National State of Oceans and Coasts 2018:

Blue Economy Growth

CAMBODIA

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National State of Oceans and Coasts 2018:
Blue Economy Growth of Cambodia

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Acronyms and Abbreviations

ADB	–	Asian Development Bank
AIDS	–	acquired immunodeficiency syndrome
ASEAN	–	Association of Southeast Asian Nations
BOD	–	biological oxygen demand
CBD	–	Convention on Biological Diversity
CCCA	–	Cambodia Climate Change Alliance
CDP	–	commune development plan
CFi	–	fishery communities
CIP	–	commune investment plan
CO_2	–	carbon dioxide
COD	–	chemical oxygen demand
CITES	–	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSES	–	Cambodia socio-economic survey
CUZ	–	coastal use zoning
CZM	–	coastal zone management
DO	–	dissolved oxygen
DHF	–	dengue hemorrhagic fever
DoF	–	Department of Fisheries
DNCP	–	Department of Nature Conservation and Protection
DRR	–	disaster risk reduction
EAS	–	East Asian Seas
EEZ	–	Exclusive Economic Zone
EIA	–	Environmental Impact Assessment
ENR	–	Environment and Natural Resources
ESI	–	Environmental Sensitivity Index
EU	–	European Union
EUF	–	Environmental Users Fee
FAO	–	Food and Agricultural Organization
FFI	–	The Fauna & Flora International
FiA	–	Fishery Administration
FP	–	facultative pond
GDI	–	gender development index
GDP	–	gross domestic product
GEF	–	Global Environment Facility
GII	–	gender inequality index
GNI	–	gross national income
GOT	–	Gulf of Thailand
GT	–	gross tonnage
GVA	–	gross value added
HDI	–	human development index
HIV	–	human immunodeficiency virus
ha	–	hectare
HIV	–	human immunodeficiency virus
HMIS	–	Health Management Information System
Hp	–	horsepower
HWL	–	high water level
ICM	–	integrated coastal management
IFS	–	integrated farming systems
IMO	–	International Maritime Organization
IPCC	–	Intergovernmental Panel on Climate Change
IPD		inpatient department
IRRC		Integrated Resources Recovery Center
ISIC	–	International Standard Industrial Classification of All Economic Activities
IUCN	–	International Union for Conservation of Nature
JICA	–	Japan International Cooperation Agency
KHR	–	Cambodian riel
kg	–	kilogram
km	–	kilometer
km^2	–	square kilometer
KRA	–	Koh Rong Archipelago
KRS	–	Koh Rong Sanloem
LME	–	large marine ecosystems
LWL	–	low water level
m	–	meter
mm	–	millimeter
mg/l	–	milligrams per liter
MAFF	–	Ministry of Agriculture, Forestry and Fishery

MARPOL	–	International Convention for the Prevention of Pollution from Ships
MCT	–	Malaysia-Cambodia-Thailand Submarine Cable System
MDGs	–	Millennium Development Goals
METT	–	Management Effectiveness Tracking Tool
MFF	–	Mangroves for the Future
MFMA	–	marine fisheries management area
MOE	–	Ministry of Environment
MOT	–	Ministry of Tourism
MOU	–	Memorandum of Understanding
MP	–	maturation pond
MPA	–	marine protected area
MPN	–	most probable number
MSY	–	maximum sustainable yield
NCCC	–	National Climate Change Committee
NCMD	–	National Committee for Management and Development of Cambodian Coastal Areas
NGOs	–	nongovernment organizations
NH4	–	National Highway No. 4
NMP	–	National Marine Park
NSOC	–	National State of Oceans and Coasts
OPD	–	outpatient department
PAS	–	Sihanoukville Autonomous Port
PAPP	–	Phnom Penh Autonomous Port
PDAs	–	Provincial Development Authorities
PEMSEA	–	Partnerships in Environmental Management for the Seas of East Asia
pH	–	potential of hydrogen
PMBC	–	Phuket Marine Biological Centre
PSHEMS	–	Port Safety, Health, and Environmental Management System
RCP	–	Representative Concentration Pathway
SDGs	–	sustainable development goals
SDS-SEA	–	Sustainable Development Strategy for the Seas of East Asia
SLR	–	sea level rise
SMART	–	spatial monitoring and reporting tool
SOC	–	State of Oceans and Coasts
SOCECCSR	–	State of the Coastal Environment, Climate Change and Socio-Economy Report
SOER	–	State of Environmental Report
SWM	–	solid waste management
TB	–	tuberculosis
TEU	–	twenty-foot equivalent unit
TSS	–	total suspended solid
UNDP	–	United Nations Development Programme
UNEP	–	United Nations Environment Programme
UNFCCC	–	United Nations Framework Convention on Climate Change
UV	–	ultraviolet
VAAP	–	Vulnerability Assessment and Adaptation Project for Climate Change in the Coastal Zone of Cambodia Considering Livelihood Improvement and Ecosystems
WDR	–	World Development Report
WHO	–	World Health Organization
WTTC	–	World Travel and Tourism Commission
yr	–	year
MAFF	–	Ministry of Agriculture, Forestry and Fishery

FOREWORD

It is my great pleasure and honor to present the State of the Oceans and Coasts (SOC) Report, which is an important document to illustrate Cambodia's marine and coastal environmental resources as well as socio-economic development with consideration of a respinse to environmental threats, climate change, natural disasters, and blue economy development. The report describes some key important sectors related to marine and coastal activities, including economic development and eco-system services; coastal and marine ecosystems and biodiversity conservation; food security; eco-tourism, recreational and heritage sites; sea port and shipping; risk and threats to marine and coastal environment and resources; blue economy development; institutional arrangement and governance; and investment opportunities for the blue economy development.

As we are aware of, Cambodia's coastal area covers four provinces namely Kep, Kampot, Preah Sihanouk, and Koh Kong with the coastline of about 435 km and exclusive economic zone up to 200 nautical miles (370 km). The coastal provinces home to more than one million people, who are mostly relying on marine and coastal resources. The coastal areas are rich in mangrove forests, coral reefs, seagrass, fish, crab, shrimps, oil and gas, quartz sand, minerals and salt. With its beautiful sandy beaches and prestige environment, the coastal zone of Cambodia has been inaugurated into the Club of the Most Beautiful Bays of the World since 2011, which can attract more than two million tourists every year and the number of tourists are increasing annually.

Cambodia's coastal provinces are the ones among the other economic development poles where infrastructures have speedily been developed such as railways, roads, seaports, airport, recreational areas, hotels, maritime transport, manufacturing facilities, tourism facilities, etc. Such fast developments attract more investment and foster the economic growth, for instance, marine and coastal pollution, climate change, seawater intrusion, soil erosion, and environmental degradation, etc.

The blue economy aims to improve the implementation of processes that integrate science, public awareness, cultural heritage, and social change and to lead the real improvement in economic, environmental and ecological health and social well-beings. In this regard, the integration of the blue economy development concept into national economic development policies and strategies shall be taken into account as we want to achieve the Sutainable Development Goals (SDGs) which Goal 14 focused on the conservation and sustainable use of the oceans, seas and marine resources for sustainable development. The possibility of transistioning from unsustainable growth approaches to sustainable approaches can be made through the blue economy development.

Therefore, I do hope that the information in the SOC report will serve as an important source of data and information compiled to provide and overview to support planners, policy makers, and researchers, and civil society as well as academia to work hard together to ensure that our valuable marine and coastal resources continue to be the sustainable for the next generations, sources of poverty reduction, and economic development.

Last but not the least, I would like to express my sincere thanks to representatives of governmental line ministries, coastal provincial authorities, and otherrelevant stakeholders, particularly thanks to key ministries namely the Ministry of Planning, the Ministry of Public Works and Transport, the Ministry of Tourism, the Ministry of Mines and Energy, the Ministry of Agriculture, Forestry and Fisheries, the Ministry of Land Management, Urban Planning and COnstruction, and the Ministry of Environment for their kind contributions, comments, and inputs to make the SOC report possible. I would also like to thank the Working Group for the contribution and commitment in the development of this SOC report.

ACKNOWLEDGMENTS

The development of the State of the Oceans and Coasts Report (SOC Report) is significant and illustrates the country's situation related to ocean economy and ecosystem system services, blue economy development, marine and coastal physical and biological features, risks and threats to blue economy and ocean health, supporting institutional arrangements and governance mechanisms, and investment opportunities for blue economy. The SOC report also describes changes in Pressures, State and Response indicators for the ocean economic activities and ocean health. In the process of preparing the SOC Report, data have been collected from primary and secondary sources, with inputs from government agencies and stakeholders. A number of consultation workshops had been done at the national and coastal provincial levels for the review and updating of the drafts. Data in the SOC report follow the format of the regional SOC report, with guidance by PEMSEA.

The development of this SOC report has faced many challenges, especially those related to data gathering, compilation, and analysis because most of data are not systematically collected and computerized. In some instances, it is difficult to get disaggregated data and up-to-date information for analysis. Nevertheless, with inputs and verifications from line governmental ministries and departments, data and information described in this SOC report are useful as reference and basis for policy, planning, decision-making and management.

Therefore, on behalf of the Working Groups we would like to express our sincere thanks to his Excellency Say Samal, Minister of Environment for his strong support and motivation. We would also like to thank other governmental line ministries and coastal provinces for their commitment, for sharing information, and reviewing this SOC report until the final version has been completed. We would like to express our sincere thanks to the Working Group for their contributions and commitment in the development of this SOC report without which the report would have not been produced. Finally, our profound thanks go to the International Consultants, PEMSEA and other stakeholders for their expert advice, analysis, and other suggestions.

Mr. Long Rithirak
Deputy Director General
Ministry of Environment

EXECUTIVE SUMMARY

Background

The ministers of the East Asian Seas (EAS) Region adopted the **Da Nang Compact** during the EAS Congress 2015 held in Da Nang, Viet Nam in November 2015. One of its targets is the development of a Regional State of Oceans and Coasts (SOC) report. Cambodia prepared this National State of Oceans and Coasts (NSOC) report as its contribution to the regional report. The regional and national SOC reports also aims to contribute to the assessment of development in blue economy, and monitoring of progress on the implementation of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA), the UN Sustainable Development Goals (SDGs), other international agreements subscribed to by PR China, and related national laws and policies on oceans and coasts.

The definition of blue economy is given in the **Changwon Declaration 2012**,[a] which was adopted by the ministers of the East Asian Seas (EAS) Region as a way to respond to the challenges of the changing environment and climate as well as fostering economic development through activities that reduce negative impacts on ocean health and communities.

Cambodia's National SOC Report provides information on the status of seas and coasts of the country, including its ocean economy; coastal and marine resources; the existing and potential uses of such resources, and the corresponding benefits and impacts. The NSOC report of Cambodia aims to:

- support the Information Management System for the Coastal Zone and compile data and information collected from different concerned agencies to serve as baseline information for the assessment of coastal and marine areas of Cambodia;
- contribute to the blue economy assessment and monitoring of the implementation of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA), SDGs, other international agreements, and related national laws and policies;
- aid policy-making, planning and management of the coastal and marine areas of the country, including the natural resources, environment, economic activities and investments, and foster inter-agency collaboration; and
- monitor the Vulnerability Assessment and Adaptation Programme for Blue Economy Development in Cambodia's marine and coastal areas.

[a] *"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 Seas and People of Cambodia

Cambodia is a tropical country situated in Southeast Asia. It is located between latitudes 10 to 15 degrees north and longitudes 102 to 108 degrees east. The country shares border with Lao People's Democratic Republic (Lao PDR) on the north, Thailand on the north and west, and Viet Nam on the east and south.

Cambodia has a total land area of 181,035 km^2. The coastal zone is located in the southwest part of the country. Four provinces are situated along this coastline, namely Koh Kong, Preah Sihanouk, Kep, and Kampot. In the coastal zone, there are mangrove forests, numerous bays, beaches, seagrass beds and coral reefs. Cambodia also has more than 64 islands. Cambodia has a 435-km coastline along the Gulf of Thailand, with 55,600 square kilometres (km^2) of exclusive economic zone (EEZ). The country has claimed its EEZ up to 200 nautical miles (370 km) from the coastline.

Figure 1: Map of Cambodia.

Socioeconomic features[b]

Population. According to the Cambodia Socio-Economic Survey (CSES) 2015, the total population of Cambodia was 15.405 million people in 2015. The annual population growth rate is 1.79% from 1998 to 2014 (CSES, 2014). In 2015, the coastal population was 1,094,072, which accounted for 7.1% of the total population.

Economy. Cambodia is undergoing rapid development, as indicated by the average GDP growth rate of 7.2% from 2011 to 2015. This is fueled by rapid industrialization as shown by the growth rate of the industry sector, in contrast to the decline of the agriculture, fisheries, and forestry sector. In 2017, the GDP is US$18.17 billion (in constant 2010 US$ prices).

Human development. Cambodia's human development index (HDI) value in 2017 is 0.582—which put the country in the medium human development category—positioning it at 146 out of 188 countries and territories. In 2017, GNI per capita (using 2011 purchasing power parity or PPP $) was $3,413. Cambodia's GNI per capita increased by about 265.8% between 1990 and 2017. Life expectancy at birth was 69.3 years; mean years of schooling was 4.8 years; and expected years of schooling was 11.7 years in 2017. The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. Promoting literacy, education and health will have long-term impact on the human capital and socioeconomic development of the country, and ensure inclusive growth. Poverty reduction also reduces resource-use pressures.

Poverty incidence. In terms of poverty reduction, Cambodia has achieved the Millennium Development Goal (MDG) of reducing poverty into half in 2009. By 2014, the poverty rate or the proportion of people who live below the national poverty line was 13.5% compared to 47.8% in 2007 (The World Bank, 2014).

Access to water and sanitation. Water and sanitation remain a key issue in Cambodia. While the country is experiencing economic growth, infrastructure for water, sanitation and wastewater management is lagging behind. In 2015, around 75% of the population has access to the least basic drinking water services, but only 24% of the population is using safely managed drinking water services. Around 49% of the population has access to only the least basic sanitation services.

[b] Data used in this section are from: the National Institute of Statistics (2016); UNDP (2018). *Human Development Indices and Indicators: 2018 Statistical Update; World Bank (2014). World Development Report 2014;* data accessed from https://data.worldbank.org/country/cambodia

Table 1: Cambodia: Basic Geographic and Socioeconomic Indicators.

Indicator	As of 2017
Land area (square kilometres or km^2)	181,035 km^2
Coastline	435 km
Sea area (EEZ waters up to 200 nautical miles)	55,600 km^2
Population	15.405 million (as of 2015)
Coastal population	1,094,072 or 7.1% of the total population (as of 2015)
Gross domestic product (GDP, in constant 2010 US$ prices)	US$18.17 billion
Human development index (HDI)	0.582—medium human development category—positioning it at 146 out of 188 countries and territories
Gross national income (GNI) per capita (at 2011 PPP prices)	US$3,413
Life expectancy at birth	69.3
Mean years of schooling	4.8
Access to safely managed water supply	24% Access to the least basic drinking water services: 75%
Access to safely managed sanitation	Access to only the least basic sanitation services: 49%
Ocean health index (OHI)	64 (Cambodia ranks 140 among 221 countries and territories.)
Percentage of coastline with ICM	100%
Marine protected area (percentage of territorial waters)	0.5%
Ocean economy (Gross value added or GVA, 2015, in constant prices)	US$ 2.4 billion or 16% of GDP (in 2015)
Employment in ocean economy	3.2 million
Estimated value of coastal and marine ecosystems	US$ 200.42 million to 583.42 million per year

Cambodia's Ocean Economy

The ocean economy – comprising the fisheries, ports and shipping, and coastal and marine tourism sectors – contributes an estimated US$2.4 billion in value added or around 16% of the country's GDP (**Table 2**). This figure may be underestimated as other ocean-related economic activities have not been taken into account yet.

Table 2: Ocean Economy.

Economic Activity	Estimated Gross Value Added (US$, 2015)	Employment
Fisheries and aquaculture	1,103,303,447	2.4 million
Shipping and ports (Marine transport, storage, and communication)	1,212,278,654	944
Coastal and marine tourism - Sihanoukville	70,119,588	782,500 (nationwide)
TOTAL	**2,385,701,690**	
	= 16% of GDP	

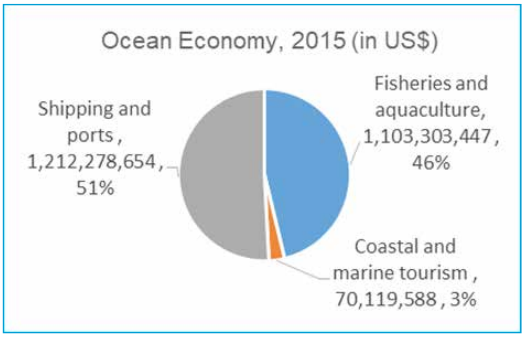
Valuation of Ecosystem Services

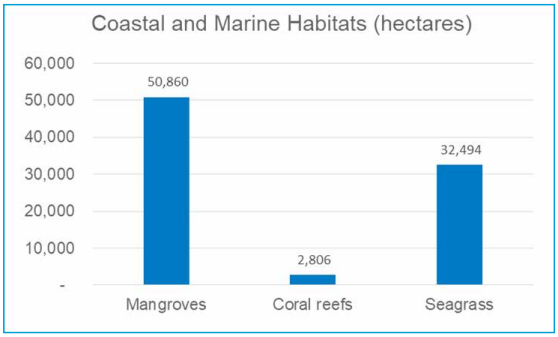
The oceans also provide goods and services that are not usually quantified in monetary terms, and excluded in the national income accounts. Using various studies, the total economic value of the coastal and marine ecosystems ranges from **US$200.42 million** to **US$583.42 million per year** (**Table 3**). The ecosystem services include direct values, such as fisheries and tourism (included in the ocean account), and indirect values, such as shoreline protection, climate regulation, waste assimilation (regulating and supporting services).

Table 3: Valuation of Coastal and Marine Ecosystems.

Habitat	Area (ha)	Valuation	
		(US$/ha/yr)	(US$/yr)
Mangroves	50,860[a]	882.35[c]	44.88 million
Seagrass	32,494[b]	1,186[c]	38.54 million
Coral reefs	2,805[a]	230.1 – 2,700[d]	
Koh Rong Archipelago			117 million–500 million[e]
Tidal swamps	54,500	N/A	
Total			**200.42 million–583.42 million**

Source: [a] MOE 2013; [b] Department of Fisheries; MOE 2013; [c] UNEP, 2007; [d] Conservation International 2008; [e] Coral Cay Conservation 2011.





Fisheries and Aquaculture

Production. Fisheries production in 2016 was 751,000 tonnes.Capture fisheries and aquaculture grew at an annual average of 5.2% and 16.5%, respectively, between 2000 and 2015.[c] These figures include both marine and freshwater fisheries.

Employment. The fishery sector provides substantial employment opportunities to the rural population. The sector employs over 2.4 million people (FAO, 2011) either in the primary sector or secondary sector, full-time or part-time, which indicates this sector as a major driver of livelihood.

Food security. On average, fish provides around 66% of daily animal protein and 19% of total protein consumption of Cambodians. It is also a critical source of essential vitamins and micronutrients. The per capita consumption of fish is one of the highest in the world, at an average of 40.5 kilogram per year (kg/yr).

