea level rise, storms, changes in rain regime, coastal water warming; effects of fishing and other forms of overfishing; water pollution and marine debris; encroachment of alien species; coastline alteration; and unsustainable tourism [19]. While the establishment of MPAs will address these threats, an assessment of the management effectiveness of the 10 MPAs undertaken by IUCN suggests that it is necessary to improve management, monitoring and enforcement mechanisms [1], finance investment and capacity building for MPA staff in formulating management plans.

13.2 Pollution Reduction

13.2.1 Solid Waste Management

The current rate of daily-life solid waste collection is about 85% in urban areas and 60% in suburban areas, compared to daily-life solid waste volume generated. The rate of domestic solid waste collection in rural areas is still low, about 40-55%, compared to the amount of domestic solid waste generated there. The collection and transportation of solid waste is still scattered, not

centralized; vehicles and equipment are backward, and the collection is inadequate, thus affecting the urban landscape and environment.

Currently, the waste treatment facilities have an average capacity of less than 200 tonnes/day. Only some solid waste treatment facilities have a large design capacity of 500-5,000 tonnes/day. There is a lack of large-scale treatment facilities for construction and industrial solid waste. The current treatment of medical waste and hazardous waste is mainly incineration, which is applied for many different types of waste and often on a small scale; so, it only meets a part of the current hazardous waste treatment need.

Efforts on solid waste treatment have not focused on solutions to reduce, reuse, recycle, and recover energy from waste, leading to high volume of solid waste to be buried, and causing waste of resources, land budget and money, and environmental impact.

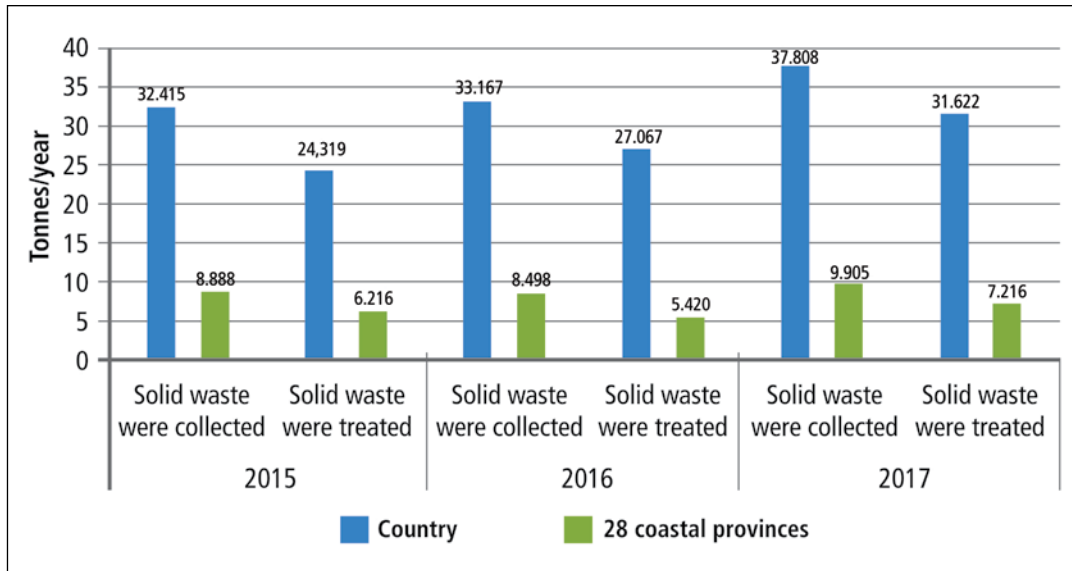
Specifically, according to the General Statistics Office, in 2017, about 37,808 tonnes of solid waste were collected in the entire country, of which 31,622 tonnes (accounting for 84%) had been treated to meet the corresponding national standards and technical regulations. Thus, there are still about 6,186 tonnes of collected solid waste (16%) that must be treated in accordance with the regulations.

In 28 coastal provinces, the percentage of untreated waste from the collected waste is fluctuating: 30.06% in 2015; 36.22% in 2016; and 27.15% in 2017. In addition, there is still an amount of solid waste that has not been collected.

The total amount of daily ordinary solid waste collected and treated in compliance with national standards and technical regulations throughout the country and in coastal provinces during the period 2016-2017 is presented in **Figure 13.1**.

According to the statistics of the Ministry of Construction, out of 660 landfills with more than 1 hectare size, only 120 landfills are hygienic.

Currently, many landfills and solid waste treatment plants in provinces and cities of Vietnam are overloaded. Some large-scale landfills (from one to several thousand tonnes/day) pollute a large area with a distance of tens of kilometers. Leachate from landfills is not collected and treated thoroughly and promptly, thereby polluting surface water sources as well as soil and groundwater. Many solid waste treatment plants are accumulating tens of thousands (even hundreds of thousands) tonnes of untreated waste, which are piled in open areas, with no roofs. These dumpsites lack groundwater-proofing layers, collection and treatment facilities for leachate and runoff water, and measures to treat odors. These are potential sources of serious environmental pollution. In Hanoi alone, 85-90% of landfills are unsanitary and not environmentally sound.

Figure 13.1: Average Daily Amount of Ordinary Solid Waste Collected and Treated.

Source: General Statistics Office, 2017.

Box 13.1 Targets of National Strategy for integrated solid waste management to 2025, vision to 2050

Vietnam commits to collect, transport, and treat 100% of non-household waste by 2025 and 85% household waste by 2025 in urban areas.

13.2.2 Wastewater Management

Vietnam is one of the countries with fast urbanization process. Due to the difficult economic conditions, investment is still limited in urban infrastructure systems in general, and in urban water supply and drainage systems in particular. The lack of technical infrastructure for wastewater treatment and inappropriate technology used in many treatment systems have led to the situation that untreated urban wastewater is discharged directly into the environment, threatening the environment that now becoming big challenge for urban areas in Vietnam.