Pressures. The degradation of the marine environment and depletion of fish habitats (e.g., mangroves, seagrass, etc.) and marine resources have occurred due to land encroachment for agricultural activities, fuelwood/charcoal production, sea port expansion/development, salt and shrimp farming, unregulated coastal development and human settlements, and poverty. Domestic waste is still discharged directly into coastal waters without treatment with negative impacts on fish and human health.

Population growth is also a factor causing pressure on coastal fisheries. More and more fishermen employ modern fishing methods and prohibited gears to increase fish catch since the marine fishery resources have declined. This activity creates negative impacts on the environment and fisheries resources. In turn, the catch per unit of effort is declining and the size of fish and other products caught is also declining. This threatens the livelihood of fishing families, and availability of fish for consumption.

There are also various coastal governance issues, such as lack of effective and transparent implementation of laws, limitation of systems for monitoring coastal development, lack of provincial authorities to control natural resource uses, and overlapping role and responsibilities among line agencies of the government on marine resource management.

Response. A sub-decree on community fisheries that aims to empower local communities to participate in fisheries management scheme and address the various pressures has been approved in 2005 (MAFF, ASSDP, 2006-2010). The Fisheries Law was adopted by the National Assembly on 21 May 2006. The Fisheries Administration (FiA) of MAFF is responsible for:

- managing fisheries and aquaculture in Cambodia;
- implementing fisheries-related laws and policies;

[c] World Bank. 2017. The Little Green Data Book 2017.

- establishment and management of fish sanctuaries and conservation of habitats;
- controlling illegal fishing; and
- ensuring benefits from aquatic resources.

Coastal and Marine Tourism

The Ministry of Tourism has been promoting investments into coastal tourism and ecotourism as they are potential alternative revenue sources for the government, and as an employment opportunity for local communities. The coastal areas along Sihanoukville, Koh Kong, Kampot, and Kep are attracting an increasing number of tourists. Major tourist destinations in marine and coastal areas are Ream National Park, Kep National Park, Prem Krasop Wildlife Sanctuary, the marine protected area of Koh Rong, the historical site of Khun Change Khun Pen, and beaches in Preah Sihanouk.

Contribution to income and employment

- In 2016, Preah Sihanouk Province alone welcomed nearly 2.4 million tourists, which generated **US$96 million in revenue**.
- The Cambodian tourism sector provided **988,000 jobs directly in 2016 or 11.4% of total employment**. This figure included the employment by hotels, travel agents, airlines, and other passenger transportation service.

Pressures. As the country is realizing the potential of the tourism sector for its economic growth, there are major challenges that Cambodia is facing:

- *Revenue loss*: Based on the official data from the Ministry of Tourism, 25% of the revenue from this sector was lost due to importation of materials and agricultural products, which could have been supplied locally. This also showed the weakness of Cambodia's agricultural sector, which accounts for 80% of the total population. The restaurant owners typically turned down local farmers' products or offer a lower price as they consider their quality to be lower than acceptable standards.
- *Limited skilled human resources*: Besides the leakage of revenue, there is a lack of human resources and professionalism in the sector. This issue has been acknowledged by the Tourism Minister who indicated that enhancing the quality of tourism services in the country is a challenge.
- *Sustainability of tourism*: With the increasing number of tourists, there will also be increasing waste generation and pressures concerning carrying capacity of beaches, islands, and coral reefs.

Response. The "Clean City, Clean Resorts, and Good Services" movement was launched by the Ministry of Tourism in 2011 to encourage responsible businesses. In 2016, the "Clean Beach, Green Sea, and Preservation of Marine Resources" movement was initiated. The following are the major programmes for sustainable tourism:

- Ecotourism projects: community-based ecotourism site in Chi Phat

- Island Conservation and Development: Koh Rong
- Beach improvement with zoning, wastewater treatment and solid waste management, and areas for public access: Occheateal Beach in Sihanoukville; Pilot project in Otres Beach
- Cambodia Bay: The government is implementing programs to ensure that it remains among the best beaches in the world, and has identified the following tourist destinations:
    - Beach and island destination
    - Snorkeling, diving, and fishing destination
    - Mangrove destination
    - Historical and natural destination
    - Waterfall destination
    - Seafood destination
    - Agricultural destination

Ports and Shipping

Sihanoukville Autonomous Port (PAS) is the main public deep-sea port of Cambodia. In addition to PAS, there are a number of private sea ports, such as Port of Sre Ambel, Port of Oknha Mongon in the east coast of Kompong Som Bay, and two oil jetties in the north of PAS built by oil companies, which replaced the old oil jetty of PAS.

Contribution to income and employment. PAS had earned a total revenue of US$70 million in 2016. The recorded cargo shipments at PAS increased to 399,192 TEU from January to December of 2016, and generated revenues amounting to approximately US$53 million. PAS alone handles more than 60% of Cambodia's cargo traffic and has seen an average annual revenue growth rate of 10% since 2012.

Pressures and risks

- **Port construction and dredging**. To construct the container port in Sihanoukville Autonomous Port, about 1,312,000 m³ of soil were removed from the berth area and an additional 465,000 m³ will be dredged from the canal. The following are the key risks. First, soil particles and debris generated and suspended in the water pollute the seawater and may affect other places including fishing grounds, sensitive areas and recreational beaches. Second, proper dumping places are required for disposal of the removed soil to prevent pollution in the sub-soil and underground water.
- **Pollution from ships and port**. (a) sewage, (b) garbage, and (c) oil spills that are caused during normal operations of ships and ports, and accidents when loading and unloading goods.
- **Ship accidents and oil and chemical spills**. The number of ships movement at Sihanoukville Port is increasing every year, increasing the risks from ship accidents and oil spills; harmful and toxic substances released from ships; and abandoned ships that affect maritime navigation.

Response

- **Joint Statement on Partnership in Oil Spill Preparedness and Response in the Gulf of Thailand (GOT Program)**. It aims to enhance national and regional competences on oil pollution prevention, preparedness and response by exchanging information, research, and conducting oil spill response (OSR) exercise for implementation throughout the Gulf. The Joint Statement was initiated by PEMSEA and signed on January 12, 2006 in Hanoi by Cambodia, Thailand, and Vietnam.
- **2014 Memorandum of Understanding (MoU) on ASEAN Cooperation Mechanism for Joint Oil Spill Preparedness and Response**. Cambodia also worked together with other ASEAN Member States to combat oil spill by signing this MoU.
- **National Oil Spill Contingency Plan**, including the mechanism for the Joint Oil Spill Response in the Gulf of Thailand.
- **Environmental Sensitivity Index (ESI) Mapping**. With support from PEMSEA and Korea International Cooperation Agency, Cambodia has completed the ESI Atlas, which is useful for the oil spill contingency plan, response to oil spill incidence, and protecting the coastal and marine resources along the Gulf of Thailand.
- **Port, Safety, Health and Environmental Management System (PSHEMS)**. With support from PEMSEA, Sihanoukville Autonomous Port (PAS) and Phnom Penh Autonomous Port (PAPP) are implementing the PSHEMS, and have completed the Stage 1 Audit. Both ports are expected to be awarded their PSHEMS certification in 2019. The development and implementation of PSHEMS resulted in concrete economic, social, and environmental benefits, not only in the ports but also in the host cities.

Transitioning to Blue Economy

The blue economy, as discussed during the East Asian Seas (EAS) Congress 2012, refers to a sustainable ocean-based economic model; one that employs environmentally-sound and innovative infrastructure, technologies, and practices, including institutional and financing arrangements, for meeting the goals of: (a) sustainable and inclusive development; (b) protecting our coasts and oceans, and reducing environmental risks and ecological scarcities; (c) addressing water, energy, and food security; (d) protecting the health, livelihoods, and welfare of the people in the coastal zone; and (e) fostering ecosystem-based climate change mitigation and adaptation measures.

Table 4 shows the developments in ocean economic activities, and new trends in blue economy.

Table 4: Status of ocean economy and developments in blue economy.

Ocean economy	Blue Economy Initiatives
Fisheries and aquaculture • Total fisheries and aquaculture production in 2016 was 751,000 tonnes. • The sector provides livelihood and employment to over 2.4 million people. • ***Pressures:*** small-scale fisheries, conflict with increasing commercial fishing; overfishing, destructive fishing; habitat loss; pollution	**Sustainable fisheries** • Community-based fisheries • Alternative livelihood. Under the Preah Sihankouk ICM program, a revolving fund for households was set up to support supplemental livelihood and micro-enterprise projects to reduce fishing pressure. • Supporting measures: Delineation of fishing boundaries (commercial fishing lots and municipal marine fisheries); community-based fish sanctuaries; enforcement of anti-illegal fishing, and habitat conservation.
Coastal and marine tourism • In 2016, Preah Sihanouk Province alone welcomed nearly 2.4 million tourists, which generated US$96 million in revenue. • ***Pressures***: habitat degradation, pollution, increasing waste generation and pressures concerning carrying capacity of beaches, islands, and coral reefs; harvesting of live specimens and corals; multiple resource-use conflicts; revenue loss; limited skilled human resources	**Sustainable tourism** • Ecotourism: community-based ecotourism site in Chi Phat • Island Conservation and Development: Koh Rong • Beach management with coastal use zoning, wastewater treatment and solid waste management, and areas for public access: Occheateal Beach in Sihanoukville; Pilot project in Otres Beach - Outcomes: Increased number of tourists in Sihanoukville; higher income for stall owners and hotels/homestay; public accessibility of beach and other tourist attraction sites; erosion and pollution being addressed; biodiversity conservation and eco-tourism enhanced
	Habitat restoration and management • Mangrove rehabilitation • National parks in the coastal areas • MPA: Koh Rong was declared as the country's first Marine National Park - includes zoning, management plan, sustainable fisheries and ecotourism for livelihood, habitat restoration, and empowerment of fishery communities. - Outcomes: Enhanced protection of coastal resources; increased resilience of fish species; changes in behavior; controlled illegal fishing and cutting of trees; increased awareness and capacity
Ports and shipping • Sihanoukville Autonomous Port (PAS) is the main public deep-sea port of Cambodia. PAS had earned a total revenue of US$70 million in 2016. • Pressures: port construction and dredging; oil spills from operations and accidents; pollution (garbage, sewage) from ships and ports	**Sustainable ports** • Port Safety, Health and Environmental Management System: Sihanoukville Autonomous Port and Phnom Penh Autonomous Port - resulted in concrete economic and environmental benefits • Oil spill contingency - Joint Statement on Partnership in Oil Spill Preparedness and Response in the Gulf of Thailand with Thailand and Viet Nam - 2014 Memorandum of Understanding on ASEAN Cooperation Mechanism for Joint Oil Spill Preparedness and Response - Environmental Sensitivity Index (ESI) Mapping of coastline

Table 4: Status of ocean economy and developments in blue economy. (cont.)

Ocean economy	Blue Economy Initiatives
Water	**Wastewater and solid waste management/Pollution reduction** • Krong Preah Sihanouk: community-based solid waste collection system and transfer to landfill, with collection of environmental user fees; wastewater treatment facility using cost-effective technology - Outcomes: community awareness and cooperation on waste management; increased coverage and access to solid waste and wastewater management systems; cleaner beaches; higher tourism revenues
	Climate resiliency • Koh Rong commune in Preah Sihanouk: Water harvesting, storage, and distribution infrastructure and systems at community tap stations to cope with drought; potable water filters in vulnerable communities; restoration of mangroves and coral reefs to increase resiliency and adaptive capacity of local communities; training in mainstreaming climate change adaptation and disaster risk reduction into community development and infrastructure plans - Outcomes: improved access to potable water; increased savings; increased income; coastal and marine ecosystems protected; enhanced adaptive capacity of local government and communities

Ocean health underpinning the blue economy

The long-term potential of the blue economy cannot be realized unless actions are taken to improve the marine water quality and condition of the coastal and marine ecosystems as people and industries rely on healthy oceans for food, recreation, alternative water and energy sources, shoreline protection, and climate regulation.

Marine Water Quality

There is no regular marine and coastal water quality monitoring system in Cambodia. There is no information on nutrients from watershed areas discharging into Cambodia's coastal waters. There was one incident of algal bloom, which occurred in 2016 in Kep Province. It cannot be determined if such algal bloom was due to nutrient runoff from Cambodia's watersheds or from neighbouring countries. Marine water quality is inferred from the UNEP/GEF Transboundary Water Assessment Programme 2015 report on the Gulf of Thailand (LME 35). The Nitrogen Load risk level for contemporary (2000) conditions was low – Level 2 – of the five risk categories.[d] For the nutrient ratio, the risk level for contemporary

[d] Five risk levels: 1 = very low risk; 2 = low risk; 3 = moderate risk; 4 = high risk; 5 = very high risk

(2000) conditions was very low. Based on another assessment – "current trends" scenario – this will remain low in 2030 and increased to moderate by 2050 (Global Orchestration, Millennium Ecosystem Assessment 2005). **Table 5** shows the marine water quality in the Gulf of Thailand.

Table 5: Marine Water Quality.

Parameters	Water Quality Standard[a]	Monitored Water Quality[b]
pH	7.0–8.3	8
Dissolved oxygen (DO)	7.5 mg/l–2.0 mg/l	5 mg/l
Chemical oxygen demand (COD)	1 mg/l–8 mg/l	
Total nitrogen	0.2 mg/l–1.0 mg/l	0.1 mg/l
Total phosphorus	0.02 mg/l–0.09 mg/l	0.01 mg/l
Total suspended solids (TSS)	1 mg/l–15 mg/l	
Oil	0 mg/l	
Coliform	<1000 MPN/100 ml	
Heavy metals		

mg/l = milligram per liter, ml = milliliter, MPN = most probable number
Source: aSub-decree on water pollution control, 1999; bwater quality of Gulf of Thailand - UNEP/GEF Transboundary Water Assessment Programme, 2015; Millennium Ecosystem Assessment 2005.

Threats to Cambodia's marine water quality come from residential wastewater discharge and nutrient runoff from the watershed area. In urban areas, household wastewater goes to the drainage system or to open canals and open ponds before releasing into the sea. In rural areas, many households lack access to sanitation and wastewater treatment facilities. Untreated sewage and leaking pit latrines result in water pollution, thereby affecting rivers, lakes and groundwater that people rely on for water supply.

Environmental Cost

According to the report on the Economic Impact of Sanitation in Cambodia, **poor sanitation and untreated sewage affect human health, water supply, fisheries, and tourism that lead to economic losses of US$448 million per year**.[e] These economic losses are equivalent to 7.2% of Cambodia's GDP. This amount is roughly equivalent to the contribution of the fishery sector to the GDP, or twice the forestry's contribution. Health impact is the largest contributor of quantified costs, accounting for 42% of the total economic costs. The next main contributor is the water costs attributed to the cost of accessing cleaner drinking water, the cost of accessing other domestic water uses, and the loss in fish production due to polluted water, which is roughly 33% of the total economic losses. Moreover, the tourism sector, which may also be affected by poor sanitation and hygiene practice in the country, accounts for 16% of the total costs. The economic loss caused by the loss of time due to unimproved sanitation is 9% of the total costs.

[e] *World Bank, 2008.*

Habitats and biodiversity

There are relatively pristine mangrove forests growing in four major zones from the shoreline to the landward edge. Coral reefs and seagrass beds exist along the coastline of the mainland and islands. **Table 6** shows the status of the coastal and marine habitats and biodiversity in Cambodia, and the pressures and threats they are facing.

Table 6: Status and Condition of Coastal and Marine Habitats and Biodiversity.

Resources	Area	Species Composition	Condition and Pressures
Mangroves	50,860 ha (in 2011) (No recent data)	74 species	Condition: declining area In 1992:[f] • Total area: 85,100 hectares (ha) • Koh Kong: 75% (63,200 ha) • Preah Sihanouk: 16% (13,200 ha) • Kampot: 9% (7,300 ha) In 1997: 63,039 ha[g] In 2002: 56,241 ha[h] In 2011: 50,860 ha[i] Pressures: • Conversion to coastal development, shrimp ponds, etc. • Harvesting for fuelwood • Natural hazards and climate change
Coral reefs[10]	Total area: 2,805.5 ha • Preah Sihanouk: 1198 ha • Kampot: 953 ha • Koh Kong: 602 ha • Kep: 52.5 ha (No recent data)	70 coral species	Condition • Some coral reefs are in poor condition because of sedimentation particularly around Polowii Island • Abundant coral reefs can be found around Koh Karang located in the Kampot Province, but are very rare in Koh Daung. • Most of the Cambodian islands are reported to be abundant in coral reefs. Pressures • destructive fishing • harvest of live specimens and corals for trade • pollution (domestic and industrial wastewater discharge, agricultural runoff) • sedimentation • natural hazards and climate change

[f] Chea, 1993; MRC/UNDP/FAO, 1994.
[g] Ashell, 1997.
[h] JICA, 1997; MoE, 2002.
[i] *MOE, 2013.*
[j] State of Environment Report.

Table 6: Status and Condition of Coastal and Marine Habitats and Biodiversity. (cont.)

Resources	Area	Species Composition	Condition and Pressures
Seagrass[k]	Total area: 32,494 ha, • Kampot: 25,241 ha • Koh Kong: 3,993 ha • Kep province: 3,096 ha • Preah Sihanouk: 164 ha (No recent data)		Condition: Stretches of shallow areas often provide habitats for seagrass. • extensive seagrass meadows along the mainland • patches of seagrass interlinked with coral reefs around islands Pressures: • degradation of water quality, - increasing siltation caused by illegal logging and coastal development; - increasing use of fertilizer and pesticides in the coastal agricultural areas; - discharge of domestic and industrial wastewater • destructive fishing practices, such as push nets and trawling in the seagrass beds • reclamation • natural hazards and climate change
Estuaries and mudflats	No data		Located mostly in protected areas: Botum Sakor National Park, Ream National Park, Dong Peng Multiple Wildlife Use Area, Peam Krasoab Sanctuary, and Koh Kapik Ramsar Site
Fisheries	• 525 marine fish species, classified in 202 genera and 97 families, with total fish stock estimated at 50,000 metric tons[l] • 20 species of marine crabs, 42 species of marine gastropods, 24 species of marine bivalves, and 11 species of marine mammals • Targeted reef fish: sweetlips (Haemulidae), snapper (Lutjanidae), barramundi cod (Cromileptes), grouper, humphead wrasse, bumphead parrotfish, and other parrotfish (The number of reef fish species and invertebrates are unknown.)		Pressures and threats: • overfishing and destructive fishing methods due to limited understanding of fish stocks, lack of fish catch quota, and poverty • pollution • habitat loss due to: pollution and conversion of key habitats for agricultural activities, fuel wood/ charcoal production, sea port expansion, salt and shrimp farming, coastal tourism development, human settlements, etc.

[k] Department of Fisheries, 2016.
[l] UNEP. 2009. UNEP/GEF Project: *Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*.

Table 6: Status and Condition of Coastal and Marine Habitats and Biodiversity. (cont.)

Resources	Area	Species Composition	Condition and Pressures
Rare, threatened and endangered species	• Dugong • Irrawaddy dolphin and Spinner dolphin • Indo-Pacific Humpback dolphin (*Sousa chinensis*), • common dolphin (*Delphinus delphis*), • bottlenose dolphin (*Tursiops truncatus*), • spinner dolphin (*Stenella longirostris*) • finless porpoise (Neophocaena phocaenoides). • green turtle • hawksbill turtle		Pressures and threats: • destructive fishing methods • conversion and destruction of habitats • pollution

The following are the underlying causes of the coastal and marine habitat and biodiversity loss:

- Lack of protection for endangered species, and culturally important species
- Few marine protected areas (MPAs) established
- Inadequate management system for MPAs and fish sanctuaries
- Lack of sanitation, wastewater and solid waste management facilities
- Lack of monitoring system to regularly assess the status of habitats, protected areas, and marine water quality
- Limited environmental inputs into the urban, infrastructure and tourism development plans
- Poverty and lack of alternative livelihood.

Ocean Health Index

The overall ocean health index[m] (OHI) score of Cambodia is 64, compared to the overall global OHI score of 70. The OHI score for Cambodia ranks it at #140 among 221 EEZs. This indicates that more needs to be done to protect the seas, waters and coasts of Cambodia, and ensure the ecosystems services and delivery of future benefits from the oceans.

Ocean Governance: Gearing Up for the Challenges

Major National Laws, Policies and Institutional Arrangements. Many regulations, strategies and projects have been developed and implemented to protect the marine and coastal environment, support sustainable development in the coastal area, and enhance people's income and livelihood. Major royal decrees, laws, sub-decrees and other regulatory frameworks have been issued, such as Land Law, Royal Decree on the Creation and Designation of Protected Areas, Sub-decree on

[m] The Ocean Health Index (OHI) establishes reference points for achieving widely accepted socio-ecological goals and scores for 220 countries and territories, Antarctica and 15 High Seas regions. Evaluated globally and by country, these goals represent the wide range of benefits that a healthy ocean can provide. Each country's overall score is the average of its respective goal scores. A goal is given a score of 100 if its maximum sustainable benefits are gained in ways that do not compromise the ocean's ability to deliver those benefits in the future. Lower scores indicate that more benefits could be gained or that current methods are harming the delivery of future benefits.

Environmental Impact Assessment, Water Pollution Control, Fisheries and Forestry laws, and Law on Land Management Urbanization and Construction, etc. In addition, the government plans to adopt the one-umbrella environmental law – "Environment and Natural Resources Code of Cambodia". This Code will address the mandate of governmental institutions responsible for environmentally-sound management of waste as well as requiring treatment of wastes before releasing into the environment.

Institutional arrangements. Institutions with statutory power in implementing these legal frameworks have been identified. However, they have overlapping mandates and responsibilities in coastal and marine areas, giving rise to the problems of overlapping responsibilities and lack of coordination. Thus, the Royal Government of Cambodia has established the National Committee for Management and Development (NCMD) of Cambodian Coastal Areas (NCMD, 2012), which is directly subordinate to the Royal Government. It is in charge of managing and developing the coastal areas of the Kingdom of Cambodia in a sustainable and responsible manner. The NCMD is chaired by the Ministry of Land Management, Urban Planning and Construction, with the Ministry of Environment and Ministry of Tourism as the vice chairs. Other line ministries and agencies are members of the NCMD.

Integrated coastal management. In order to protect coastal and marine environment for sustainable use and development, and address risks and pressures, Cambodia is implementing the integrated coastal management (ICM) program in all of Cambodia's coastal provinces. Preah Sihanouk Province started to apply ICM with support from PEMSEA in 1999, and since then, has institutionalized ICM as part of its coastal governance structure. Waste management, habitat conservation, coastal use zoning, beach management, sustainable tourism, and sustainable ports are key initiatives in Sihanoukville. In 2016, with support from the GEF/UNDP/PEMSEA SDS-SEA Scaling Up Project, the three other coastal provinces (Kampot, Kep and Koh Koh Kong) initiated the implementation of their ICM programs.

The main principle behind ICM is to try and bring together various interest groups and ensure that they work together to adopt and implement policies and action plans on habitat conservation, pollution reduction, fisheries and alternative livelihood, water use and supply management, and climate resiliency for the sustainable development of coastal and marine areas. ICM aims to effectively address current coastal issues while at the same time take a strategic approach to deal with long-term issues, such as sea-level rise. Climate resilient infrastructure development, reforestation, and mangrove rehabilitation are also being undertaken as part of climate change mitigation and adaptation efforts within the ICM program.

Coastal use plan. To support the ICM concept, and ensure sustainable tourism and infrastructure development, the government issued a circular on the development of Cambodia's coastal area,

including the definition of coastline and delineation of zones (e.g., beach or setback zone, beach corridor or buffer zone, coastal road, public access, open space, development area). Coastal use plans and zoning schemes are also being applied along rivers and streams, and for sustainable island development.

Conclusion and Way Forward

Cambodia understands that the coastal and marine resources provide a substantial portion of the county's population with food, livelihoods, and the means of transportation and international trade. The marine and coastal environment also constitutes key resources that are important to Cambodia's tourism industry. However, there are pressures and threats that need to be addressed to ensure the delivery of these benefits and other ecosystem services. Table 4 shows the status of the ocean economy and ocean health.

To further promote economic growth, Cambodia has been investing in infrastructure development, such as airport, seaports, roads, railways, and industrial facilities in the coastal areas. It is also recognized that there are a number of investment opportunities for blue economy, such as (a) sustainable ecotourism and beach management; (b) green port development; (c) climate resilient infrastructure; (d) sustainable and climate-smart fisheries and aquaculture; and (e) sustainable fish and seafood sourcing and processing, etc.

It is also critical to have investments in the following areas: (a) waste treatment facilities for solid waste, plastic waste, and toxic and hazardous waste, (b) sanitation and wastewater management system, (c) safe drinking water supply, and (d) habitat conservation and marine protected areas. These are essential to: ensure food, water and energy security; improve the quality and condition of the marine waters and ecosystems; and support the continued growth and sustainability of the ocean economy.

Blue economy can help optimize the benefits derived from Cambodia's marine and coastal resources and enhance implementation processes that lead to significant improvement in economic, environmental and ecological health not only of the ocean and marine environment, but most importantly, the well-being of the people. The ocean economy contributes a significant portion of the country's GDP. However, it is essential to conserve coastal and marine resources, and protect freshwater and coastal waters given the challenges from pollution, declining fish stocks, habitat loss, drought, flooding, salt water intrusion, etc. Blue economy allows the transitioning from unsustainable approaches to a more sustainable growth path. There are a number of blue economy initiatives to promote sustainable ocean economy (e.g., sustainable tourism and beach management, sustainable fisheries and aquaculture, green port development, etc.) and ensure protection of ocean health and communities (e.g., investments in wastewater treatment facilities,

solid waste management facilities, habitat restoration and conservation, marine protected area, and climate resiliency). In order to achieve such transformational change, the following are recommended to further boost blue economy in Cambodia:

- Develop a 3-5 year plan and project for blue economy, integrating strategies and activities of relevant ministries.
- Introduce a diverse panel of experts to monitor and evaluate blue economy initiatives.
- Set up an database and statistical system for ocean economy, marine and coastal ecosystems, freshwater and marine water quality, fisheries, and environmental accounts as well as on-going initiatives, investments, plans and projects to monitor trends, changes, and progress in achieving the SDS-SEA, SDGs, and other international commitments, and assess the gaps, benefits, outcomes and impacts.
- Put in place wastewater and stormwater management systems to mitigate water pollution, and monitor the water quality of rivers, groundwater, and coastal and offshore waters .
- Implement an integrated waste management (IWM) system to address solid waste, plastic waste and marine debris.
- Engage local communities as partners and co-managers in ocean health conservation initiatives, and identify potential livelihood opportunities.
- Promote initiatives on ecotourism, waste management, habitat and biodiversity protection, community livelihood programs, and related infrastructure development to support sustainable coastal and marine tourism since the tourism industry has become an emerging source of national income.
- Adopt measures and strategies on climate change mitigation and adaptation, including initiatives on water resource management, habitat restoration, waste management, and infrastructure for climate resiliency, considering the vulnerability assessment results, and water, food and energy security needs.
- Strengthen knowledge and capacity development of institutions at the national and local levels and provide incentives to enable innovative blue economy initiatives.
- Explore and establish government, business, and community partnerships, and other collaborative arrangements to support blue economy initiatives.

Table 7: Cambodia's State of Oceans and Coasts.

Indicator	Status / Trend
State of ocean economy	
Ocean economy	↑
Fisheries and aquaculture	↑
Tourism	↑
Ports and shipping	↑
Offshore oil and gas	N/A
Employment in ocean economy	↑
State of ocean health	
Fish stocks	N/A
Catch per unit effort	↑
Mangroves (area)	↑
Coral reefs (area)	N/A
Seagrass beds (area)	N/A
Tidal swamps, mudflats	N/A
Beach (area)	--
Prevention of extinction of known threatened species	N/A
Marine water quality (DO, N, P, TSS, etc.)	N/A
Marine protected areas (% of territorial waters)	↑
Pressures and threats	
Population growth in the coastal areas	↑
IUU fishing	N/A
Coastal erosion and sedimentation	--
Wastewater (untreated) discharge	↑
Solid waste generation	↑
Plastic waste generation and marine debris	↑
Oil spills	N/A
Greenhouse gas emissions	N/A
Response	
Policies on coastal and marine management	↑
Coastal area with integrated coastal management	↑ (100%)
Population with access to sanitation and wastewater management systems	↑
Population covered by solid waste management services	↑
Tourist establishments with habitat, solid waste and wastewater management	↑
Ports with environmental management systems	--
Mainstreaming of valuation of ecosystem services; natural capital accounting	N/A

Notes: N/A - No Data ↑ - Increase ↓ - Decrease -- - remain the same data

1 Introduction

1.1 Background

The ministers of the East Asian Seas (EAS) Region adopted the Da Nang Compact during the EAS Congress held in Da Nang, Viet Nam in November 2015. One of its targets is the development of a Regional State of Oceans and Coasts (SOC) report. Cambodia prepared this National SOC report as its contribution to the regional report. The theme of the first national State of Oceans and Coasts (NSOC) report is blue economy. The definition of blue economy is given in the **Changwon Declaration 2012**,[1] which was adopted by the ministers of the East Asian Seas (EAS) Region as a way to respond to the challenges of the changing environment and climate as well as fostering economic development through activities that harness the natural capital of the oceans but at the same time reduce negative impacts on ocean health and communities. The Blue Economy entails the sustainable use of ocean resources for economic growth, improved livelihoods and jobs, while preserving the health of marine and coastal ecosystems (World Bank 2017). This is also in line with the Agenda 2030 and the Sustainable Development Goals (SDGs), especially SDG 14 – Life Below Water.

1.2 Objectives

The SOC report aims to:

- support the Information Management System for the Coastal Zone and compile data and information collected from different concerned agencies to serve as baseline information for the assessment of coastal and marine areas of Cambodia;
- contribute to the blue economy assessment and monitoring of the implementation of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA), SDGs, other international agreements, and related national laws and policies;
- aid policy-making, planning and management of the coastal and marine areas of the country, including the natural resources, environment, economic activities and investments, and foster inter-agency collaboration; and
- monitor the Vulnerability Assessment and Adaptation Programme for Blue Economy Development in Cambodia's marine and coastal areas.

[1] *"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).

1.3 Rationale

One of the most important but little noticed change over the past decades is how our perspective on the world's oceans has changed. Oceans were first considered vast and limitless. Following centuries of exploration, oceans became areas for nuclear testing, dumping of wastes, and exploitation for food, minerals, oil and gas, and other resources. Given the current challenges, studies on the state of the marine environment have become more significant. There is now increasing recognition that oceans are finite, with fragile ecosystems and biodiversity under pressure from human activities, and climate and environmental changes. Yet, the benefits derived from the oceans have not been fully quantified as well as the environmental and societal impacts and costs of over-exploitation, pollution, and years of neglect. It has therefore become critical to understand that each of our uses of oceans involves real or potential tradeoffs with other uses. This means we need a much better and more detailed understanding of the economic values of oceans and coastal and marine resources, and the state of ocean health underpinning the sustainable development of oceans and coasts.

Within this context, the term "blue economy" has entered into the vocabulary of economic development in all parts of the world. But the meaning of "blue economy" is still evolving, with some emphasizing the possibilities of new ocean-based industries, such as renewable energy or bio-pharmaceuticals, and others emphasizing the need to transform the traditional ocean economy and the emerging ocean industries into a more sustainable and inclusive blue economy, conserving the oceanic natural capital and providing opportunities across the society. All of these changes are taking place in a changing climate that is altering the physical properties of oceans that may dramatically shift the foundations of ocean and coastal economies. Though changes such as sea-level rise and ocean acidification are becoming known, uncertainty remains about the extent and timing with which these ocean changes will affect resources and coastal areas.

The blue economy, as discussed during the East Asian Seas (EAS) Congress 2012, refers to a sustainable ocean-based economic model; one that employs environmentally-sound and innovative infrastructure, technologies, and practices, including institutional and financing arrangements, for meeting the goals of: (a) sustainable and inclusive development; (b) protecting our coasts and oceans, and reducing environmental risks and ecological scarcities; (c) addressing water, energy, and food security; (d) protecting the health, livelihoods, and welfare of the people in the coastal zone; and (e) fostering ecosystem-based climate change mitigation and adaptation measures.

1.4 Framework and Scope

The development of the NSOC Report entailed the use of the drivers-pressures-state-impacts-response (DPSIR) framework for the analysis and focus on the blue economy theme (Figure 4). It also involved review of literature, existing studies and reports, and consultations with key government agencies and other stakeholders. The scope of the report is at national level, but includes inputs at the local level on good practices and governance, etc.

The SOC report provides the description of the status and assessment of the following:

- **Socioeconomic conditions:** population, economy, social features
- **Ocean economy:** gross value added of the ocean economy and contribution to national economy; valuation of ecosystem services; key ocean economic activities (contribution to income and employment, pressures and issues, response in terms of policies and best practices)
- **Developments in blue economy:** innovative and sustainable ocean economic activities; emerging industries; opportunities for investments and partnerships for blue economy development.
- **State of ocean health underpinning the blue economy:** natural conditions (oceanography and physical features of the seas and coasts); ecosystems and biodiversity; pressures and impacts (risks and threats from human activities, natural hazards, and climate change, impacts on the environment and communities).
- **Governance structure supporting blue economy development:**
  - *Institutional arrangements:*
    - Description of key policies, laws, and international agreements adopted that would address the pressures and threats to ocean health and ocean economy, and support blue economy development.
    - Supporting mechanisms (capacity development; research and development; financing, stakeholder participation; partnerships, etc.) for the implementation of these policies, laws, and international agreements.
  - *Sustainable development strategy and actions:* ocean and coastal management, fisheries management, ecosystem and biodiversity conservation, marine protected areas, pollution reduction, natural hazard management and climate change response to achieve the SDG 14 targets, SDS-SEA targets, other international commitments, and national targets to ensure ocean health and sustainable blue economy.
  - *Driving forces for blue economy*
- **Conclusion and recommendations**

1.5 Caveats

The NSOC Report is limited by the availability of data. It is essential to have regular monitoring and assessment of habitats (area, condition, species composition, and species distribution), fish stocks, marine water quality, and land- and sea-use changes to evaluate the state of ocean health, pressures, and impacts. Disaggregated data of the national income, macroeconomic, and sectoral accounts are needed for the ocean economy accounts. Only three sectors – fisheries, ports and shipping, and coastal and marine tourism – were included in the ocean economy. Studies are also needed on the valuation of coastal and marine ecosystem services, and environmental damage in Cambodia.

PART 1

THE SEAS AND PEOPLE OF CAMBODIA

2 The Seas, People and Economy of Cambodia

2.1 Location

Cambodia is a tropical country in Southeast Asia. It is located between latitudes 10 to 15 degrees north and longitudes 102 to 108 degrees east. The country shares a border with Lao PDR on the north, Thailand on the north and west, and Vietnam on the east and south. Cambodia has a total area of 181,035 km^2, with a coastline of about 435km on the Gulf of Thailand (**Figure 2.1**).[2] Cambodia has claimed its Exclusive Economic Zone (EEZ) up to 200 miles from the coastline. Cambodia's coastal zone is located in the southwest part of the country. Cambodia has four coastal provinces, namely, Kampot, Kep, Koh Kong, and Preah Sihanouk.

Figure 2.1: Map of Cambodia.

Source: JICA. 2013. Profile on Environmental and Social Considerations in Cambodia.

[2] MOE, 2013: *The 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report and MOE, National Climate Change Committee, 2013: Cambodia Climate Change Strategic Plan 2014 – 2023*.

2.2 Ecological and Coastal Characteristics

In the coastal zone, there are mangrove forests, numerous bays, and beaches. Cambodia also has more than 64 islands. The biggest one is called Koh Rong. Cambodia's territorial sea and coastline are recognized as rich in biological productivity and supported habitats. These habitats include coral reefs, mangroves, wetland areas, and seagrass beds, adjacent along the coastline. There are about 435 species of fish from 97 families. Globally endangered marine mammals like dugong and marine dolphin (*Delphinus* species) are living in these habitats (Tana, 1994). With this environmental value, Cambodia has established one marine park as well as national parks, wildlife sanctuaries, and multiple-use management areas in the coastal provinces:

- National Park Kep, which is located in the Kep Province, covers an area of 5,000 ha
- National Park Ream, which is located in Sihanoukville, covers an area of 150,000 ha
- National Park Botum Sakor covers an area of 171,250 ha, and is located in the Kampot Province and Sihanoukville.
- Dong Peng is a multiple-use management area located in the Koh Kong Province, and it covers an area of 27,700 ha.
- Peam Krasop wildlife sanctuary covers an area of 23,750 ha and is located in the Koh Kong Province. (Royal decree on creation and designation of this protected area was signed on 1 November 1993.)

The management of these protected areas is under the responsibility of the Department of Nature Conservation and Protection (DNCP).

2.3 Demography

2.3.1 Total population

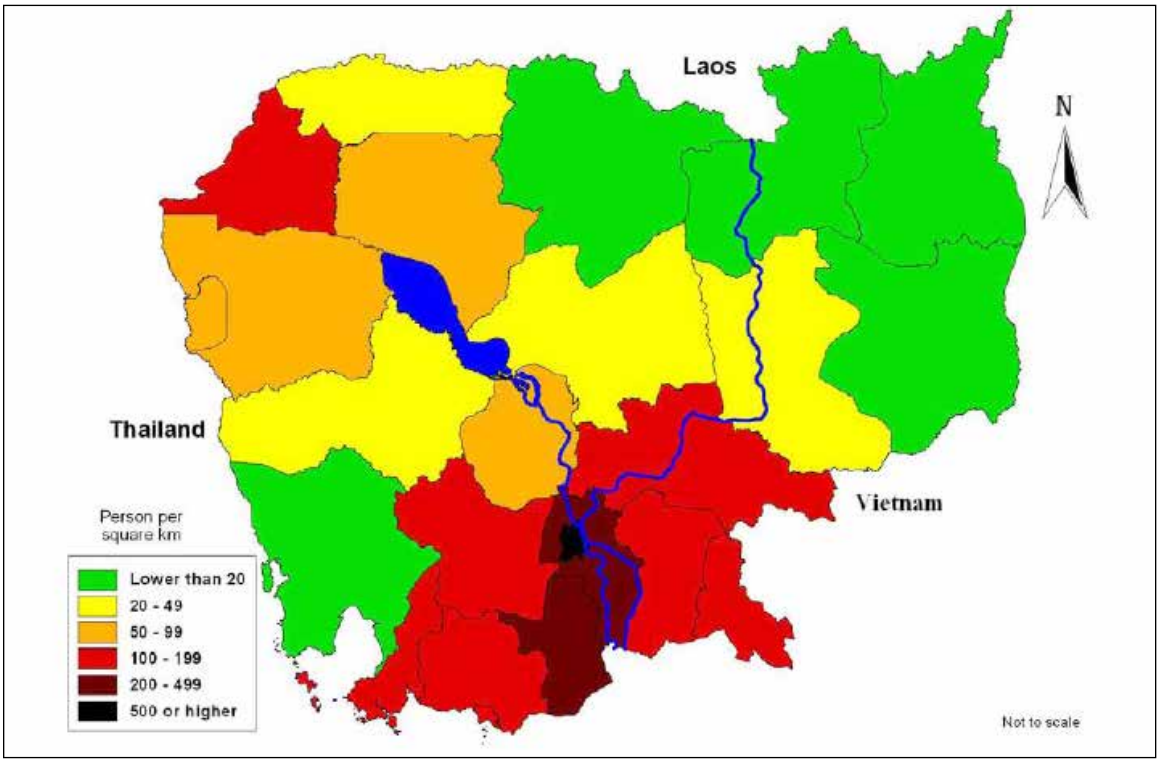
According to the Cambodia Socio-Economic Survey 2015, the total population of Cambodia was 15.2 million people in 2014, and 15.4 million people in 2015. There was an increase of 1.46% (**Table 1.1**). The average annual population growth rate is 1.79% from 1998 to 2014 [Cambodia Socio-Economic Survey (CSES), 2014]. The population density increased from 77 persons per km^2 in 2008 to 85 persons per km^2 in 2015 (**Table 2.1**).