According to the data of the Ministry of Construction, as of 2018, the proportion of urban areas (from grade III or higher) invested in constructing centralized wastewater treatment system was 39% with 43 concentrated wastewater treatment plants in operation, with total designed capacity reaching 926,000 m³/day.



If including the projects under construction, there are about 80 centralized wastewater treatment systems with a total designed capacity of about 2,400,000 m³/day. However, the plants put into operation only meet about 13% of the demand. In big cities, the proportion of wastewater treated is higher than that of small and medium cities, but still low, not meeting the current urbanization rate. In Hanoi, only about 20.62% of the city's total domestic wastewater is treated, while in the Ho Chi Minh City, the proportion of treated domestic wastewater is about 13%.

According to the World Bank assessment on urban wastewater management activities in Vietnam, although 60% of sewage discharged from Vietnamese households are connected to the public combined sewer-drainage systems, almost all wastewater is discharged directly to the surface waterways and only 10% of the wastewater is treated. In addition, the ability to recover construction investment costs, and operation and maintenance costs of wastewater treatment systems is generally low. In the coming years, Vietnam has a very high demand for investment capital, expected to reach US\$ 8.3 billion to provide drainage services to about 36 million urban residents by 2025 [51]. Thus, cost recovery is important to ensure sustainability, efficiency, and continuous operation and service provision.

13.2.3. Efforts to Manage Plastic Waste and Marine Litter

At the Open G7 Summit in Canada on May 9, 2018, Vietnam's Prime Minister welcomed Canada's initiative to prevent the discharge of ocean plastic waste, affirming Vietnam is ready to cooperate with Canada and international communities for implementing this initiative. In particular, the Prime Minister has proposed to the G7 countries the initiative on promoting the formation of a global cooperation mechanism to reduce plastic waste in order to achieve the goal of green and clean oceans, which are free of plastic waste.

In the framework of the 6th General Meeting of the Global Environment Fund (GEF 6) on June 26, 2018, at the sideline event “Marine litter” organized by MONRE in cooperation with GEF, the Minister of Natural Resources and Environment proposed the initiative of “**Establishing a Partnership for the East Asian Seas free of plastic waste**”. This initiative is to promote cooperation and share information, knowledge and experience on ocean waste management among countries in the region with international and local organizations; and build capacity to transform the fuel consumption-based economy to a circular economy, and mobilize the participation of manufacturers at all levels.

Vietnam participated in **IUCN Marine Plastics and Coastal Communities initiative** (MARPLASTICCs) funded by Swedish International Development Cooperation Agency (SIDA) implemented in five countries of Africa and Asia. Vietnam has begun selecting appropriate pilot sites for implementation in 2019 and intends to set up a national coordinating body comprising representatives from all major relevant sectors.

Implementing *Resolution 36-NQ/TW* of October 22, 2018, on the *Strategy for Vietnam’s sustainable ocean economy development to 2030, vision to 2045*, the Government has issued the **National Action Plan for reducing ocean plastic waste by 2030**. This is an important plan to solve the problem of ocean plastic waste in Vietnam as well as in the region and the world. The goal of this Action Plan is to manage ocean plastic waste from both land and sea, following a circular economy approach, and to create breakthroughs and radical changes in awareness and behavior of the whole community in the production, consumption and disposal of plastic products and collection and treatment of plastic waste.

Vietnam aims to develop and improve mechanisms and policies for ocean plastic waste management by 2025; reduce 50% of ocean plastic waste; collect 50% of lost or discarded fishing gear; reduce the use of disposable plastic products and plastic bags, which are difficult to be decomposed, in 80% of coastal tourist resorts and service establishments; and ensure that 80% of marine protected areas is free of plastic waste.

By 2030, Vietnam will: strive for 100% of coastal tourist and service areas do not use disposable plastic products and plastic bags; stop disposing of fishing gear directly into the sea; basically restrict the import of plastic scrap for use as raw materials in industrial production in coastal export processing zones and industrial parks; reduce 75% of ocean plastic waste; achieve zero plastic waste in 100% of marine protected areas; expand annual monitoring and periodically evaluate the current state of ocean plastic waste in the main estuaries and islands with tourism development potential.

The Plan has set out seven main tasks: (1) Raising awareness and changing behaviors on plastic products and ocean plastic waste; (2) reviewing, amending, supplementing and improving mechanisms, policies and laws on the management of ocean plastic waste; (3) preventing and reducing ocean plastic waste from the mainland; (4) preventing and minimizing ocean plastic waste

from sources at sea; (5) increasing socialization to improve the effectiveness of cleaning and collecting plastic and ocean plastic waste; (6) promoting scientific research, and technology transfer, development and application on ocean plastic waste; and (7) strengthening international cooperation on ocean plastic waste management.

The Plan also outlines five solutions, including the (1) implementation of awareness raising programs and plans; (2) improvement of the effectiveness and efficiency of leadership, direction, organization of implementation and cooperation of all levels, sectors and agencies; (3) mobilization of domestic and foreign resources to implement the Plan; (4) conduct of education and training to improve capacity and experience for management and technical staffs; and (5) strengthening of the cooperation with countries, international organizations, and non-governmental organizations on ocean plastic waste.

In 2020, as the Chairman of ASEAN, Vietnam took the lead on specific actions related to solving the problem of ocean plastic waste. The development of the **National Plan of Action on Ocean Plastic Waste to 2030** is one of the important activities to realize Vietnam's initiative in managing ocean plastic waste.