Table 2.1: Population, Population Growth, and Population Density.

	2008	2009	2010	2011	2012	2013	2014	2015
Total Population	**13,868,227**	**14,085,324**	**14,302,779**	**14,521,275**	**14,741,414**	**14,962,591**	**15,184,116**	**15,045,157**
Male	6,745,592	6,859,756	6,973,994	7,088,691	7,204,166	7,320,112	7,436,178	7,551,944
Female	7,122,635	7,225,568	7,328,785	7,432,584	7,537,248	7,642,479	7,747,938	7,853,213
Gender ratio	0.95	0.95	0.95	0.95	0.96	0.96	0.96	0.96
Annual Population Growth (%)		1.57	1.54	1.53	1.52	1.50	1.48	1.46
Population Density	77	78	79	80	81	83	84	85

Source: National Institute of Statistics, Ministry of Planning, 2016.

Figure 2.2: Population Density by Province.



Source: National Institute of Statistics, 2008.

Gender ratio

The gender ratio in a population measures the number of males for every 100 females. The gender ratio for the country is 96 males for every 100 females in 2014 and 2015 (**Table 1.1**).

2.3.2 Coastal population

Based on the 1998 census, it was indicated that the population of the four coastal provinces were about 840,000 people or about 7.38% of Cambodia's population, with a growth rate of 2.8% per annum. Although the population density in the coastal provinces is low in comparison to other parts of the country, the number of people in coastal areas increased by about 25% in the five-year period ending in 1998. Kampot, comprising 4.62% of the total population, has the largest proportion of population followed by Sihanoukville with 1.36%, and Koh Kong and Kep with 1.16% and 0.25% respectively.

In 2008, the four provinces have a population of 960,480 people, which accounted for 7.2% of the total population of the country (**Table 2.2**). Although the total coastal population increased to 1,094,072 in 2015, this is only 7.1% of the country's total population (**Table 2.3**). This is due to the out-migration in Kampot, Kep, and Koh Kong.

Table 2.2: Population of Coastal Provinces, 2008.

Province/ Municipality	Sihanoukville	Kampot	Koh Kong	Kep	Total
Population	221,396	585,850	117,481	35,753	960,480

Source: National Institute of Statistics, 2008.

Table 2.3: Coastal Population, 2009 – 2015.

	2009	2010	2011	2012	2013	2014	2015
Coastal population	1,007,125	1,020,236	1,033,849	1,048,051	1,062,834	1,078,183	1,094,072
Male	495,620	502,865	510,338	518,086	526,102	534,379	542,905
Female	511,505	517,371	523,511	529,965	536,732	543,804	551,167
Annual growth (%)	1.28	1.30	1.33	1.37	1.41	1.44	1.47
Coastal population as percentage of total population (%)	7.2	7.1	7.1	7.1	7.1	7.1	7.1
Population Density	58	59	60	61	62	63	63

Source: National Institute of Statistics, 2016.

A number of studies have shown that most of the residents of Cambodia's four coastal provinces and municipalities are recent migrants to the coastal zone. Statistics from the 2008 national population census indicate that up to 41% of the coastal population had their previous residence outside the district or province of remuneration. Some 3% of the population of Kampot Province moved there from another province or municipality, while 45% of the residents of Koh Kong are from another province. **Table 2.4** shows the place of birth of the people in the coastal provinces.

Table 2.4: Place of Birth of Residents per Coastal Province (%).

Place of Birth	Kampot	Koh Kong	Kep	Sihanoukville
Born in place of Remuneration	84	58	77	55
Born elsewhere in District of Remuneration	6	3	2	3
Born in another District of Province of Remuneration	6	4	1	3
Born in another Province	4	35	20	38
Born in another Asian country	0	1	0	1
Born in another country	0	0	0	0
Total	**100**	**100**	**100**	**100**

Source: National Institute for Statistics Cambodia, 2008.

2.3.3 Urban and rural population

Around 77% of Cambodians still live in rural areas, but urban population is increasing (**Table 2.5**). Many people migrate to urban areas each year for employment. At country level, about 100,000 to 150,000 jobs are created each year, mostly in urban areas. However, the labour force is projected to grow over 3.2% per year. This means that there will be around 228,000 people migrating to seek employment in the urban areas, including coastal municipalities. This reflects a trend of rural-urban migration, with consequences on natural resource use and decline as well as impacts on the livelihoods of the majority of rural households. Mr. Sideth and Mr. Vanntha (1999) pointed out that "many residents of coastal Cambodia are economic migrants and internally displaced people from the inland areas of the country, and therefore do not have traditional ties to the landscape or experience in the management of mangroves."[3] This point is further elucidated in interviews of residents of coastline provinces conducted by the Asian Development Bank (ADB). Most of them moved to their current place of residence for economic or security reasons. Coastal Cambodia, therefore, has a relatively large population whose patterns of resource use might contribute to the economic pressure on coastal ecosystems.

Table 2.5: Urban and Rural Population ('000).

	Census 2008	CSES 2009	CIPS 2013	CSES 2014	CSES 2015
TOTAL	**11,438**	**13,729***	**14,677**	**15,184**	**15,405**
Urban	1,796	2,644	3,146	3,412	3,541
Rural	9,642	11,085	11,530	11,772	11,865
Urban/Rural	**18.6**	**23.9**	**27.3**	**29.0**	**29.8**

* The estimates of totals for 2009 are lower than the totals presented in the CSES 2009 report. A review of the estimation procedure for 2009 revealed that the procedure gave a slight upward bias. The procedure has consequently been adjusted and the 2009 estimates have been updated.

Source: NIS. October 2016. Cambodia Socio-Economic Survey (CSES) 2015.

[3] IUCN Publication. 2011. *Cambodia Coastal Situational Analysis: Building Resilience to Climate Change Impacts, Coastal Southeast Asia No.6.*

2.3.4 Ethnic composition

CSES 2015 showed that the estimated population of Cambodia in 2015 was 15.405 million, composed of 96.1% Khmer, followed by 1.1% Cham, 0.8% Lao, 0.3% Vietnamese, and 1.5% others including Chinese.

Koh Kong with a population density of only 10.5 people per km² is a sparsely populated province. PMMR (2000) indicates that there are about six ethnic groups residing here: Khmer, Chinese, Vietnamese, Thai, Cham, and Lao. There are two different social segments of inhabitants residing in Koh Kong: in-migrants and indigenous or so-called autochthonous people. In-migrants have come to Koh Kong from the central and eastern Cambodian provinces.

The population census of 2008 shows that 35% of the province's population moved to the province during the past decade; while 36.2% of the recently settled indicated the "search of employment" as the reason for migration. This is, amongst others, an indicator for livelihood opportunities, primarily resource based, that the province is offering to in-migrants from other parts of the country. Thus, the majority of the inhabitants of Koh Kong province depend on fishing, farming, and other resource dependent activities, such as charcoal production.

2.3.5 Ethno-linguistic composition and religion

In the survey, all persons in the selected households were asked to state their mother tongue. The information presented in **Table 2.6** shows that Khmer is the predominant mother tongue in the country. Speakers of ethnic minority languages constitute 2.26%. Persons with a foreign language as mother tongue (mainly predominant languages of the neighboring countries) form less than 1%.

The speakers of minority languages, with the exception of Chaams, are mostly concentrated in forest and hill areas. The development of these minority ethnic groups forms an important component of the National Strategic Development Plan of Cambodia.

Table 2.6: Percent Distribution of Population by Mother Tongue and Sex, Cambodia, 2013.

Sex	Population	Mother Tongue							
		Total	Khmer	Vietnamese	Chinese	Lao	Thai	Minority Languages	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Both sexes	**14,676,591**	**100**	**97.05**	**0.42**	**0.05**	**0.17**	**0.01**	**2.26**	**0.05**
Male	7,121,508	100	97.08	0.41	0.05	0.17	0.01	2.21	0.06
Females	7,555,083	100	97.03	0.42	0.05	0.16	0.00	2.30	0.04

Source: National Institute of Statistic, Ministry of Planning. November 2013. Cambodia Inter-Censal Population Survey 2013 (Final Report).

In Cambodia, about 97.9% or 14.4 million people are affiliated with Buddhism (**Table 2.7**). The next largest group is Muslims with 1.1% share. Highland tribal groups and a few minority religious groups account for 0.6%. Christians form only 0.5% of the population. The pattern of distribution of population by religion is more or less the same in 2008 and 2013.

Table 2.7: Percent Distribution of Population by Religion, Residence, Natural Region, and Sex, Cambodia, 2008 and 2013.

Sex/ Residence Natural Regions	Population 2008 (%)				Population 2013 (%)			
	Buddhist	Muslim	Christian	Others	Buddhist	Muslim	Christian	Others
Cambodia	**96.9**	**1.9**	**0.4**	**0.8**	**97.9**	**1. 1**	**0.5**	**0.6**
Male	96.9	1.9	0.4	0.8	97.9	1. 1	0.5	0.6
Female	97.0	1.9	0.4	0.8	97.9	1. 1	0.5	0.6
Urban	**97.4**	**1.6**	**0.8**	**0.2**	**98.0**	**0.8**	**1.1**	**0.6**
Rural	**96.8**	**2.0**	**0.3**	**0.9**	**97.9**	**1.2**	**0.3**	**0.7**
Plains region	97.3	2.3	0.4	0.1	98.6	0.8	0.5	0.0
Tonle Sap region	98.4	1.2	0.3	0.1	98.7	1.0	0.3	0.0
Coastal region	96.3	3.3	0.3	0.0	96.0	3.1	0.8	0.1
Plateau & Mountain region	91.4	1.7	0.6	6.2	93.7	1.1	0.6	4.7

Source: National Institute of Statistic, Ministry of Planning. November 2013. Cambodia Inter-Censal Population Survey 2013 (Final Report).

2.4 Economic Development

2.4.1 Gross domestic product (GDP)

The gross domestic product (GDP) is known as the total output of goods and services for final use produced by an economy, by both residents and non-residents, regardless of the allocation to domestic and foreign claims. It does not include deductions for depreciation of physical capital or depletion and degradation of natural resources.

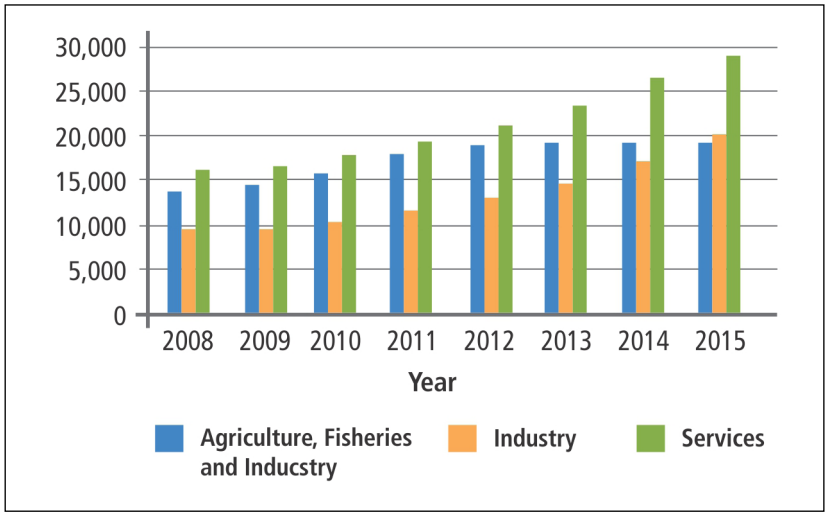
Table 2.8 and **Figure 2.3** show the GDP in riels (KHR) by industry, from 2008 to 2015. The agriculture, fisheries and forestry sectors contributed almost 33% of the GDP in 2008, but decreased to 27% of GDP in 2015. The industry and services sectors contributed 28% and 40%, respectively, to the GDP in 2015.

Table 2.8: GDP and Gross Value Added, by Industry, in billion KHR, 2008-2015 (Current Prices).

Year/VA by industry	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture, Fisheries and Forestry	13,745	14,420	15,938	17,994	18,999	19,376	19,470	19,516
Industry	9,389	9,327	10,289	11,529	13,023	14,760	17,268	20,323
Services	16,301	16,702	18,022	19,528	21,409	23,616	26,775	29,246
GDP	41,968	43,057	47,048	52,069	56,682	61,327	67,437	73,423

Source: National Institute of Statistics, 2016.

Figure 2.3: Gross Value Added, by Industry, in Current Prices (Billion KHR).



Source: National Institute of Statistics, 2016.

Cambodia has an agrarian economy and mainly depends upon productive natural resources for food and income. But the industry sector has rapidly grown and is now contributing almost the same share as the agriculture, fisheries, and forestry sector. As shown in **Tables 2.8** and **2.9**, agriculture was the second largest sector in 2008, but became third in 2016. Unfortunately, the tables do not provide information on the resource-intensive economic activities, such as charcoal production, salt mining, and aquaculture, which lead to the most pressure on coastal ecosystems.

Table 2.9: Gross Value Added (GVA) by Economic Activity (US$, 2010 Constant Prices).

Economic Activity	Year	
	2016	2015
Agriculture, hunting, forestry, fishing (ISIC A-B)	4,231,132,282	4,179,179,725
Industry		
Mining, manufacturing, utilities (ISIC C-E)	3,079,757,797	2,874,624,231
Manufacturing (ISIC D)	2,793,754,641	2,623,240,655
Services		
Construction (ISIC F)	1,737,395,344	1,426,531,968
Wholesale, retail trade, restaurants, and hotels (ISIC G-H)	2,329,940,661	2,215,176,106
Transport, storage, and communication (ISIC I)	1,306,216,226	1,212,278,654
Other activities (ISIC J-P)	2,995,977,406	2,753,241,915
Total Value Added	**15,992,907,716**	**14,943,213,714**

Source: United Nations Statistics Division (data.un.org).

It has been estimated that about 10,000 people are involved in the marine fishery sector (Touch and Todd, 2002), which is comprised of fishing, gathering, processing, and marketing.

The involvement in fisheries remains between 7% and 21% in all provinces. FAO (1999) indicates that the Gulf of Thailand is among the most productive fishing grounds in the world. APIP (2001b) states that Cambodia's coastal area is the most productive in the Gulf. The annual catch has been increasing rapidly since the mid-1990s. This has contributed to a dramatic decline of fish stocks of those fishing grounds. However, the marine component of the fisheries sector in Cambodia is not nearly as important as that of the inland areas. Reasons for this include a consumer preference for inland fish species and the relatively small fish production. Only about one-tenth of all fish production comes from marine areas. The inland fishery yields around 500,000 tonnes of fish annually; while the marine fish catch was estimated to be about 120,000 tonnes in 2016 (FiA, 2016).

The share of fisheries in the GDP or government revenue was 10.8% in 2000. The estimate for 2005 was 9.30%. The specific contribution of marine fisheries to GDP has not yet been assessed accurately. However, some estimates, based on fish catch and market prices, have been made. For example, a proxy value is the average price of US$1 per kg for marine fish (Try et al., 2006). Even with these low returns, the marine capture fishery can be estimated to value US$50.7 million annually. Excluding illegal exports, the capture marine fishery is estimated at US$15 million to US$30 million (Try et al., 2006). This estimate used the average market price of trash fish at US$0.12 per kg. With the estimated annual increase in tourist arrivals of 20% (MoT, 2007 in Puthy, 2007), the demand for fish for food consumption of these tourists increased. This led to an increase in the domestic market price of marine fish in Cambodia. The total revenue of marine capture fisheries in 2006 can be estimated to have a value of around US$63.5 million.

GDP growth

Table 2.10 shows the growth of GDP, in constant prices, from 2008 to 2015. Cambodia is undergoing rapid development, as indicated by the average GDP growth rate of 7.2% from 2011 to 2015. This is fueled by rapid industrialization as shown by the growth rate of the industry sector, in contrast to the decline of the agriculture, fisheries, and forestry sector.

Table 2.10: GDP Growth Rate at Constant Prices (%).

Year/Growth rate at constant prices (%)	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture, Fisheries and Forestry	5.7	5.4	4.0	3.1	4.3	1.6	0.3	0.2
Industry	4.0	-9.5	13.6	14.5	9.3	10.7	10.1	11.7
Services	9.0	2.3	3.3	5.0	8.1	8.7	8.7	7.1
GDP	6.7	0.1	6.0	7.1	7.3	7.4	7.1	7.0

Source: National Institute of Statistics, 2016.

GDP per capita

GDP per capita in 2015 was estimated at US$1,228 from US$1,123 in 2014 (SNA/MEF, 2015).

2.4.2 Household income

The number of households in Cambodia is 3.3 million as estimated in Cambodia Socio-Economic Survey (CSES) of 2015.

Total income of Cambodian households is estimated at 1,619 thousand riels in 2015, which is an increase by 13% over the last year, and it has increased by 82% compared to 2011. **Table 2.11** shows income composition in average value per month.

The source of Cambodian household income from wage and salary showed tendencies to increase, to about 49% of total income in 2015. It has significantly increased by 23% over the last year, from 642 thousand riels in 2014 to 788 thousand riels in 2015. Self-employment income showed tendency to decrease its share to about 45% of the total incomes in 2015.

It is notable that the main source of Cambodian household income in 2015 is wages and salary, while it was self-employment in the previous years. The agriculture income is a common source of income in other rural areas, while the main source of income in Phnom Penh and other urban areas were non-agriculture incomes. Agriculture income in Cambodia as a whole increased by 3% from 2014 to 2015. However, its share of total incomes seems to decrease slightly – about 15% in

2015 and 16% in 2014. Non-agriculture income decreased by 4% from 2014 to 2015. However, it increased by 62% over the last 5 years from 2011.

In Phnom Penh, household wages and salaries increased by 25% in 2015 compared to 2014. In 2015, the main sources of income in Phnom Penh were from wages and salaries. Self-employment income decreased by 21% in 2015, caused by agriculture, non-agriculture, and owner-occupied house income, which also decreased. The property income increased about 5% in 2015 compared to 2014. The household total income in Phnom Penh increased about 3% in 2015 over the last year.

In other urban areas, the household total income increased about 20% in 2015 compared to 2014. The main source of household income is from self-employment, which represented about 54% of the total income. Self-employment income has increased to 1,225 thousand riels in 2015 from 1,024 thousand riels in 2014. The income from wages and salaries represented about 39% of the total income in 2015, and increased about 16% from 2014. Household income from agriculture increased about 20%, while the non-agriculture income increased by 16% over the last year, from 2014 to 2015.

In the rural areas, the household total incomes increased by about 14% in 2015 compared to 2014. The main source of household income in other rural areas is wages and salaries, which represented about 48% of the total income. Income from wages and salaries in other rural areas increased about 22% over the last year. Household income from agriculture increased about 5% in 2015, while non-agriculture decreased by about 3%.

Table 2.11: Income Composition, Average per Month, 2011–2015, in Thousand KHR.

Source of Income	Value in Thousand KHR				
	CSES 2011	CSES 2012	CSES 2013	CSES 2014	CSES 2015
Primary Income	862	984	1183	1371	1523
Wage and Salary	340	403	505	642	788
Self-employment income	520	576	675	722	727
Agriculture	209	229	195	230	238
Non-agriculture	224	249	369	378	362
Owner-occupied house	86	98	111	115	127
Property Income	2	5	3	7	8
Total transfer received	26	35	53	62	96
Total Income	**888**	**1019**	**1236**	**1434**	**1619**

Source: National Institute of Statistics, MoP-2016, CSEC-2015.

2.4.3 Unemployment

Unemployment rate in Cambodia increased to 0.30% in 2017 from 0.20% in 2016. Unemployment rate averaged 0.99% from 1994 until 2017. The highest unemployment rate was 2.50% in 2000, and lowest at 0.10% in 2014 (World Bank 2014).

2.4.4 Poverty incidence

Cambodia has achieved the Millennium Development Goal (MDG) of reducing poverty into half in 2009. In 2014, the poverty rate or the proportion of people who lives below the national poverty line was 13.5% compared to 47.8% in 2007 (The World Bank, 2014).

Among the important factors of income poverty is location. "Poverty is overwhelmingly concentrated in rural areas, and the gap appears to be growing. Whereas 89% of poor households lived in rural areas in 2004, this increased to 91% by 2011. Poor households are larger, with 5.6 members; the national average is 4.5. Consumption is lower in households whose working-age adults have fewer years of education."[4] The majority of Cambodia's poorest and most vulnerable people are therefore rural. Education, health, and other social expenditures could be better targeted towards rural poor households. However, urban poverty may be rising. The urban poverty rate in 2012 was 16.3% in Phnom Penh and 14.5% in other urban areas. Although rural poverty incidence is higher, it fell from 24.6% in 2009 to 20% in 2012.

2.5 Social Development

2.5.1 Human development index (HDI)

The human development index (HDI) is a summary measure for assessing progress in the three basic dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living. A long and healthy life is measured by life expectancy at birth. Knowledge level is measured by mean years of education and access to learning and knowledge. The standard of living is measured by Gross National Income (GNI) per capita expressed in constant 2011 international dollars converted using purchasing power parity (PPP) conversion rates.

Cambodia's HDI value in 2017 is 0.582—which put the country in the medium human development category—positioning it at 146 out of 188 countries and territories. In 2017, life expectancy at birth was 69.3 years; mean years of schooling was 4.8 years; expected years of schooling was 11.7 years; and GNI per capita (2011 PPP $) was US$3,413 (**Table 2.12**).

[4] ADB. *Cambodia: Country Poverty Analysis 2014*.

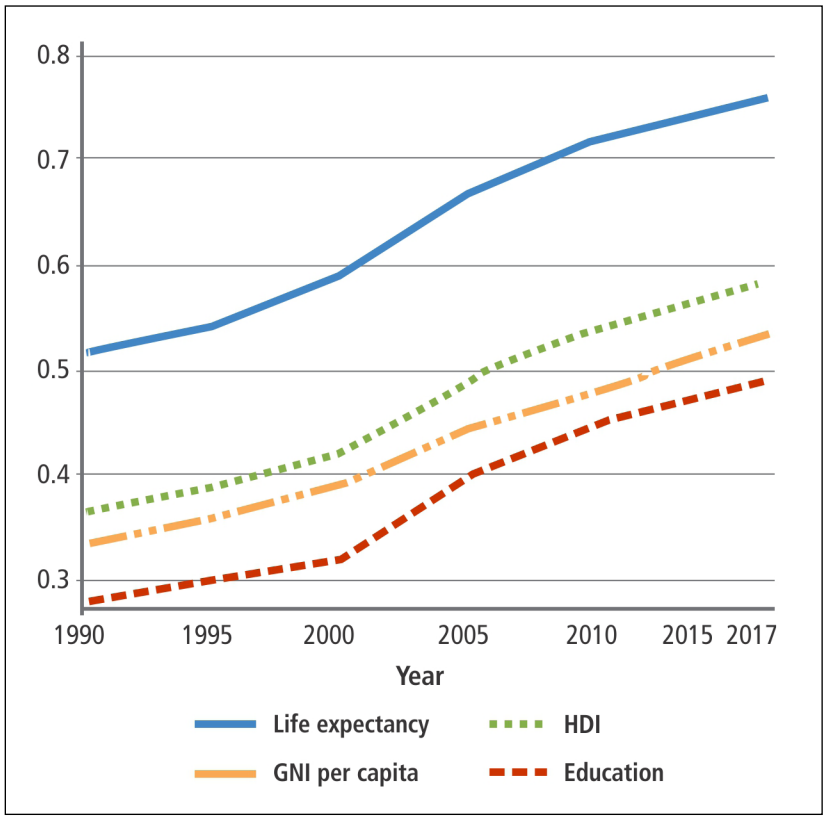
Table 2.12: Cambodia's HDI Trends (based on consistent timeseries data and new goal posts).

	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita capita (2011 PPPS)	HDI value
1990	53.6	6.7	2.7	933	0.364
1995	55.2	7.1	3.0	1,084	0.387
2000	58.4	7.6	3.2	1,347	0.420
2005	63.1	10.2	3.5	1,889	0.490
2010	66.6	11.0	4.4	2,410	0.537
2015	68.6	11.7	4.7	3,086	0.571
2016	69.0	11.7	4.7	3,246	0.576
2017	69.3	11.7	4.8	3,413	0.582

Source: UNDP (2018). Human Development Indices and Indicators: 2018 Statistical Update.

Between 1990 and 2017, Cambodia's HDI value increased from 0.364 to 0.582, an increase of 59.9 percent (**Figure 2.4**). Between 1990 and 2017, Cambodia's life expectancy at birth increased by 15.7 years, mean years of schooling increased by 2.1 years and expected years of schooling increased by 5.0 years. Cambodia's GNI per capita increased by about 265.8 percent between 1990 and 2017. **Table 2.16** reviews Cambodia's progress in each of the HDI indicators.

Figure 2.4: Trends in HDI and HDI Component Indices, 1990–2017.



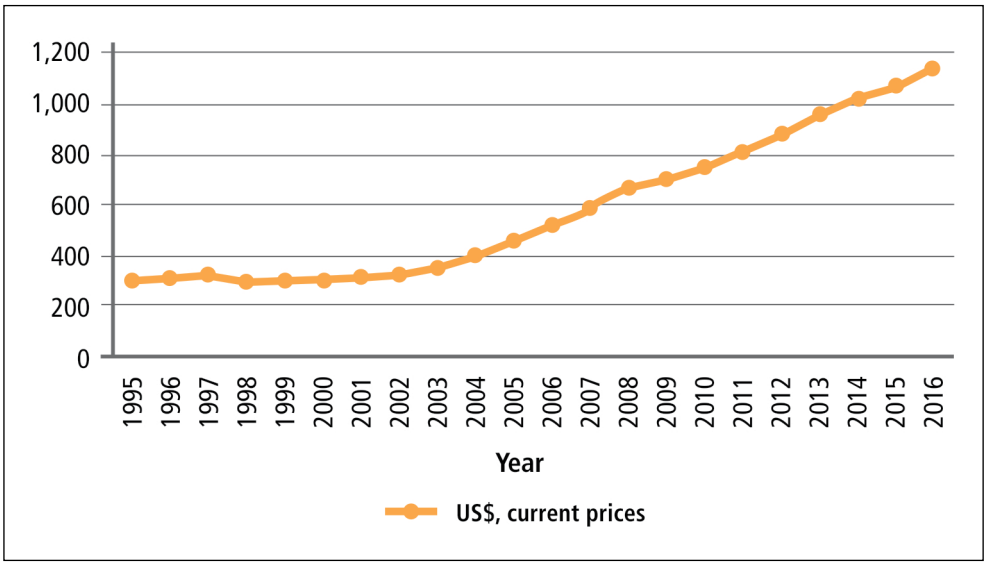
Source: UNDP (2018). Human Development Indices and Indicators: 2018 Statistical Update.

2.5.2 Gross National Income (GNI) per capita (Atlas method)

GNI per capita (formerly GNP per capita) is the gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. GNI, calculated in national currency, is usually converted to US$ at official exchange rates for comparisons across economies. To smoothen fluctuations in prices and exchange rates, a special Atlas method of conversion is used by the World Bank.

The GNI per capita in Cambodia was only US$300 in 1995 and 2000. But it increased to US$460 in 2005. It then doubled after 10 years. The GNI per capita was US$1,070 in 2015, and US$1,140 in 2016 (**Figure 2.5**).

Figure 2.5: Gross National Income Per Capita, Atlas Method (US$, Current Prices).



Source: World Bank 2018.

2.5.3 Literacy and education

Cambodia's literacy challenge lies in reducing disparities in literacy rates among age and gender groups, between urban and rural populations, and among ethnic minorities and those who are the most marginalized. The improvement of literacy rates appears to be slowing, compounded by the fact that a majority of illiterate individuals are members of hard to reach groups, such as ethnic minorities, migrants or people with disabilities (Celebration of the International Literacy Day 2012: Literacy - Catalyst for Development and Peace in Cambodia). In Cambodia, the 2008 National Population Census placed the literacy rate of those aged 15 years or older at 77.6%, while this figure is an improvement from the 1998 census-based measurement of 67.3%.

Promoting literacy as the foundation for lifelong learning will improve Cambodia's human development and thus, has an impact on the socio-economic development of the country. UNESCO in Cambodia, in collaboration with the government, development partners and civil society, is working towards accelerating literacy efforts to achieve our hopes for a peaceful and sustainable development of Cambodia.

From 1979, Cambodia education has started from zero foundation due to the system being destroyed during the Khmer Rouge regime, to gradually being developed until present. According to Education Statistics and Indicators 2011–2012, for the national level,

- total number of schools was 11,046;
- total number of classrooms was 81,601;
- total number of enrolled students was 3,123,082, in which the female students were 48% of the total; and
- total number of teaching staffs was 86,404, in which the female staffs were 45%.

With more children in Cambodia entering the school, the gender gap is quickly closing as more girls make their way to the classroom.

Table 2.13 shows the percentage of persons who are currently attending school by level of education and sex. There was a large difference in the level of education among the persons attending school. A high proportion of the population has attended primary level, followed by upper secondary level, while less than6% has completed the technical/vocational to undergraduate college/graduate levels.The pattern was the same for both women and men, and the gender difference was small over the period 2004–2015. In 2015, 61.7% of women and 59.3% of men have completed or attending primary school. For the pre-primary education level, the share of children attending has increased from about 1% to 3% in the last 10 years for both women and men; while the share of children attending primary education has significantly decreased over this period from about 76% to 62% for women and 73% to 59% for men. For levels higher than the lower secondary education, the share has increased steadily for both women and men.

2.5.4 Health indicators

Life expectancy

Mortality rates for different age groups (infants, children, and adults) and overall mortality indicators (life expectancy at birth or survival to a given age) are important indicators of health status in a country. Incidence and prevalence of diseases and mortality rates are often used to identify vulnerable populations. These are among the indicators most frequently used to compare socioeconomic development across countries. CIPS (2004 and 2013) revealed that Cambodians have stabilized their life expectancy between 1998 and 2013. The life expectancy at birth for men in Cambodia was 54.4 years and 58.3 years for women in 1998. In 2015, life expectancy at birth

has increased to 68.5 years, and to 69.3 years in 2017. However, infant mortality rate is still high. For every 1,000 babies born in Cambodia in 2016, 31 die before their 5th birthday.[5]

Table 2.13: Education Levels, by Gender, 2004, 2009, 2014 and 2015 (%).

Educational levels	Women	Men	Both sexes
CSES 2004			
Pre-primary	1.1	1.1	1.1
Primary	75.7	72.6	74.0
Lower Secondary	15.3	15.8	15.6
Upper secondary - Technical/vocational pre-secondary diploma/certificate	6.0	7.6	6.9
Technical/vocational post-secondary diploma/ certificate - Undergraduate/graduate	1.9	2.8	2.4
Total	**100**	**100**	**100**
CSES 2009			
Pre-primary	2.0	1.8	1.9
Primary	65.1	62.0	63.5
Lower Secondary	18.8	18.9	18.8
Upper secondary -Technical/vocational pre-secondary diploma/certificate	10.2	12.2	11.3
Technical/vocational post-secondary diploma/ certificate - Undergraduate/graduate	3.9	5.1	4.5
Total	**100**	**100**	**100**
CSES 2014			
Pre-primary	3.1	2.7	2.9
Primary	59.6	58.6	59.1
Lower Secondary	20.4	20.5	20.4
Upper secondary - Technical/vocational pre-secondary diploma/certificate	10.4	11.2	10.8
Technical/vocational post-secondary diploma/ certificate - Undergraduate/graduate	6.5	7.1	6.8
Total	**100**	**100**	**100**
CSES 2015			
Pre-primary	3.3	3.8	3.6
Primary	61.7	59.3	60.5
Lower secondary	19.8	20.4	20.1
Upper secondary - Technical/vocational pre-secondary diploma/certificate	9.9	10.6	10.3
Technical/vocational post-secondary diploma/ certificate - Undergraduate/graduate	5.4	5.9	5.6
Total	**100**	**100**	**100**

Source: NIS, Cambodia Socio-Economic Survey 2004, 2009, 2014 and 2015.

[5] http://www.adb.org/countries/cambodia/poverty via @ADB_HQ.

At the provincial level, the total life expectancy at birth for Koh Kong, Sihanoukville, and Kampot Provinces in 1998 was 59.4, 58.5, and 57.7 years, respectively, which is higher than the national number at 56.3 years. Meanwhile, Kep Province's total life expectancy at birth was 54 years, lower than the national figure (**Table 2.14**). However, it is comparable with other provinces. All coastal provinces have life expectancy years that are still lower than Phnom Penh, which has life expectancy of 65.7 years. Remote provinces, such as Mondul Kiri and Ratanak Kiri, have lower life expectancy at 44.6 and 38.5 years, respectively. Improvements toward good health conditions for the coastal population still remains as a key concern and challenge. In 2008, the life expectancy for people living in Kampot and Kep has increased to 60.2 years and 63 years, respectively. However, the life expectancy of people living in Koh Kong and Preah Sihanouk Provinces has declined to 52.1 years and 52.8 years, respectively.

Table 2.14: Provincial Life Expectancy at Birth in 1998 and 2008.

Life expectancy at birth	1998	2008
Kampot	57.7	60.2
Koh Kong	59.4	59.1
Preah Sihanouk	58.5	52.8
Kep	54.0	63.0
Phnom Penh	65.7	68.8

Source: General Population Census of Cambodia, 1998 and 2008.

Disease concerns

According to the report of the Ministry of Health, there are two types of diseases that are a major concern in Cambodia: the communicable diseases and non-communicable diseases. For the communicable diseases, there are five major diseases that produce high mortality rate compared to other diseases: malaria, tuberculosis, human immunodeficiency virus (HIV), dengue, and leprosy. Malaria and dengue are water-related diseases.

Malaria. There were 5,132 in-patient department (IPD) cases of simple malaria, and 2,160 cases of severe malaria recorded in 2012, for a total of 7,292 cases of malaria. There were no deaths recorded caused by simple malaria, while 46 deaths were recorded from severe malaria. These were recorded in the Health Management Information System (HMIS) in 2012, with a case fatality rate of 0.63%. The case fatality rate increased slightly from 2.33% in 2008 to 2.41% in 2009. Since 2009, the case fatality rate has steadily and substantially reduced to 0.63% in 2012. The case fatality rate at 0.63% did not meet the 2015 target of 0.1%. However, it is on track to meet the target if fatality rate continues to fall.

Tuberculosis. HMIS recorded 22,121 IPD cases of tuberculosis (TB) in 2012 as well as 190 deaths due to TB, with a case fatality rate of 0.86%. The TB fatality rate decreased substantially from 2.09% in 2008 to 0.62% in 2011, but increased slightly to 0.86% in 2012.

Human Immunodeficiency Virus (HIV). In 2012, around 422,124 patients were tested for HIV. Of the total, 5,466 cases tested HIV positive, an incidence of 0.38 per 1,000 persons. The majority of cases testing HIV positive were in the age group of 15–49 years, accounting for 82% of all HIV-positive cases. The fatality rate has been steadily decreasing from 8.11% in 2008 to 4.98% in 2012. It has declined each year for the past 5 years – a very strong trend and evidence of the significant gains Cambodia has made towards combating HIV/acquired immunodeficiency syndrome (AIDS).

Dengue. In 2012, there were 23,078 out-patient department (OPD) cases of suspected dengue recorded in HMIS. The OPD cases of suspected dengue recorded in 2012 were evenly spread between males at 49% and females at 51% of all cases. The majority of cases occurred in the age groups of 0 to 4 years and 15 to 49 years. The case fatality rate recorded in HMIS for dengue hemorrhagic fever (DHF) has remained stable at 0% in 2010–2011, and is lower than in the two preceding years (0.09% in 2008 and 0.35% in 2009). The case fatality rate for DHF is currently meeting the 2015 target of 0.3%.

Leprosy. In 2012, 246 new cases of leprosy were recorded in HMIS, an incidence of 1.7 per 100,000 persons. The incidence of leprosy has decreased from 2.4 per 100,000 persons in 2010 to 1.7 per 100,000 persons in 2012. Moreover, in 2012, more cases were recorded among males than females, with 62% of cases occurring in males and 38% of cases in females. The data for leprosy is not broken down in HMIS by all four age groups as it is for other diagnoses. A breakdown of the total cases into age group is only provided for the 15 to 49 years age group. In 2012, 7% of cases occurred in the 15 to 49 years age group. The total number of cases of leprosy for which treatment was completed has also fallen in 2010-2012: 118 patients completed treatment in 2010; 86 patients in 2011; and 78 patients in 2012.

2.5.5 Access to water and sanitation

In 2015, around 75% of the population has access to the least basic drinking water services, but only 24% of the population is using safely managed drinking water services.[6] Around 49% of the population has access to the least basic sanitation services.[7] There are economic costs resulting from inadequate water and sanitation facilities and services.