At the local level, the UNESCO Office in Hanoi has collaborated with the Management Board of the Cu Lao Cham - Hoi An World Biosphere Reserve and other relevant organizations to organize a series of environmental protection activities in Cu Lao Cham: the campaign on cleaning the coast of Cu Lao Cham, response to the Earth Hour, award to the Art of Recycling and the "Initiative on Plastic Waste Reduction" at the end of March 2019. Attending the program of plastic waste reduction initiative in Cu Lao Cham, the delegates experienced many meaningful activities, such as a beach cleaning campaign together with local people, field survey at the Eo Gio landfill site and wastewater treatment areas at Tan Hiep market and Bai Ong, as well as participation in the Earth Hour launching ceremony. Here, UNESCO Viet Nam Office and the sponsor Coca Cola also organized awards for the winning groups of authors in the Recycling Art competition. In the talkshow, action solutions to reduce plastic waste and reduce environmental pollution in Cu Lao Cham were proposed by the delegates, giving local governments and communities on the island more direction to handle this problem.

In the North, the Ha Long-Cat Ba Alliance (HLCBA) of government agencies and local businesses organized large-scale beach cleanup campaigns with participation of hundreds of volunteers, collecting many tonnes of foam and plastic waste along the 4km of coast in the area.

Ha Long Bay Management Board has just issued a *letter No. 598/BQLVHL-NVNC* dated July 17, 2019 to businesses, organizations and individuals engaged in service, tourism and aquaculture activities in the Ha Long Bay area on cooperation in the implementation of **"Anti-plastic waste" movement in Ha Long Bay**. According to the document, Ha Long Bay Management Board will cooperate with related organizations to implement: (a) waste classification and segregation at the sources, especially recyclable waste (plastic bottles, cans, paper, etc.), (b) collection and transport of the waste to the

shore for treatment in accordance with regulations, (c) limitation of the use of packaging, plastic bags, products from single-use plastic, such as cups and straws, (d) use of products from reusable, recyclable and environmentally friendly materials in service and tourism activities on the bay, and (e) information campaign to the tourists about limiting the use of disposable plastic products, waste segregation, and disposing of garbage at prescribed places when participating in sightseeing and tourist activities on Ha Long Bay. At the same time, the Ha Long Bay Management Board issued *Document No. 599 / BQLVHL-NVNC* in 2019, requiring its affiliated units to seriously implement the *Plan No. 39/KH-BQLVHL* regarding the “Anti-plastic waste” movement.

The **Community Beach Clean Up Event** for ocean free of waste was organized on September 22, 2019 at the coast of the buffer zone of Xuan Thuy National Park, Giao Thuy district, Nam Dinh province, with the support of the Center for Marine Conservation and Community Development (MCD). This activity is in response to the **Movement Against Plastic Waste to the Ocean** launched by the Prime Minister of Vietnam on June 9, 2019. It takes place within the framework of the project “**Pilot urban waste management by river flow to the sea to reduce plastic pollution in Nam Dinh province, in the Red River biosphere reserve,**” sponsored by US Agency for International Development (USAID), and the component of **Promoting Waste-free initiative** in Vietnam through pioneering coastal partners, sponsored by Pacific Environment Organization (PE).

13.3 Habitat Restoration

Restoration, conservation and sustainable management of key coastal habitats have been undertaken by the government, together with partners from communities, NGOs, and international organizations.

13.3.1 Mangrove Planting for the Coastline Protection and Climate Change Response

Vietnam is considered as one of the countries that are most seriously affected by climate change in the coming decades, especially regarding the sea level rise in coastal areas. To proactively respond to climate change, Vietnam has been making efforts to create resources to limit the impacts caused by climate change. The Government and MONRE have implemented many priority and important tasks. From 2011 up to now, the Government has invested in adaptation works suitable to each region and locality affected by climate change, with a total budget of nearly VND 19 trillion, especially for the Mekong Delta provinces and coastal provinces and cities. The above funds have been invested in upgrading the salt control system; upgrading sections of sea dike and river dike in crucial areas; upgrading the storage and supply water system for household use, production and flood control; planting upstream protection forests, etc.

Coastal erosion in the Mekong Delta is very complicated, increasingly serious and has a great influence, adversely affecting the lives of coastal residents and infrastructure. Over the past years, the Government, coastal provinces/cities and international organizations have mobilized many resources to cope with, overcome and limit this situation, aiming at practical, effective and sustainable solutions.

On July 20, 2019, at Kinh Hon hamlet (Khanh Binh Tay commune, Tran Van Thoi district), the Central Steering Committee for Disaster Prevention and GIZ in collaboration with the People's Committee of Ca Mau province organized "Launching ceremony of the movement of planting mangroves and protecting beaches in some Mekong Delta provinces". Attending the ceremony, there were Deputy Minister of Agriculture and Rural Development, Vice Chairman of Ca Mau People's Committee and representatives of leadership of 19 provinces and cities in the Southern Region, as well as the international organizations and experts. After the ceremony, leaders of MARD and representatives the provinces, international organizations and youth organization of Ca Mau organized planting thousands of mangrove trees in accretion areas along Hon Da Bac estuary.

Following this event, many coastal provinces and cities launched their troops, in response to the Launching Ceremony, spreading the movement of planting mangrove forests and protecting coastlines and beaches nationwide. The provinces and cities conducted pilot environmentally friendly constructions of low cost using local materials to prevent coastal erosion, developed beaches in combination with environmental protection in some areas of the Mekong Delta.

In the program of planting 10,000 *Sonneratia* trees to protect coastal land of about 4 ha at Dinh An - Soc Trang estuary area, the FPT Software Company coordinated with Green Happiness Project (the program's initiator) and planted 2,000 trees. The *Sonneratia* planting helps to increase the area of protected mangroves. This initiative will protect the environment and biodiversity, prevent erosion, and secure coastal mudflats. This is the opening event of a global chain of planting 20,000 trees worldwide of *Run For Green* campaign - a marathon for green environment organized by FPT Software to spread the spirit of healthy and green living in the community.

As part of activities of Vietnam Sea and Islands Week and the Environment Action Month to respond to *World Ocean Day* and *World Environment Day* 2019, in the morning of May 31, 2019, MONRE coordinated with the People's Committee of Bac Lieu Province to plant 2,000 mangrove trees in the mangrove forest, Nha Mat Ward, Bac Lieu City. Attending were nearly 1,000 officials, civil servants, union members, and staffs from agencies located in Bac Lieu city.

The regeneration of protection forests in coastal areas along the sea dike is considered as a sustainable "soft solution" for long-term and effective response to climate change.

13.3.2 Sustainable Management of Coral Reef Resources in Ninh Hai district, Ninh Thuan Province

Ninh Hai has a coastline of over 50 km, with coral reefs considered to be the most abundant in distribution, diverse in types and structure compared to those in other coastal areas. Coral structure is of typical and atypical fringing, of which the typical fringing reefs are the main. The total area is estimated at 1,070 ha, with 333 species, of which 308 species belong to 15 families. There are 59 reef generator coral species, 16 soft coral species, 6 horn coral species, 3 species of polyp coral species and 1 species of Zoanthid coral.

Coral reef ecosystems bring a lot of values to the local community. However, the coastal reef ecosystems of Ninh Hai are threatened by human activities. Overexploitation of resources in the coral reefs is still taking place. The main forms of exploitation of aquatic species are: diving to catch live fish, such as the grouper *Epinephelus spp.* Lutjanus snapper; catching fish by using cyanide, shooting arrows and netting; exploiting shellfish, oysters, and abalone for food and fine art articles; and exploiting ornamental fish, such as Butterfly fish, Pangasius fish, and Angel fish, to provide for display of ornamental creatures. In addition, the breaking of coral for ornamental purposes is still ongoing, causing danger to corals and coral reef ecosystems.

All levels of government and authorities, domestic and foreign scientists have been conducting many studies, plans and projects in search of solutions to restore and protect coral reefs in Ninh Hai coastal waters. In this context, the GEF/UNEP Project “Demonstration of Sustainable Management of Coral Reef Resources in the Coastal Waters of Ninh Hai District, Ninh Thuan Province, Vietnam” has been developed and implemented, being one of the demonstration projects under the framework of UNEP/GEF Project called “Preventing the trend of environmental degradation in the South China Sea and Gulf of Thailand”.

The project was implemented from July 2010 to May 2013. The total cost of the Project is US\$ 935,186 of which US\$ 406,900 is provided by GEF, the rest is co-financed by the Government of Vietnam.

The objective of the project is to demonstrate measures to reduce the stress on coral reef and seagrass habitats of regional significance, connected to the East Sea for conservation of critical marine biodiversity, prevention of future ecosystem degradation and sustainable utilization of coastal resources at the Ninh Hai site.

The Project has 3 components:

- Component 1: Improving Area Management through cross-sectorial and participatory Approaches.
- Component 2: Pilot projects on sustainable income-generation options.
- Component 3: Capacity building and awareness raising.

The main outcomes of the Project include:

- Outcome 1: Area management improved through cross-sectorial and participatory Approaches.
- Outcome 2: Pressure to coral reef ecosystems derived from unsustainable livelihoods is reduced.
- Outcome 3: Knowledge and skills for the management of coral reef habitats are increased.

Some important measures have been applied: prevention of illegal fishing and anchoring of ships and boats, that causes damages of coral reefs; zoning for aquaculture areas; rational exploitation of aquatic resources and restoration of corals by using artificial coral reefs; creating a stable income for the fishing community outside the, fishing, etc. It can be said that the Project achieved initially certain results.

The measures to restore aquatic resources here also based on the mechanism of financial support for communities in maintaining and restoring coral reef fisheries, such as developing iguana farming model on sand in order to generate revenue for local communities, maintaining the operation of the Self-Management Voluntary Group to protect aquatic resources, mobilizing funding sources from organizations to carry out activities of management and restoration of fisheries resources.

With the active participation of local authorities, scientists and communities, aquatic resources in particular and marine environmental resources in Ninh Hai district are being protected and restored. The benefits derived from the project includes ecosystem benefit that is protection of coral reef and associated habitats, transboundary benefits that is conservation of spawning and nursery grounds for fish and other marine animals of transboundary significance, and local benefits that is increase alternative opportunities for sustainable income-generation.

Box 13.2 Co-management of Xuan Thuy National Park for Sustainable Protected Areas and Livelihoods

Co-management is a process-based management and governance approach to natural resource management. Mangroves for the Future (MFF) introduced the co-management approach to protect coastal resources and provide sustainable livelihood opportunities at the same time. Xuan Thuy National Park is a coastal national park in the Red River delta in Nam Dinh province, and Vietnam's first Ramsar site. It is a vast wetland, which covers an area of about 7,100 ha of the *core zone*, and 8,000 ha of the *buffer zone*. Management guidelines were specifically made for each zone, so that the core zone is a strictly protected area without any human activity allowed; and the buffer zone, adjacent to the core zone, acts as a transition area where activities are regulated to restrict and reduce adverse human impacts on the park. However, local people rely heavily on the wetlands for their livelihoods and income.

Following a series of consultations led by the park's management board, a Women's Fishing Group was established to represent the interests of the nearly 500 women collectors of clams in the area. The women's group and the authorities then set about negotiating a co-management policy with regulations and licensing determining what can be collected, in which areas, at what times, and using what methods. A peer-based monitoring system was established to help park authorities regulate compliance. The local government established a *Livelihood Improvement Fund* whereby women could get small loans to make opportunities to diversify the income base with the idea of reducing the amount of clams they need to collect in Xuan Thuy. This co-management arrangement between the park authorities and the collectors established a win-win situation for both. For the collectors, they secured user rights to a critical resource and now actively participate in the co-management system. For park authorities, they mitigated a growing conflict situation, and now the collectors are an ally in the sustainable management of the national park.



Photos from MFF.