"Against a backdrop of strong economic growth and increasing household consumption over the past decade, Cambodia has made considerable progress to help people gain access to improved water and sanitation services, most notably in urban areas where around 1/5 of the population lives. However, approximately four million people out of the total population in Cambodia still lack access to safe water, and around two million lack access to improved sanitation. With approximately 80% of Cambodians

[6] Data accessed from https://data.worldbank.org/country/cambodia.
[7] Data accessed from https://data.worldbank.org/country/cambodia.

living in rural areas, poor access to safe water and adequate sanitation disproportionately affects its rural communities. Cambodia loses more than US$450 million annually due to poor sanitation and hygiene, which is equivalent to US$32 per capita or KHR130,000. These are costs to health, water supply, and environment, and losses in fisheries and tourism. The economic losses are equivalent to 7.2% of Cambodia's GDP. Sewage discharged without treatment to water bodies and leaking pit latrines are major sources of water pollution, affecting rivers, lakes and groundwater that serve as the drinking water supply for most Cambodians."[8]

2.5.6 Gender

Gender development index (GDI)

The gender development index (GDI) reflects gender inequalities in achievement in the same three dimensions of the HDI: health (measured by female and male life expectancy at birth), education (measured by female and male expected years of schooling for children, and mean years of schooling for adults aged 25 years and older); and female and male estimated GNI per capita. The female HDI value for Cambodia is 0.529 in contrast with 0.592 for males, resulting in a GDI value of 0.892 (**Table 2.15**).

Table 2.15: HDI and GDI Values by Gender, 2015.

Life expectancy at birth		Expected years of schooling		Mean years of schooling		GNI per capita		HDI values		F-M ratio
Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	GDI value
70.8	66.7	10.1	11.7	3.7	5.5	2,650	3,563	0.529	0.592	0.892

Source: UNDP. 2016. Human Development Report 2016.

Gender inequality index (GII)

The gender inequality index (GII) reflects gender-based inequalities in three dimensions – reproductive health, empowerment, and economic activity. Reproductive health is measured by maternal mortality and adolescent birth rates. Empowerment is measured by the share of parliamentary seats held by women and attainment in secondary and higher education by each gender. Economic activity is measured by the labour market participation rate for women and men. The GII can be interpreted as the loss in human development due to inequality between female and male achievements in the three GII dimensions.

Cambodia has a GII value of 0.479, ranking it 112 out of 159 countries in 2015. For every 100,000 live births, 161 women die from pregnancy related causes; and the adolescent birth rate is 51.6 births per 1,000 women for ages 15–19. In Cambodia, only 19% of parliamentary seats are held by women. Only 13.2% of adult women have reached at least a secondary level of education compared to 26.1% of their male counterparts. Female participation in the labour market is 75.5% compared to 86.7% for men.

[8] World Bank (2008).

PART 2

HARNESSING THE OCEANS

3 Ocean Economy

Oceans provide an extensive range of natural assets and resources – natural capital from which humans derive a wide variety of ecosystem services that make life possible and upon which human activities rely.

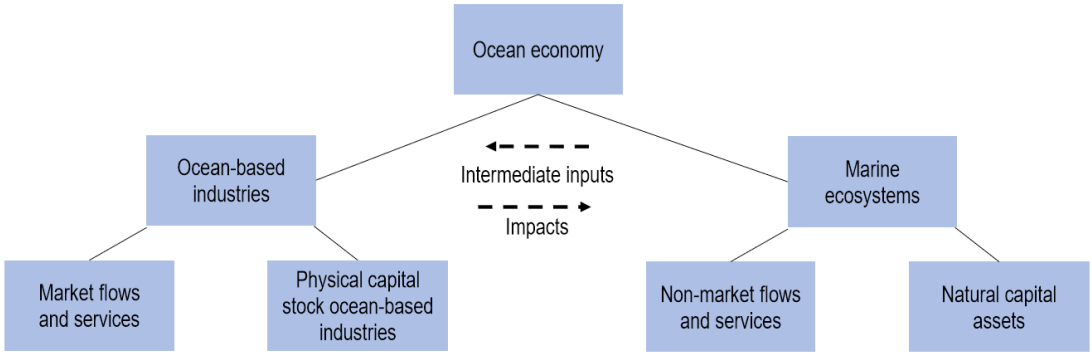
The entire ocean economy is measured as the sum of: (a) the economic activities with dependence on the ocean and coastal and marine resources, and (b) natural assets, goods and services of marine ecosystems upon which these industries depend on, and people rely on for food, income, livelihood, recreation, shoreline protection, etc. (**Figure 3.1**)

The ocean economic activities can be measured using the System of National Accounts (SNA), 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, ship-building, communication, maritime insurance); (c) marine education, and research and development; and (d) government agencies with direct maritime responsibilities (e.g., navy, coast guard, marine environmental protection, 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, nutrient cycling), *supporting services* (e.g., habitat, nursery), and *cultural services*.

Figure 3.1: Ocean Economy.



Source: OECD (2016), The Ocean Economy in 2030, http://dx.doi.org/10.1787/9789264251724-en.

3.1 Ocean Industry: Contribution to Income and Employment

The ocean economy contributes an estimated US$2.4 billion in value added or around 16% of the country's GDP. The estimated gross value added (GVA) of the fisheries, ports and shipping and coastal and marine tourism sectors are shown in **Table 3.1**. There are other ocean economic activities in Cambodia, but it is difficult to get disaggregated GVA data. It is recommended to review the Input-Output (I-O) Tables, International Standard Industrial Classification of All Economic Activities (ISIC) as used in Cambodia, and national income and sector accounts, and assess how the ocean economy accounts can be further developed.

Table 3.1: Ocean Economy.

Economic Activity	Outputs (US$)	Estimated Gross Value Added (GVA) (US$, year 2015)	Employment
Fisheries and aquaculture	US$1 billion per year (in 2013)	1,103,303,447[a]	2.4 million people (primary and secondary sector);
Shipping and ports (Transport, storage and communication)	US$ 70 million (PAS alone)	1,212,278,654[b]	944 people
Coastal and marine tourism and recreation (Sihanoukville)	US$96 million in revenue (3% of total tourism revenues)	70,119,588[c]	782,500 people (direct job national wide)
TOTAL		**2,385,701,690 = 16% of GDP**	

Note: GVA figures for total economy are shown in Table 2.9

[a] Fisheries account for 26.4% of GVA of the agriculture, fisheries, and forestry sector.

[b] See Table 2.9. This includes both marine and inland ports and shipping.

[c] Assuming 3% of tourism GVA. Tourism contributes 15.7% of the country's GDP. The tourism revenues of US$96 million in Sihanoukville account for 3% of total tourism revenues.

3.2 Ocean Economic Activities

3.2.1 Fisheries and Aquaculture

3.2.1.1 Coastal and Marine Fisheries

Fishing is the most important economic use of the coastal zone for local people. Around 26% of all Cambodia's fisheries are marine fisheries. Villagers and government officials claim that fish catch is declining, but it is not clear whether (a) it is merely catch per fishermen that is declining while overall catch remains the same, or (b) whether fish stocks are indeed decreasing. There is extensive use of illegal fishing equipment, such as motorized push nets and dynamite, as well as trawling in waters shallower than 20 m,

which is illegal. This illegal equipment and fishing grounds are causing great damage to seagrass and coastal reef fish habitats. The loss of mangroves in much of the coastal area is also causing a loss of habitat for many fish. Declines in fish stocks and habitats have serious consequences for coastal residents.

3.2.1.2 Coastal aquaculture

To date, popular aquaculture practices in the Cambodian coastal areas vary and include extensive, semi-extensive, and intensive shrimp pond cultures, crab farms, and green mussel cultures.

3.2.2 Offshore Oil and Gas

Offshore oil and gas exploration have been conducted since the 1990s, which may bring hope for Cambodia to secure oil and gas supply. To date, information on the outcome of oil and gas exploration is not accessible.

Beside oil and gas, Cambodia's private companies are urging government to install oil refinery at the coast of Preah Sihanouk province, where oil terminal and port will be developed.
The development of onshore and offshore oil and gas, assuming commercial quantities exist, raises environmental concerns on potential negative effects depending on the scale of operation. The most vulnerable is tourism, which is also the fastest growing sector in the country's economy.

3.2.3 Mining

Besides oil and gas, Cambodia's coastal mining, basically mineral, is considered a limited activity. There were reports of exports of sand and quarts, but unfortunately, records and statistics were unavailable for this NSOC report.

3.2.4 Salt production

Salt production is located in the Kampot province, where saltpans expanded in 1998. Unfortunately, local salt production seems to be uncompetitive. Salt imports and locally produced salt serve domestic use only.

3.2.5 Manufacturing

Cambodia does not have large manufacturing facilities, such as fish and seafood processing, ship-building and repair, marine transport equipment, marine biotechnology, pharmaceuticals, chemicals, and salt, etc. However, there are some small-scale facilities, such as fish and seafood

processing, boat repairing and salt production facilities available for local consumption and use. Those facilities are located in communities along the shoreline of the four provinces. Fish and seafood processing are located in the four coastal provinces, while salt production is mainly located in Kampot and Kep provinces. Boats repairing facilities are located in Preah Sihanouk and Koh Kong Province.

The processing of marine fishery products is undertaken by both small-scale, family-style operations as well as on a much larger commercial level. Small-scale operations primarily comprise the manufacture of pastes like shrimp, and dried products (e.g., dried shrimp, squid, and shark). According to an estimate, about 480 metric tons of these processed marine items worth US$1,131,500 were produced in 2000 (Touch and Todd, 2002). While most of this production is for family use, significant amounts are sold commercially (Navy, 2002). Even though the final product is generally of low value, small-scale operations are able to process large amounts of raw products during peak landing periods.

On a larger commercial scale, fish sauce is an important product of marine fisheries in Cambodia. As the sauce traditionally uses anchovy as a primary ingredient, the catch of this fish has declined in recent years, and so has the production of the sauce. Although there were several marine fish sauce factories in the country a decade ago, presently there are only three: one in Kampot and two in Sihanoukville. Larger-scale processing includes a crab-meat operation in Kep, a fishmeal factory outside Sihanoukville, and a few other facilities in Sihanoukville for freezing and export of shrimp and fish.

For the most part, the production of small-scale processing is for domestic use; marine fish sauce being a good example here. Most other commercial marine fishery products are for export. Even with the recent migration of people to the coastal areas, the population of Cambodia mainly resides inland and traditionally, there is a consumer preference for inland fish species. In addition, the coastline is physically isolated from much of the rest of the country, and years of political instability has resulted in a lack of infrastructure development to allow for fresh marine fish to be distributed throughout the country. (O'Brien, 2003).

3.2.6 Marine and coastal construction

Cambodia joined the club of Most Beautiful Beaches in the World in 2011, which the Cambodian Coastline has made significant advances in its development, especially in the tourism sector. It welcomed 70,000 international visitors and 2.7 million national visitors. Beside the tourism sector, infrastructure development and other economic activities have also become sources of major construction facilities, such as residential areas including condominiums and hotels, seaports and airport construction, roads, industrial zones, oil refineries, etc.

Major marine construction along the coastline include international seaports, oil terminals, local fishing ports, tourism harbors at both on shore and off shore, boat repairing yards, and oil exploration facilities at sea, marine cable, etc.

3.2.7 Shipping and ports

Sihanoukville Autonomous Port (PAS) is the main public deep-sea port of Cambodia. In addition to PAS, there are a number of private sea ports, such as the Port of Sre Ambel, Port of Oknha Mongon the east coast of Kompong Som Bay, and two oil jetties in the north of Sihanoukville Port built by oil companies, which replaced the old oil jetty of PAS. In addition, the Phnom Penh Autonomous Port is the main river port in the country.

Cambodia's ports had earned a total revenue of US$70 million in 2016, while the total tonnage rose every year. The recorded cargo shipments at PAS increased to 399,192 TEU from January to December of 2016, and generated revenues amounting to approximately US$53 million. PAS alone handles more than 60% of Cambodia's cargo traffic, which saw an average annual revenue growth rate of 10% since 2012.

3.2.8 Coastal and marine tourism and recreation

Major tourist destinations in marine and coastal areas are coastal beaches (at terrestrial and islands), National Park Ream, National Park Kep, marine protected area of Koh Ring, and the historical site of Khun Change Khun Peng.

Tourism in Sihanoukville is comprised of 70% domestic tourists, while international tourists approximately account for 30%. In 2016, Preah Sihanouk province alone welcomed nearly 2.4 million tourists and tourism generated US$96 million in revenue due to the significant rise in domestic and international tourist arrivals.

Cambodian tourism sector provided 782,500 jobs directly in 2012, (9.7% of total employment) and grew by 6.1% in 2013. In 2016, this sector provided 988,000 jobs directly or 11.4% of total employment. This figure included the employment by hotels, travel agents, airlines, and other passenger transportation service.

3.2.9 Marine communications

The Malaysia-Cambodia-Thailand (MCT) Submarine Cable System and Landing Station in Cambodia, which will provide a secured internet connection for the Kingdom and related countries, was officially launched on 15th of March, 2017 (**Figure 3.2**). The MCT cable system spans approximately 1,300 km and adopts state-of-the-art 100 Gbps technology. It will support a capacity of at least 30 Tbps. The MCT submarine cable will connect to other submarine cable systems, including Telcotech – the only Cambodian member of the Asia-America Gateway – and the 20,000-kilometer submarine communication cable which links Southeast Asia to the USA.

The system makes use of landing stations, of which Cambodia's landing station, the Mittapheap (Friendship) Landing Station, is located at O' Tres Beach in Sihanoukville, Preah Sihanouk province. The other landing stations are Kuantan in Malaysia, and Rayong for Thailand.

The MCT Submarine Cable System was built by Telcotech, a subsidiary of EZECOM, Malaysia Telekom Malaysia Berhard, and Symphony Communication of Thailand.[9]

Figure 3.2: Malaysia-Cambodia-Thailand Subsea Cable.

Source: Subsea World News website. https://subseaworldnews.com/2016/12/16/malaysia-cambodia-thailand-submarine-cable-laying-work-begins/.

[9] http://www.akp.gov.kh/?p=98309

3.2.10 Defense/Government

Cambodia does not have coast guard units. The navy and marine police play important role for guarding the sea. They also function during search and rescue operations.

3.2.11 Marine education and research

Cambodia does not have marine education and research so far. Nevertheless, the Ministry of Environment is interested in marine research and started cooperation with their counterparts in the People's Republic of China and South Korea to undertake marine research since late 2016. All parties are developing a study area for installing equipment to collect marine data, as there is no scientific information and marine research studies available.

3.3 Coastal and Marine Ecosystem Services

There is no comprehensive study on coastal and marine ecosystem services in Cambodia or economic value related to coastal and marine ecosystem services.

According to UNEP (2007), the estimated annual net economic values of seagrass and mangroves in Cambodia are US$1,186/ha/yr, and US$882.35/ha/year, respectively.

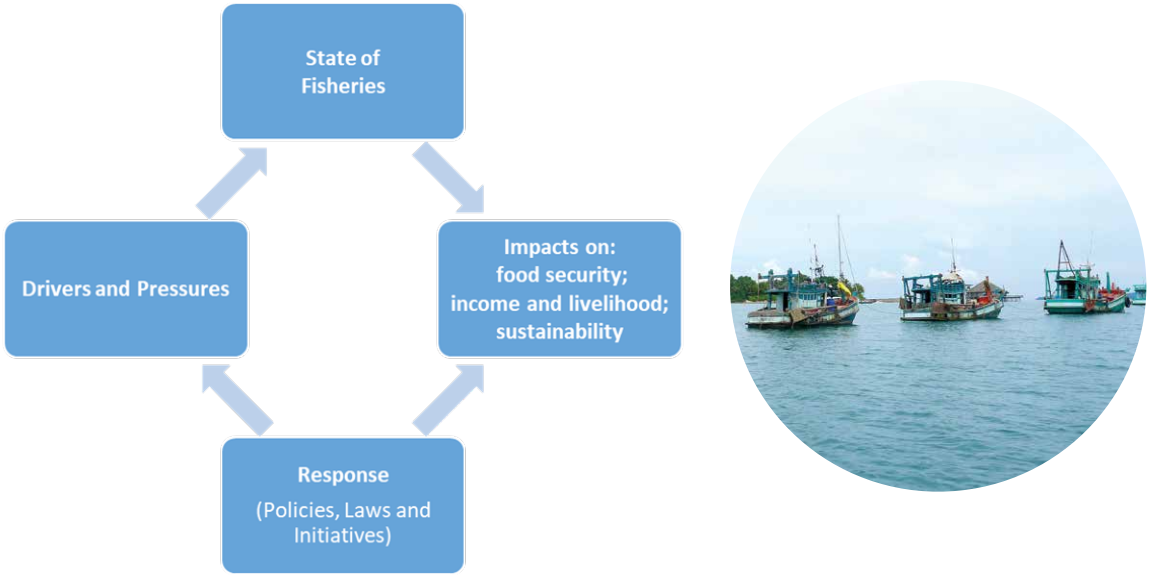
The total potential sustainable annual economic net benefits per km² of healthy coral reef in Southeast Asia is estimated to range from US$23,100 to US$270,000 arising from fisheries, shoreline protection, tourism, recreation, and aesthetic value (Burke, Selig and Spalding, 2002; Conservation International, 2008). The coral reefs in Koh Rong Archipelago, a marine protected area, is valued at US$117 million to US$500 million (Coral Cay Conservation, 2011). Given these assumptions, the total economic value of the coastal and marine ecosystems ranges from US$200.42 million to US$583.42 million per year (**Table 3.2**).

Table 3.2: Economic Values of Significant Coastal Resources in Cambodia.

Types of ecosystems	Estimated annual net economic values (US$/ha/yr)	Estimated existing areas in Cambodia (ha)	Total estimated annual net economic values (US$/yr)
Mangroves	882.35[a]	50,860[c]	44.88 million
Coral reefs	230.1 – 2,700[b]	2,805.5[c]	
Coral reef in Koh Rong Archipelago			117 million –500 million[d]
Seagrass	1,186[a]	32,494[d]	38.54 million
Total			**200.42 million – 583.42 million**

Source: [a] UNEP, 2007; [b] Conservation International 2008; [c] MOE 2013; [d] Coral Cay Conservation 2011.

4 Fisheries and Food Security from Coastal and Marine Resources



4.1 Fishery Resources and Stock Assessment

In line with the observed increase of fishermen in the coastal area, the total catch of marine fish has also increased. Due to lack of technology and financial availability, the total coastal fish stock within Cambodia's sea areas remains controversial since it is impossible to make a proper estimate. An estimate of the fish stock in Cambodia's sea waters was made by Russian scientists in the period 1983 to 1986. However, this estimate cannot be used for current evaluation. A more recent and accurate estimate of fish stock is useful when evaluating the state of the fish resources. The catch of fish included in this estimate is based on the total of all types of fish, including trash fish. The total catch of fish includes the catch by foreign vessels, which have not been calculated recently.

The information on the total annual fish catch and the estimated fish stocks would be useful in analyzing the threats to the coastal resources over time. It also gives a helpful signal to the marine fishery management sector if the catch exceeds a sustainable level for the coastal zone. It is important to maintain the level of the catch below the estimated fish stock; otherwise, the resource could be critically reduced in the future.