Source: PEMSEA. 2017. "MFF, Co-management, and Engaging the Private Sector," *Proceedings of the Blue Economy Forum 2017*.

PART 6

**CONCLUSION AND
RECOMMENDATIONS**

14

Conclusion and Recommendations

Coastal Economy

Many important achievements in marine economy has been forming a number of socio-economic development directions based on the potentials and advantages of the sea. Activities of agriculture, forestry, fisheries, services, tourism, including those of the island economy contribute more than 60% of the country's GDP, especially from coastal tourism, economic zones, industrial zones and other important coastal industrial facilities. Per capita income in coastal provinces and cities has increased 4.84 times compared with the national average of 4.79 times. The national target program on poverty reduction in coastal and island areas has been implemented quite well. The quality of life of people at the coast and on the islands has been improved markedly.

In the period 2007-2017, the total investment to 28 provinces and centrally run cities fluctuated around 48-51% of the total social investment. There have been approved nine inter-provincial construction plans; eight specialized planning technical infrastructure; two general planning of coastal urban areas, islands and 17 coastal economic zones, all associated with coastal provinces and cities. By the end of 2018, the economic zones have attracted more than 390 foreign investment projects with a total registered investment of US\$45.5 billion, creating jobs for about 174 thousand workers and hundreds of thousands of indirect labors. Along with the formation of a chain of coastal economic zones and industrial parks, coastal provinces and cities have taken advantage of the sea to develop urban areas and tourist resorts and open new markets – the real estate marine markets, and strongly promoting marine tourism.

Ocean economy

In general, the formulation and implementation of policies and laws on the development of the marine economy in Vietnam are directed towards the principle of not exchanging the environment for economic development at all costs. Investment projects are considered in the overall harmony between the economic interests of investors, the interests of the people and the state interests, ensuring a balance between development and marine conservation. Ministries, sectors, and local authorities actively organize the development and implementation of tasks and works to prevent marine pollution and environmental incidents (for example, the marine environmental incident caused by Formosa Company, impacting the coastal areas of four central provinces: Ha Tinh, Quang Binh, Quang Tri and Thua Thien Hue).

The *Resolution No. 36-NQ/TW* dated October 22, 2018 of the Party Central Committee on the *Strategy for sustainable marine economy development of Vietnam to 2030*, with a vision to 2045 is a major and comprehensive policy, consistent with sustainable development goals. The Resolution's cross-cutting point is to sustainably develop the ocean economy based on the 'green' growth paradigm: conserve biodiversity and marine ecosystems; ensure harmony between economic development and conservation of natural ecosystems; and strengthen linkage among various fields and restructure sectors in the direction of improving productivity, quality, efficiency, competitiveness, and sustainability.

The ocean economy consists of the ocean-based and ocean-related economic activities or sectors (produced capital), and the coastal and marine ecosystems (*natural* capital), which people rely on for various ecosystem services, such as food, energy, shoreline protection, carbon sequestration, and cultural heritage, and ensuring jobs, livelihoods, wellbeing, and climate resiliency of the people.

The ocean industries or economic sectors, valued at US\$ 11 billion, account for 4% of the country's GDP in 2017 and up to 17% of GDP in 2018 (if coastal and marine tourism is included). The value of Vietnam's coastal and marine ecosystem services is estimated at around US\$ 4 billion per year. There is a need to further develop the ocean accounting system to show the economic, social, and environmental benefits from the ocean. More importantly, the protection of the natural capital is essential to ensure the flow of benefits, ecosystem services, and sustainability of the ocean economic sectors.

Ocean health and major pressures and challenges

The health of Vietnam's marine waters and ecosystems is at risk because the exploitation and use of marine resources and environment is not harmonized with the protection, conservation, and restoration of marine and coastal ecosystems (**Table 14.1**). Many coastal ecosystems, such as mangroves, coral reefs, seagrass beds, and tidal flats, continue to be degraded due to overexploitation, unsustainable use, and the threat of pollution from waste discharges, oil spills and sedimentation. Plastic waste pollution has become an urgent problem. The pressures brought by population growth, illegal fishing, untreated wastewater dumped into the sea, marine debris, and coastal erosion are causing adverse impacts on the ocean economy and ocean health.

Some coastal localities are interested in maximizing the available resources for rapid growth with little attention paid to conservation. The licensing of investment and construction of many coastal resorts has caused coastal fragmentation, creating difficulty for local people to access to the sea, hindering their normal life.

The integration of climate change and sea level rise issues into strategies and plans is still confusing due to the lack of specific guidelines.

The ocean health index (OHI) score of Viet Nam is 56, which is below the global score of 71. The OHI score for Vietnam ranks #199 among 221 EEZs [53]. In particular, OHI scores are low on the following ocean health goals: food provision, natural products, and tourism and recreation.

Table 14.1: Preliminary Assessment of the State of Ocean and Coast of Vietnam.

Indicator	Status
State of ocean economy	
Ocean economy	↑
Fisheries	↑
<i>Fishing</i>	—
<i>Aquaculture</i>	↑
Tourism	↑
Oil and gas industry	↓
Marine transport and port development	↑
Marine renewable energy	↑
Status of ocean health	
Fisheries resource	↓
Mangrove forest	—
Coral reef	↓
Seagrass bed	↓
Tidal flat	↓
Beach	—
Rare, threatened and endangered species	ND
Sea water quality	—
Marine protected areas (MPAs)	↑
Pressure	
Population increase	↑
Illegal, un-reported and unmanaged fishing	↑
Coastal erosion	↑
Untreated wastewater pouring into the sea	—
Marine litter (including plastic waste)	↑
Oil spill	↓
Greenhouse gas emissions	—
Response	
Marine and coastal management policy	↑
Proportion of coast with ICM	↑
MPA	↑
People's access to clean water and sanitation	↑
Sustainable ecotourism, sustainable community-based coastal tourism	↑
Seaport with environmental management system	↑
Mainstreaming valuation of ecosystem services and natural capital accounting	ND

Note: ND - No data; ↑ - Increased; ↓ - Decreased; — - Unchanged

Transforming to blue economy

To develop the blue economy, it is necessary to have innovative thinking and breakthroughs, in conformity with the global trend towards sustainable development, to be able to tackle cross-border environmental pollution and climate change as well as ensure harmony between development and marine ecosystem conservation. Thus, building a blue economy must be the foundation of, and play a central role in the *National Strategy for Sustainable Marine Economy Development to 2030, with a Vision to 2045*.

Achieving the objectives of the Strategy requires the development of marine economic sectors to shift from a polluting economy to a green, circular, and low carbon economy, and investment in sustainable natural capital use and reduction of land- and sea-based sources of pollution affecting the marine environment. It involves the integration of the inland and sea areas, integration of various sectors, and integration and coordination among the different agencies and between the central and local governments. It is imperative to persevere in applying and scaling up blue economy initiatives, learning from the projects that have been undertaken and ongoing efforts (Table 14.2).

Table 14.2: Transforming the Ocean Economy and Protecting Ocean Health through Blue Economy Initiatives.

Ocean economy	Blue Economy Initiatives
<p>Fisheries and aquaculture</p> <ul style="list-style-type: none"> total production of 6.33 million tonnes in 2015. This sector contributed 32% of the ocean economy. There were 530,000 fishers in 2014. Volume of export of seafood has increased rapidly, from 5.0 billion of USD in 2010 up to 7.8 billion of USD in 2014. Pressures: <ul style="list-style-type: none"> Small-scale operations, overfishing, and use of destructive fishing methods have resulted in decline of marine resources and marine environmental quality 	<p>Sustainable fisheries and aquaculture</p> <ul style="list-style-type: none"> Climate-smart aquaculture: Advanced science and technological application will be one of the key means to help the local aquaculture sector in Viet Nam to reach targets for blue aquaculture development. <ul style="list-style-type: none"> In Thanh Hoa province, an integrated system is being piloted to cope with climate change through introduction of tilapia in brackish water shrimp ponds. In this integrated system, tilapia can utilize natural food, and make use of feed residues from shrimp crop. This will result in clean shrimp ponds, reduction of feed conversion ratio (FCR) for farmed tilapia, and reduction of production costs. Brackish water shrimp-rice rotation and forest-shrimp systems are being applied in the Mekong delta to also reduce FCR, fertilizer use, and greenhouse gas emissions. The hard clam aquaculture in Ben Tre, which resulted in increasing both mangrove areas and local incomes, has received certification from the Marine Stewardship Council. Clam collection in Xuan Thuy National Park (Ramsar site) with co-management arrangement between park authorities and Women's Fishing Group (clam collectors): regulations and licensing determining what can be collected, in which areas, at what times, and using what methods; peer-based monitoring of compliance; Livelihood Improvement Fund to help women diversify their income base
<p>Coastal and marine tourism</p> <ul style="list-style-type: none"> Contributed 14% of the ocean economy Pressures: habitat and biodiversity loss; pollution; inadequate management ecotourism sites 	<p>Sustainable tourism</p> <ul style="list-style-type: none"> Ecotourism in Nha Trang Ecotourism in Can Gio Mangrove Biosphere Reserve Coral reef conservation combined with community-based ecotourism in Kien Giang and in Tam Hai Commune, Nui Thanh district, Quang Nam Province
<p>Ports and shipping</p> <ul style="list-style-type: none"> Contributed 5% of the ocean economy Vietnam has 127 ports, of which 37 are ocean cargo ships. The major ports are Hai Phong, Danang, Qui Nhon, and Ho Chi Minh City. <p>Shipbuilding and repair</p> <ul style="list-style-type: none"> Contributed 5% of the ocean economy Vietnam has about 20 major domestic shipyards, as well as major foreign-owned shipyards. 	<p>Sustainable ports and shipping</p> <ul style="list-style-type: none"> Saigon Port: implementing the "Sustainable Port Development in the ASEAN Region" project, designed to help selected ports comply with international environment and safety standards while improving their efficiency. Green Port model: Hai Phong port

Table 14.2: Transforming the Ocean Economy and Protecting Ocean Health through Blue Economy Initiatives. (cont.)

Ocean economy	Blue Economy Initiatives
Oil and gas <ul style="list-style-type: none"> Vietnam has emerged as an important oil and natural gas producer in Southeast Asia. In 2007-14, Vietnam produced 128.2 million tonnes of crude oil and 70 m³ of natural gas. It contributed 16.4% of state budget in that period. 	<ul style="list-style-type: none"> Waste management and pollution reduction Oil spill contingency plan Investments in renewable energy (wind power and solar power), and research on ocean energy
Pressures <ul style="list-style-type: none"> Urbanization and rapid industrial zone development Water quality in coastal area and marine pollution Sea port and transport development Oil spills incidents Use of chemicals in fishing 	Pollution reduction and waste management <ul style="list-style-type: none"> Increased investments in wastewater and drainage systems (in Ho Chi Minh City, Thanh Hoa City, Da Nang, etc.) Thanh Hoa: construction of stormwater drainage and flood control works, as well as infrastructure facilities for the management of solid waste and wastewater. Households were also encouraged to construct toilets and septic tank through a Household Sanitation Credit Scheme (HSCS) managed by the Women Union. Solid waste management Marine plastic management: national policy and action plan; various initiatives (e.g., in Cu Lao Cham; Hoi An World Biosphere Reserve; Ha Long Bay; Xuan Thuy National Park)
Pressures <ul style="list-style-type: none"> Habitat conversion Illegal fishing Pollution Coastal development 	Habitat restoration and management <ul style="list-style-type: none"> Marine protected area Mangrove restoration in Ca Mau and Tien Giang province (GCF) Biodiversity conservation to respond to climate change (UNDP)
Pressures: <ul style="list-style-type: none"> Natural hazards (typhoons, extreme monsoon rains, storm surge, flooding, etc.) Climate change: sea level rise, coastal erosion, rising sea temperature, coral bleaching, ocean acidification 	Climate resiliency <ul style="list-style-type: none"> Green growth for 28 coastal provinces in Vietnam (UNEP) Cities and climate changes (UN-Habitat)