4.2 Fisheries

According to MAFF Annual Report for 2016 and 2015, the annual fish catch in the coastal provinces generally increased from 110,000 tonnes in 2013 to 120,600 tonnes in 2016. **Table 4.1** shows the increase of total catch. If it is compared to the estimate of total fish stock of 50,000 tonnes observed by Russian scientists in the period 1983 to 1986, the marine catch is over-exploited from 2003 to present.

Table 4.1: Yearly Coastal and Marine Fishes Catch from 2000 to 2016 (metric tons).

Year	Unit	Marine fish catch	Marine aquaculture	Seaweed
2000	Tons	36,000	20	-
2001	Tons			
2002	Tons	45,850	53	3,650
2003	Tons	54,750	90	7,800
2004	Tons	55,800	75	16,840
2005	Tons	60,000	110	18,000
2006	Tons	60,500	40	8,810
2007	Tons	63,500	70	-
2008	Tons	66,000	75	-
2009	Tons	75,000	80	-
2010	Tons	85,000	65	-
2011	Tons	91,000	92	-
2012	Tons	99,000	145	-
2013	Tons	110,000	131	-
2014	Tons	120,250	103	-
2015	Tons	120,500	442	-
2016	Tons	120,600	986	

Source: Fisheries Administration/MAFF. 2016.

According to the Final Report on Value Chain Assessment of Marine Fisheries Sector and Roadmap for Development (2015), the proportion of marine fisheries catch is dominated mainly by catch (43%), followed by mix fish (16%), squid and octopus (10%), shrimp (9%), and crab (9%). Meanwhile, high value fish accounts only for 4%, and mackerel and anchovy contribute 10%. Table 27 gives a brief picture on how the fish and fishery products are moved into the market particularly for fresh consumption, processing, and exporting to Vietnam and Thailand.

Fishing activities can be classified into coastal and commercial fisheries. The coastal fishery is characterized by family-scale fishing, which extends from the coast to the waters with depth of 20 m. Boats used in this area are either without engines or have engines of less than 50 horsepower

(hp). The commercial fishery is characterized by larger-scale fishing boats, using engines of more than 50 hp, and fishcatch from the 20 m depth line to the limit of the EEZ. Boats fishing in Cambodia's waters can be broadly classified as purse seiners, shrimp trawlers, and gillnetters.

In recent years, marine fishery has seen a significant increase in the number of fishing boats (both national and foreign) resulting in an increase in pressure on coastal resources. Annual catches by licensed Thai vessels in Cambodian waters are thought to range from 26,500 tonnes to 37,500 tonnes per annum. But there is probably also a substantial amount of illegal fishing by non-licensed vessels. The growing fishing effort in coastal areas is placing the natural resources under increasing pressure. There is substantial habitat degradation brought about by destructive fishing practices (dynamiting, cyanide fishing, and illegal trawling in shallow nursery areas), mangrove forest destruction (for firewood and shrimp aquaculture), siltation and pollution from urbanisation and/or industrialisation, and increasing tourism. There are also reports of increasing conflict situations among different categories of fishermen.

4.3 Aquaculture and Mariculture

Presently coastal aquaculture accounts for less than 1% of all fishery production from Cambodia's marine areas and about 2% of aquaculture production.[10] Marine shrimp (tiger prawn) farming became established in the early 1980s in Koh Kong Province and spread rapidly to the municipalities of Sihanoukville and Kampot. However, shrimp production has dropped from over 700 tonnes in 1995 to 200 tonnes in 1998 and has since been affected by disease and pollution, which caused it to drop further and reach a level of less than 100 tonnes. Seabass, grouper, and snapper are grown in cages in Kampot and Koh Kong provinces but have also declined since 1993. The major constraint is the dependence on wild seed supply.
Various types of aquaculture are provided below.

Shrimp farms

According to the final report by the Participatory Management of Mangrove Resources, which undertook research in the Peam Krasaop Wildlife Sanctuary in 1997, there were 23 shrimp farms that covered approximately 800 ha. However, since early 1998, most of these shrimp farms have stopped operations.

Based on past losses, one shrimp farm remained in operation in 1999 with one or two ponds operating with less productivity when compared to operational costs. The productivity of crab farms was also examined. Finally, a conclusion was made that extensive and semi-extensive shrimp culture was not successful in this region. (For further information, please refer to the final report of the Participatory Management of Mangrove Resources entitled Mangroves Meanderings: Learning about Life in Peam Krasaop Wildlife Sanctuary, June 2000.)

[10] FAO Report, 2011.

Green mussel culture

Green mussel is a shrimp food. Green mussels were cultured and developed consistently with shrimp culture. This culture started in 1994 and lasted until 1997. It was, however, postponed for a period of time due to the collapse of local shrimp farms. But the green mussel culture started again in 1998 when the owners of the green mussel farm found a high demand in the Thailand market. Thus far, the development of green mussel culture has accelerated rapidly.

Other cultures

In addition to the cultures mentioned, there are other cultures, which have been introduced in the Peam Krasaop Wildlife Sanctuary. These cultures include grouper and snapper. However, the results were less successful. Hence, the Participatory Management of Mangrove Resources team suggested that perhaps sea bass may be a good start for pilot testing since the species of sea bass can live and grow in fresh, marine and brackish waters. The most important factors to be considered are the market area and price. The market price for sea bass is strong in Thailand and appears to be stable.

4.4 Seaweeds

Seaweed[11] culture was introduced in 2001, and by 2005, the production reached the level of 18,000 tonnes. However, the seaweed production dropped drastically to 8,800 tonnes in 2006 and no production of farmed seaweed has been reported after that.

4.5 Demand for Fish and Seafood

The people of Cambodia have a strong preference for freshwater fish and the domestic demand for fish is expected to increase with population growth. Fish and aquatic species contribute 35% of the diet of Cambodians. Fish consumption on per capita basis[12] is relatively high, at 33.0 kg in 2007 according to FAO estimate. Some studies show consumption figures as high as 60 kg/person/yr plus, with over 5 kg of other aquatic animals/person/yr. The 2008 population of Cambodia was 14.56 million growing at a rate of 1.65% per annum. The growing population will demand more fish and this will lead to pressure on the fisheries resources. With increasing prosperity, consumer preference is shifting from traditional processed products to live and fresh fish. However, many consumers still require preserved fish, particularly fermented fish known locally as 'Prahoc', for daily consumption because of the absence of refrigeration in many rural areas. Domestic demand of marine fisheries products is limited, and most marine fisheries products are exported.

[11] FAO Report, 2011.
[12] FAO Report, 2011.

4.6 Exports of Fish and Seafood

Cambodia's fisheries sector plays a major role in its economy. The data from FAO (2011) indicates the contribution of the fisheries sector to national economy. As per the most recent official data, the country's total annual fish catch from inland and marine fisheries amounts to about 632,839 metric tons (FAO, 2012) making up around 10% of Cambodia's overall GDP.

As per FiA (2010: The Strategic Planning Framework for Fisheries: 2010 – 2019), fisheries production is estimated to be worth around US$200 million–US$300 million per year at the point of landing. The value of fish exports has been estimated to be as high as US$100 million per year. More recently, IFReDI (2013) estimated that at US$1.6/kg, the total economic value of freshwater fish and aquatic products reached US$1 billion per year. The total value of fish production after processing and transportation is unknown, but is thought to range between 8% and 12% of GDP (FiA, 2009).

There are conflicting reports of data on fish catch in the country. FAO (2012) reports a total landing of 566,695 tonnes from capture fisheries (both marine and freshwater) and 74,000 tonnes from aquaculture production. In fact, the actual catch of marine fisheries is assumed to be higher than the official statistics suggest. This is because the catch from subsistence fishing, including family-scale fisheries, are largely unrecorded. Further, catch from illegal fishing activities are not recorded. In addition, there are Thai vessels fishing in Cambodian waters and some of Cambodia's fishing vessels are selling or transferring their catch to Thai vessels at sea or landing directly in Thai ports.

Cambodia's annual marine production is estimated to be approximately 60,000 tonnes and consists of 435 fish species, with mackerel, scad, anchovy, sardine, tuna and pomfret being the most commercially important pelagic fish species and threadfin bream, croaker big-eyes, lizard hair-tail fish, flat fish, snapper, barracuda, grouper, shark and conger eel being the most important demersal fish species. There are seven shrimp species, one squid species, and two cuttlefish species. Marine capture fisheries mainly take place in coastal and inshore sub-sectors. Due to the lack of complete and accurate data collection, information on marine landings is extremely scanty and fragmented (FiA, 2009).

The total fishery export is estimated to be US$45 million in 2012 as per FAO data (**Table 4.2**). In addition to the official exports, a substantial quantity of marine fishery products, mainly high value finfish, shrimp and cephalopods, leaves the border unreported. According to the provincial fisheries office in Sihanoukville, only 20% of the exports of marine fishery products take place officially; the remaining 80% are smuggled via sea to Thailand or Vietnam traders who, in return, supply fuel and ice to Cambodian fishermen. Besides, the inland fisheries products are exported to other Asian markets, namely Singapore, Malaysia, Hong Kong, China, and Taiwan (live fish). Fish sauces are exported to Thailand and Vietnam. It is to be noted here that the European Union (EU) Commission has imposed a ban on export fishery products to the EU markets due to lack of quality control and certification systems.

Table 4.2: Total Value of International Trade – Imports and Exports (US$ '000).

Imports				Exports			
2009	2010	2011	2012	2009	2010	2011	2012
4,583	3,807	4,571	6,605	30,362	40,000 (est.)	60,000 (est.)	45,000(est.)

Source: FAO. 2012. FAO Year Book- Fishery and Aquaculture Statistics.

4.7 Contribution to Food Security

The fisheries sector is vital for Cambodia's food security. On average, fish provides around 66% of daily animal protein and 19% of total protein consumption for Cambodians. It is also a critical source of essential vitamins and micro-nutrients. As per FAO (2012), the per capita consumption of fish is one of the highest in the world – around 40.5 kg/year. Hoewever, there are reports on per capita consumption of fish in the range of 46–62 kg/year.

Fish contributes between 40%–60% of the animal protein intake for rural people. Generally, Cambodian people consume about 30 kg per capita per year, meaning that fish and fishery products are the most important source of animal protein.

4.8 Contribution to Income and Livelihood

The fishery sector provides substantial employment opportunities to the rural population. The sector employs over 2.4 million people (FAO, 2011) either in primary sector or secondary sector, full-time or part-time, which indicates this sector as a major driver of livelihood (**Table 4.3**). FiA (2009) estimated that the fisheries sector provides full-time, part-time and seasonal work to around 2 million out of 14 million people; and that 10.5% of full-time workers and 34% of part-time workers are involved in fishing (FiA, 2009). Fishing engaged 70%–80% of the population in the coastal provinces of Kampot and Kep, and around 52% of total employment in Sihanoukville is in the fisheries sector (MOE and DANIDA, 2002).

Table 4.3: National Fishery Sector Overview.

Estimated Employment (2009):	
(i) Primary sector (including aquaculture)	> 420,000
(ii) Secondary sector	> 2,000,000
Gross value of fisheries output (2007)	**US$ 608.7 million**
Trade (2008)	
(i) Value of fisheries imports	US$ 2.4 million
(ii) Value of fisheries exports	US$ 35.8 million

Source: FAO. 2011.

4.9 Sustainability of Fisheries

4.9.1 Fish stocks

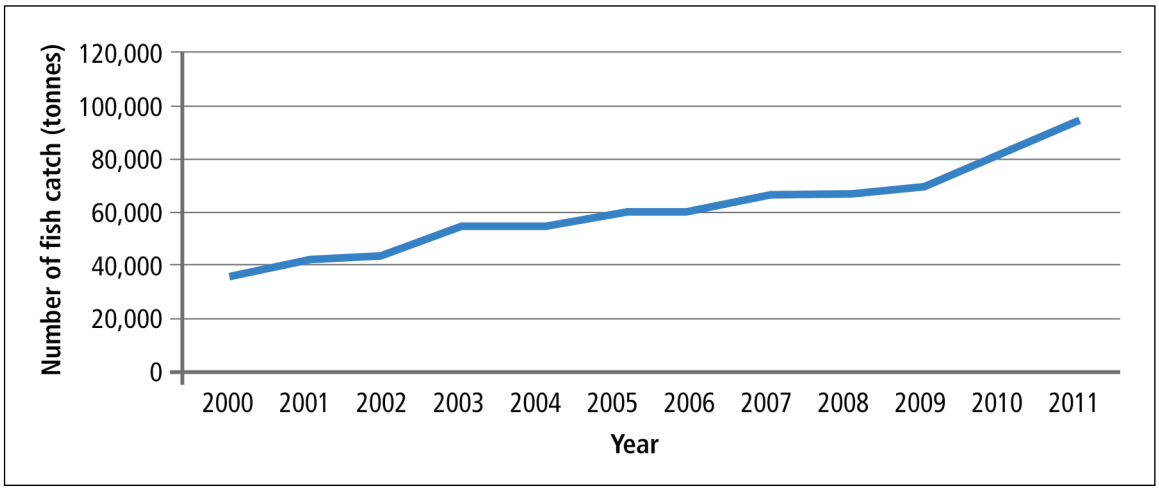
There is very limited information on the status of fish stocks in Cambodia and information required for developing a management program for the fishery. The most extensive research on fish populations was conducted jointly by USSR and Cambodian scientists in four scientific expeditions supported by the Scientific Research Institute for Oceanography and Fisheries of the then USSR from August 1983 to May 1986. This study reported more than 400 fish and crustacean species from 94 families in the EEZ. It also identified mackerel, scad, anchovy, sardine, tuna and pomfret as the most commercially important pelagic fish. Threadfin bream, croaker big-eyes, lizard hairtail fish, flat fish, snapper, barracuda, grouper, shark, and conger eel were identified as the most commercially important demersal fish (Csavas et al., 1994; Tana, 1994).

The USSR/Cambodian study also reported that fishermen could be "allowed to catch 20,000 tonnes of fish per year for sustainable management". This presumably refers to the Maximum Sustainable Yield (MSY). However, an analysis of the trends in total fish catch from 1980 to 1994 and trends in the number of boats does not yield reliable information on whether both inshore and offshore harvests are close to or exceed the estimated MSY. The catch statistics indicate that total annual harvests have grown substantially, from 1,200 tonnes in 1980 to 39,900 tonnes by 1990. However, the catch began to decline after 1990, dropping to 30,000 tonnes by 1994 (Department of Fisheries, 1996). It seems these dramatic changes relate primarily to reported harvests rather than to changes in actual harvests. Also, the data do not include the harvests of foreign vessels, subsistence, and illegal fishers. To date, there is still no study on marine fish stocks and MSY that would show that current practices result in marine fish catch reaching about 20,000 tonnes per year.

4.9.2 Fish catch

Figure 4.1 shows the increase of total catch including foreign catch. If it is compared to the estimate of total fish stock observed by Russian scientists in the period 1983–1986, which accounted catch of about 50,000 tonnes (i.e., exceeding the estimated MSY), the marine catch could be over-exploited from 2003 to the present.

Figure 4.1: Yearly Fish Catch from 2000 to 2011 (Tonnes).



Source: Department of Fisheries (2000-2003) and Provincial office of fisheries (2004-2011).

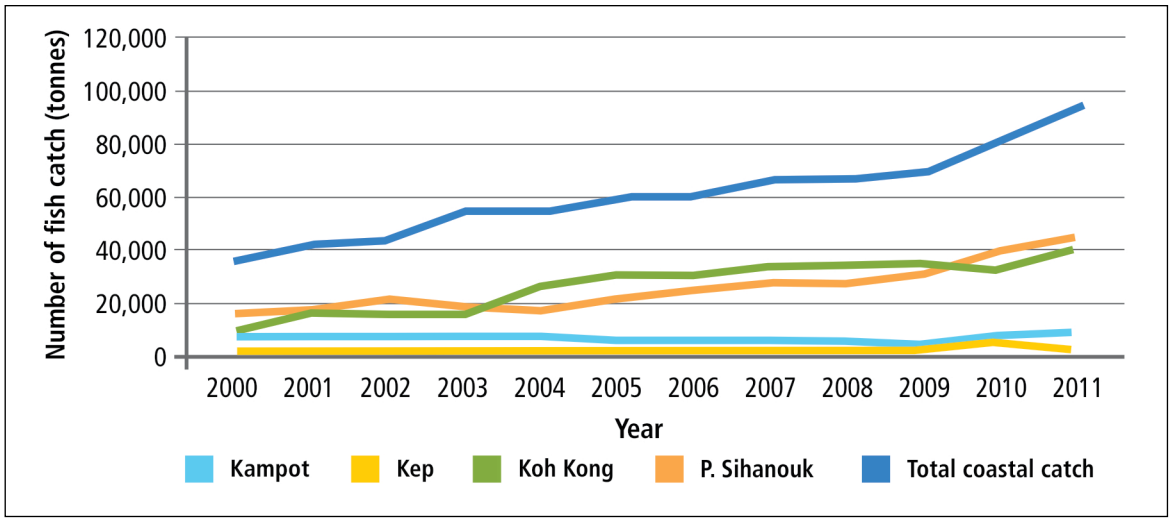
Between 2000 and 2011, the annual fish catch in the coastal provinces generally increased—from 36,000 tonnes in 2000 to 95,252 tonnes in 2011.

When looking at the provincial level, the highest annual fish catch in Preah Sihanouk Province increased from 21,200 tonnes in 2005 to 44,199 tonnes in 2011. For Koh Kong Province, annual fish catch increased from 32,030 tonnes in 2005 to 41,740 tonnes in 2011. The lowest annual fish catch is found in Kep Province. The annual fish catch in Kep increased from 456 tonnes in 2008 to 1,904 tonnes in 2011.

Figure 4.3 shows the catch per province and the total annual catch. It is noteworthy that the total annual fish catch by province may slightly deviate from the given and/or collected data. However, this would not largely affect the total annual fish catch at the coastal level.

Figures 4.2 and **4.3** show that total annual fish catch between 2000 and 2011 increased each year. It seems that the increase may be related to the increase in the amount of fishing boats in both nearshore and offshore areas. A low catch per fisherman could also make fishermen buy bigger and more modern fishing boats with higher capacity to catch fish. This would also result in the increase of total fish catch. The rising figures could be closely related to the fishing families and fishing communities along the coastal line of the Cambodian coastal zone, especially in Preah Sihanouk and Koh Kong. It also clearly reflects that marine fisheries resources are very important for the population living in coastal areas. It also indicates the tendency of increasing pressure on the marine resources every year.

Figure 4.2: Total Annual Catch by Province and Total Coastal Catch (Tonnes).