Recommendations

Recommendations to the Government of Vietnam

It is proposed to the Government and the Ministry of Natural Resources and Environment to pay attention to and direct the effective implementation of *Resolution No. 36-NQ/TW* of the Central Executive Committee on Vietnam's Strategy for Sustainable Marine Economy Development to 2030, with a vision to 2045, especially implementing the following three (3) breakthroughs:

- (1) Improving institutional arrangements for sustainable development of the ocean economy:
 - Develop appropriate policies for public-private partnership projects on infrastructure in coastal and island areas (including revenue-generating schemes to address long payback time, and annual operating and maintenance costs).
 - Develop a law on renewable energy that would attract economic sectors to participate (international investors are interested in investing in renewable energy in coastal and offshore waters, but they need investment opportunities and good investment plans, including the synchronization in power purchase plans and agreements for the provision of capital and technology).

- Review and implement the national program on economical and efficient use of energy for the period 2020–2030, with priority given to the use of wind and solar energy; Amend and supplement the national standards and regulations in the field of renewable energy in accordance with international regulations and standards; Develop a project to integrate the circular economic model into the strategy of developing energy enterprises.
- Adjust the master plans for industries using fossil fuels, which are likely to cause environmental pollution and increase greenhouse gas emissions; Encourage investment in the construction of power plants using municipal solid waste and biomass, and with waste-to-energy facilities, in parallel with environmental protection.
- Continue to consolidate and renew the organization of and operate the system of integrated and unified state management agencies on sea and islands from the central to local levels; Build a set of national criteria and indicators for sustainable development of the ocean economy, and for the management of coastal and marine areas at the provincial and central level, in line with international standards; Develop marine spatial plans, including regulations on the uses and protected areas; Build a synchronized mechanism for the management of coastal protection corridors, and ensure people's access to the sea in coastal provinces and cities.

(2) Investment in developing coastal infrastructure and ocean industries:

- Develop multi-purpose and synchronized infrastructure and transportation network connecting major economic centers of the country, industrial zones, urban areas, tourism and heritage sites, and sea areas, and ensure that seaports consider both economic factors and protection of natural ecosystems; Promote and support investments in climate-smart aquaculture, green hotels/resorts, sustainable ecotourism in marine parks or protected areas, green ports, shore reception facilities in ports, water and energy conservation, and in solid waste, plastic waste, and wastewater management facilities that have recycling, reuse and energy recovery facilities as possible. Moreover, the principle of “developing but taking into account natural disaster risk reduction solutions” must be thoroughly studied and applied to the plans and projects in coastal and island areas.
- Establish and develop renewable energy centers in appropriate regions and localities.

(3) Scientific and technological development, capacity development, and training:

- Organize research studies for the assessment of the potential of energy sources from waves, tides, and currents, at the same time, acquire the trends, scientific and technical advances, human resources, financial capacity, and other necessary factors; Develop and implement training programs for renewable energy development.
- In terms of resilience to climate change, continue the effective implementation of the program of flood control systems, rehabilitation and conservation of mangroves, seagrass beds and coral reefs as an interconnected system, and livelihood improvement, and in addition, consider the role of information management, knowledge sharing, and capacity development to equip the people. A comprehensive risk information system, with real-time

and exceptionally accessible data, will allow local people and authorities to take appropriate actions.

- Coordinate with international organizations in research and pilot application of wind-powered desalination plants with reuse applications of the brine in some central areas.

Recommendations to PEMSEA

PEMSEA in the coming years should continue to support Vietnam in matters of institutional improvement, human resource development, marine economy information and knowledge sharing, specifically in the following areas:

- Sharing information, knowledge, and experience in preparing the legal framework on transformation to blue economy.
- Supporting training and capacity development and ensuring the necessary conditions for the implementation of the SDS-SEA in the new situation of Vietnam; contributing to the successful implementation of the Strategy for sustainable development of Vietnam's marine economy to 2030, with a vision to 2045; as well as the Sustainable Development Goal 14 of the Agenda 2030 that Vietnam has committed to the international community.
- Assisting in building database and the integrated information management system to support integrated coastal and ocean management, blue economy development, and climate change adaptation.
- Continuing to organize the pilot implementation of blue economy initiatives in specific areas for replication and dissemination.
- Promoting and assuming the responsibility for a number of international activities in the region on marine scientific research for management, use and conservation of the seas and its natural resources for sustainable, resilient and inclusive development..

ANNEX

Annex. Policies and Governance Mechanisms for Blue Economy.

International agreements adopted	Ocean and coastal management	Fisheries	Coastal and Marine Tourism	Ports and shipping	Offshore Oil and Gas	Emerging blue economy industries	Coastal and marine ecosystems and biodiversity conservation	Pollution reduction				Climate Change Adaptation and Mitigation
								Solid waste, Toxic and Hazardous Waste	Sanitation, Wastewater & nutrients	Plastic waste	Sea-based	
<ul style="list-style-type: none"> • UNCLOS • SDGs 	<ul style="list-style-type: none"> • Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean • FAO Code of Conduct for Responsible Fisheries • FAO Agreement on Port State Measures • Agreement on network of fishery centers in Asia - Pacific, 1988 	<ul style="list-style-type: none"> • World Heritage Convention • Sihanoukville Declaration on Multilateral Cooperation for Ecotourism Development 	<ul style="list-style-type: none"> • MARPOL • UNCLOS • SOLAS • COLREG • AFS • CLC Protocol 1992 • BUNKERS 2001 				<ul style="list-style-type: none"> • CBD and Aichi biodiversity targets • Ramsar Convention • Document supplementary to Copenhagen, 1992 • CITES 	<ul style="list-style-type: none"> • Minimata Convention • Basel Convention 	<ul style="list-style-type: none"> • SDGs (6, 14) • GPA 	<ul style="list-style-type: none"> • SDG 14 	<ul style="list-style-type: none"> • MARPOL • Other IMO Conventions 	<ul style="list-style-type: none"> • UNFCCC; • Paris Climate Agreement • Kyoto Protocol
<ul style="list-style-type: none"> • National policies and laws 	<ul style="list-style-type: none"> • Resolution No. 36-NQ/TW dated October 22, 2018, of the XII Central Party Central Committee, on the Strategy for Sustainable Development of Vietnam's Ocean economy by 2030, Vision to 2045 	<ul style="list-style-type: none"> • Fisheries development strategy until 2020 • Law of Fisheries No. 17/2003/QH11 	<ul style="list-style-type: none"> • Vietnam tourism development strategy to 2030 • Tourism Law No. 09/2017 / QH14 2017 	<ul style="list-style-type: none"> • Vietnam Maritime Code No. 95/2015/ QH13 	<ul style="list-style-type: none"> • Amending and supplementing some articles of Law of Oil and gas No. 10/2008/QH12 	<ul style="list-style-type: none"> • Sustainable development strategy of Vietnam for the period 2011-2020 • National strategy on green growth. 	<ul style="list-style-type: none"> • National Environmental Protection Strategy until 2020, vision to 2030 • Law on Environmental Protection No. 55/2014/ QH13 • Law of Biodiversity 	<ul style="list-style-type: none"> • Decree No. 38/2015 / ND-CP dated April 24, 2015 on waste and scrap management 	<ul style="list-style-type: none"> • National strategy on water resources to 2020 • Law of Water resources No. 17/2012/ QH13 • Decree no. 80/2014 / ND-CP on drainage and wastewater treatment 		<ul style="list-style-type: none"> • National strategy on natural disaster prevention, fighting and reduction until 2020. • National strategy on climate change • Party Central Committee Resolution 24 on responding positively to climate change, strengthening natural resources management and environmental protection. 	

Annex. Policies and Governance Mechanisms for Blue Economy.. (cont.)

Strategic Action plans	Ocean and coastal management	Fisheries	Coastal and Marine Tourism	Ports and shipping	Offshore Oil and Gas	Emerging blue economy industries	Coastal and marine ecosystems and biodiversity conservation	Pollution reduction				Climate Change Adaptation and Mitigation
								Solid waste, Toxic and Hazardous Waste	Sanitation, Wastewater & nutrients	Plastic waste	Sea-based	
<ul style="list-style-type: none"> Action Plan to implement the Integrated Coastal Management Strategy of Vietnam to 2020, vision to 2030 Plan for implementing the Strategy on sustainable exploitation and use of marine natural resources and protection of environment by 2020, vision to 2030. Government's Master Plan and Five-Year Plan for implementation of the Vietnam Ocean economy Sustainable Development Strategy until 2030, vision to 2045 (Government's Resolution No. 26-NQ / CP of March 5, 2020) 	<ul style="list-style-type: none"> Master plan on fisheries development until 2020, orientation to 2030 	<ul style="list-style-type: none"> Master plan on tourism sector development until 2020, vision to 2030 	<ul style="list-style-type: none"> Development of Vietnam's seaport system to 2020, orientation to 2030 	<ul style="list-style-type: none"> Master plan on Gas industry of Vietnam, period 2015- 2025 	<ul style="list-style-type: none"> Master plan of Vietnam biodiversity conservation until 2020, orientation to 2030 Vietnam Marine protected areas planning until 2020 	<ul style="list-style-type: none"> National natural resources and environmental monitoring network for the period 2016 - 2025, vision to 2030 Master plan of thoroughly handling the facilities that cause serious environmental pollution by 2020 	<ul style="list-style-type: none"> National Action Plan for reducing ocean plastic waste by 2030 	<ul style="list-style-type: none"> Implementation plan of the National Environment Protection Strategy to 2020, vision to 2030 	<ul style="list-style-type: none"> National target program on climate change SP-RCC Program 2016-2020 Plan to implement the Paris Agreement on climate change 			

Annex. Policies and Governance Mechanisms for Blue Economy.. (cont.)

	Ocean and coastal management	Fisheries	Coastal and Marine Tourism	Ports and shipping	Offshore Oil and Gas	Emerging blue economy industries	Coastal and marine ecosystems and biodiversity conservation	Pollution reduction				Climate Change Adaptation and Mitigation
								Solid waste, Toxic and Hazardous Waste	Sanitation, Wastewater & nutrients	Plastic waste	Sea-based	
Mandated gov't agencies	<ul style="list-style-type: none"> VASI (at national level) and DASIs (at local level) 	<ul style="list-style-type: none"> General Department of Fisheries, MARD (at national level) and Fisheries Management Agency, DARDs (at local level) 	<ul style="list-style-type: none"> General Department of Tourism, MOCST (at national level) and DOTours (at local level) 	<ul style="list-style-type: none"> Development planning of Vietnam's seaport system to 2020, orientation to 2030 Vinamarine (at national level) and Port Authorities (at local level) 								<ul style="list-style-type: none"> Agency on Climate Change
Inter-agency coordination mechanism	<ul style="list-style-type: none"> National Coordination Board for implementing Vietnam Integrated coastal management Strategy until 2020, vision to 2030 									<ul style="list-style-type: none"> National Council on water resources (Decision 459 / QD-TTg dated 2 April 2014) 		<ul style="list-style-type: none"> National Committee on climate change



Hòn Island, Ha Long Bay.



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