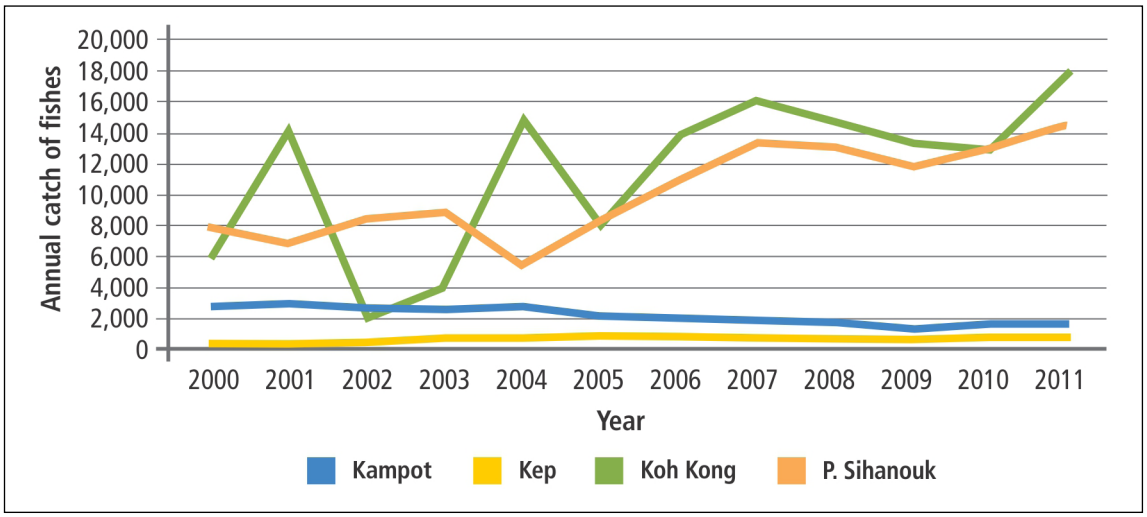
Source: Fish catch, Department of Fisheries (2000-2003) and Provincial office of fisheries (2004-2011).

4.9.3 Annual Catch by Species

The annual fish catch by grade (Grade I-III) fluctuated in Koh Kong Province from 2000 to 2005; however, from 2005 to 2011, the trend shows that the fish catch in Koh Kong Province has increased. For Koh Kong, although, it declined considerably from 14,518 tonnes in 2001 to 2,159 tonnes in 2002, and from 15,032 tonnes in 2004 to 8,512 tonnes in 2005, the annual fish catch by grade (grade I-III) has increased to 18,284 tonnes in 2011, after it declined to 13,194 tonnes in 2010. Kampot Province has generally experienced that the annual fish catch by grade (grade I-III) has constantly decreased from 2000 to 2011. Other coastal provinces, especially, Preah Sihanouk and Koh Kong, saw that the annual fish catch by grade (grade I-III) has notably increased. For Kep Province, annual fish catch by grade (grade I-III) from 2000 to 2011 has continuously increased although the total amount is moderately small (i.e., from 56 tonnes to 300 tonnes).

Figures 4.3, 4.4, 4.5, and **4.6** show the annual catch of fish (Grade I-III), squids, shrimps, and molluscs in the coastal areas.

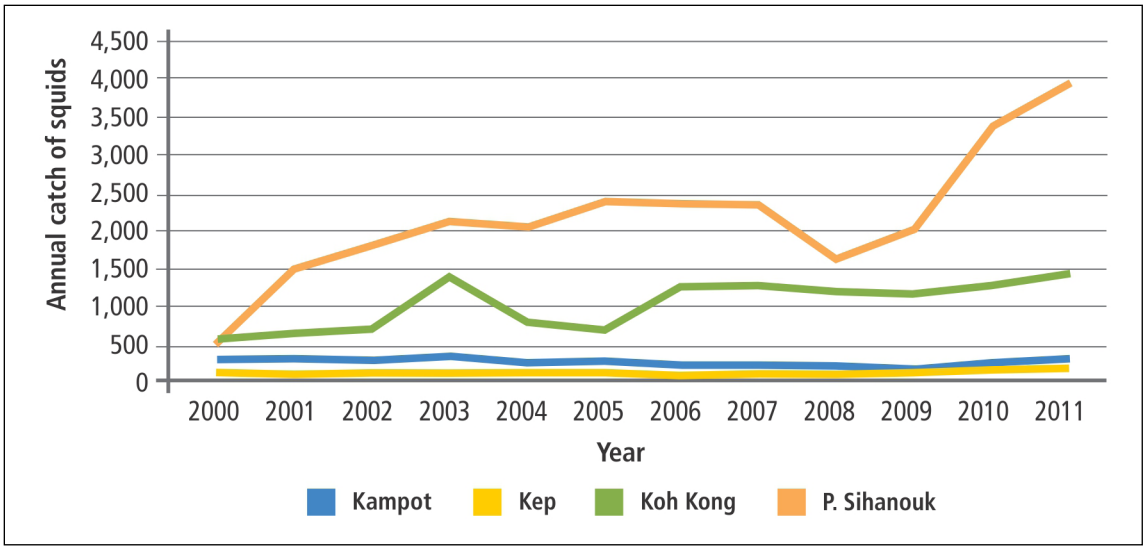
Figure 4.3: Annual Catch of Fish (Grade I - III) in the Coastal Provinces (Tonnes).



Source: Department of Fisheries (2000-2003) and Provincial office of fisheries (2004-2011).

Figure 4.4 shows that between 2000 and 2011, the squid catch generally increased throughout the period. Preah Sihanouk Province, in particular, experienced an increase of squid catch during this period, i.e., it grew from 580 tonnes in 2000 to 3,897 tonnes in 2011 even though it slightly dropped to 1,621 tonnes in 2008.

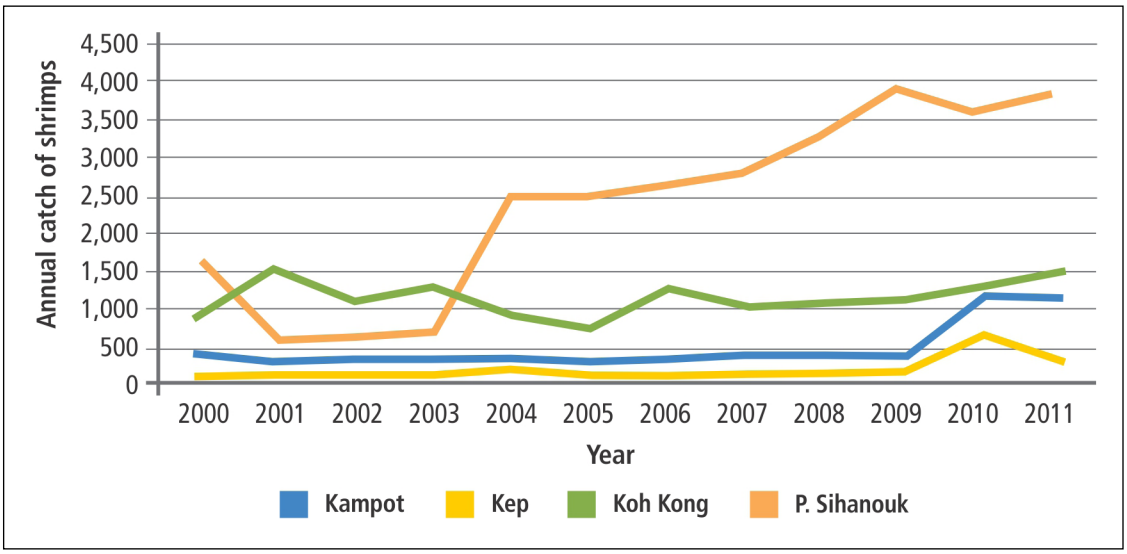
Figure 4.4: Annual Catch of Squids in the Coastal Provinces (Tonnes).



Source: Department of Fisheries (2000-2003) and Provincial office of fisheries (2004-2011).

Figure 4.5 shows that the annual catch of shrimps in Kampot and Kep Provinces have been relatively stable from 2000 to 2009. For Preah Sihanouk the annual catch of shrimps increased from 1,640 tonnes in 2000 up to 3,994 tonnes in 2011, although it decreased to 703 tonnes in 2003. In Koh Kong, the annual catch of shrimps varied between 500 tonnes to 1,500 tonnes throughout the period of 2000 to 2011.

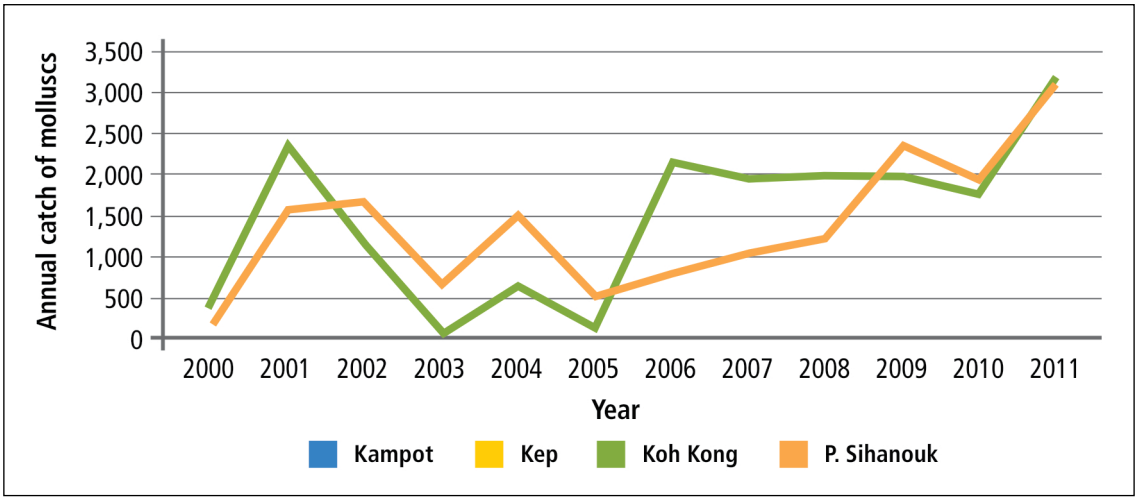
Figure 4.5: Annual Catch of Shrimps in the Coastal Provinces (Tonnes).



Source: Department of Fisheries (2000-2003) and Provincial office of fisheries (2004-2011).

The catch of molluscs throughout the period indicates a general increase in the coastal provinces even though the amount of catch shows some variability (**Figure 4.6**). The provinces of Preah Sihanouk and Koh Kong have experienced an increasing annual catch of molluscs with a peak of about 3,000 tonnes in 2011; while the lowest annual molluscs catch is observed in Kep Province. After the failure of shrimp farming in the late 1990s, these figures would reflect the trend of an increasing molluscs catch between 2000 and 2011 due to better conditions of coastal seawater quality as a result of the management of solid waste, number of households with access to garbage collection service, development of dumping areas, and the installation of wastewater treatment plant (see also waste management activities and measures in next sections).

Figure 4.6: Annual Catch of Molluscs in the Coastal Provinces (Tonnes).



Source: Department of Fisheries (2000-2003) and Provincial office of fisheries (2004-2011).

4.9.4 Fishing Boats

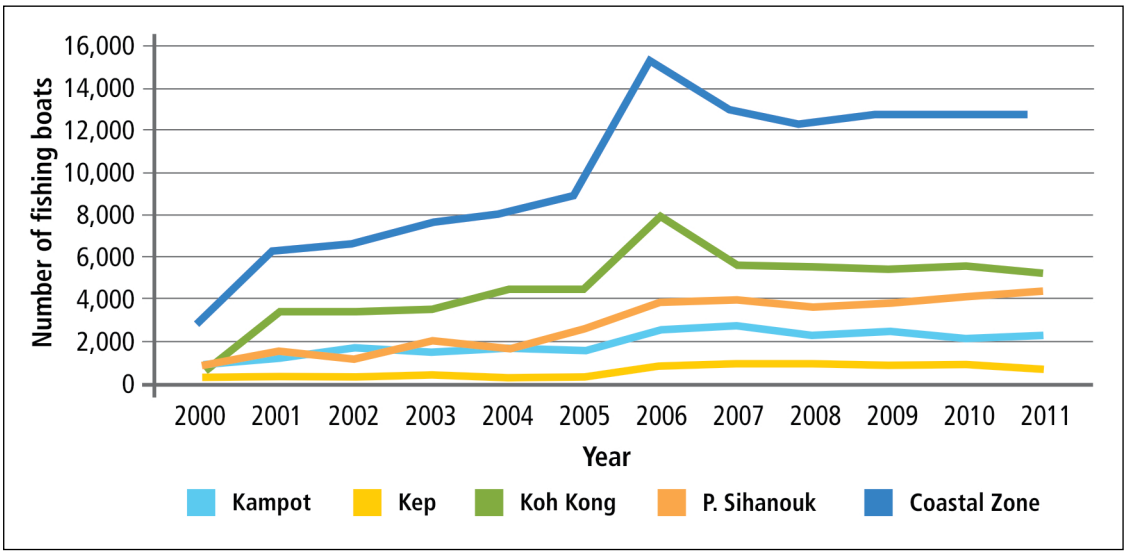
There are numerous fishing vessels targeting specific species. Two types of fishing boats are commonly found in the coastal area - fishing boats with and without engine. These have shown significant variation through the years.

Small family-scale fishing operations near the shore extends from the coast to a depth of 20 m where fishing boats without engines or with less than 50 hp engines. Commercial fishery is characterised by larger-scale fishing from 20 m depth to the limit of the Exclusive Economic Zone (EEZ), where fishing boats, in general, use engines of more than 50 hp. Prohibited fishing gear and methods include pair trawling, light fishing, and other illegal fishing gear (FAO, 2005).

At the coastal level, the number of fishing boats has constantly increased (**Figure 4.7**). The highest number of fishing boats in the coastal provinces in 2018 is reported in Preah Sihanouk Province. (about 3,265 fishing boats in all types), followed by Koh Kong, Kampot, and Kep provinces with

2,815 boats, 663, boats and 636 boats, respectively (**Table 4.4**). The highest number of fishing boats with power less than 10 hp is reported in Koh Kong Province, while in Kep and Kampot, the number remains low.

Figure 4.7: Total Number of Fishing Boats Used in the Coastal Areas.



Source: Department of Fisheries (2000-2003), Provincial fisheries (2004-2005), Commune Profiles (2006-2011).

The fishing boats with engines less than 10 hp is the most common type of boat used in the coastal provinces, followed by the engine power between 10 hp to 33 hp (**Table 4.4**). Preah Sihanouk Province has the highest number of powered fishing boats; whereas, Kep has the lowest number. Preah Sihanouk and Koh Kong are also reported to have fishing boats with engines more than 33 hp compared to Kep and Kampot provinces, which have none of such fishing boats.

Table 4.4: Total Number of Fishing Boats Used in the Coastal Area, 2018.

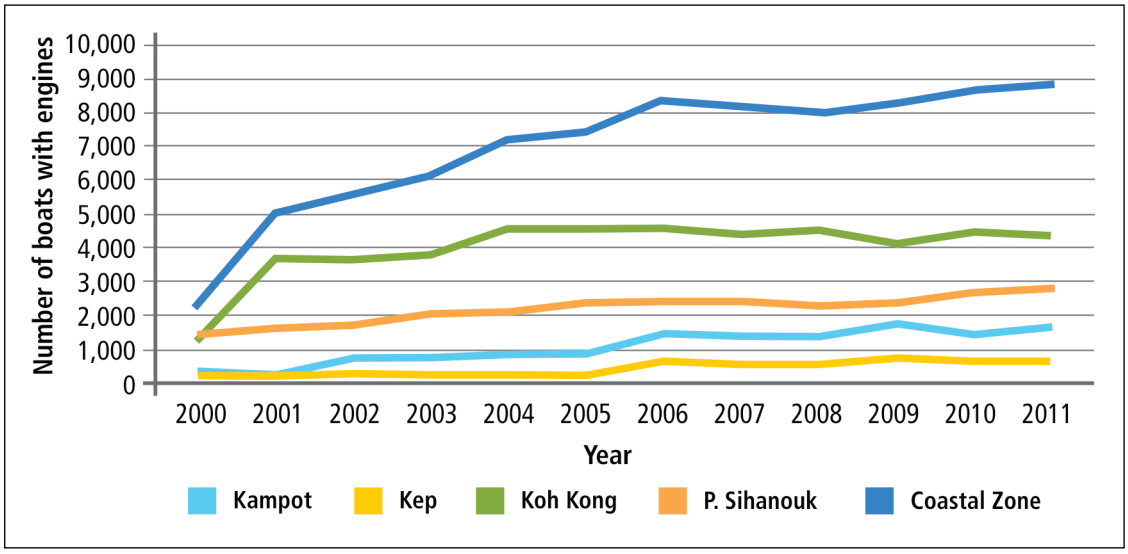
No.	Power (hp)	Province				Total
		Kep	Kampot	Preah Sihanouk	Koh Kong	
1.	Rowing boats	134	242	520	1	**897**
2.	<10 hp	460	263	1,095	2,099	**3,917**
3.	10hp-33 hp	42	158	1,360	473	**2,033**
4.	33hp-50 hp	0	0	5	87	**92**
5.	>50 hp	0	0	285	155	**440**
	Total	**636**	**663**	**3,265**	**2,815**	**7,379**

Source: Department of Fisheries. Report January 2018; Fisheries Administration. 2018.

The fishing boats without engines are available in most of the coastal provinces, except Koh Kong, which has only one fishing boat without an engine. These figures show a close linkage with the number of families involved in fishing as mentioned above. It also seems to reflect that fishing families use more fishing boats with engines than without engines to catch more fish either near and/or offshore.

The number of fishing boats with engines has increased in most coastal provinces from 2000 to 2011 (**Figure 4.8**). From 2001 to 2011, Koh Kong Province has the highest number of fishing boats; whereas, Kep has the lowest number. Preah Sihanouk is reported to have more fishing boats with engines than Kampot Province since 2000 to 2011, which is also reflected by the much higher catch in Preah Sihanouk compared with Kampot Province.

Figure 4.8: Number of Boats with Engines Used in the Coastal Areas.

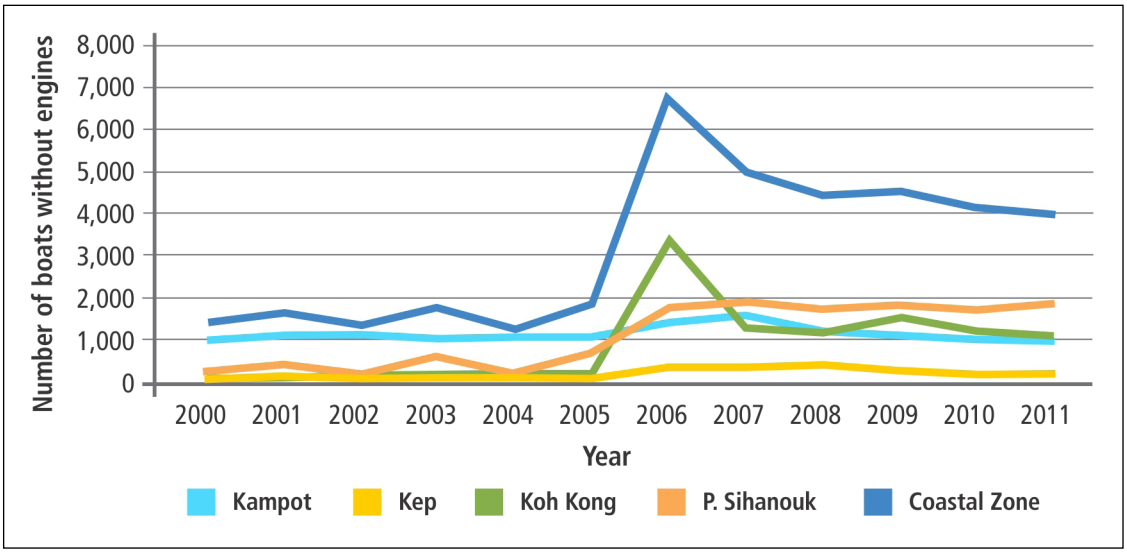


Source: Department of Fisheries (2000-2003), Provincial fisheries (2004-2005), Commune Profiles (2006-2011).

The fishing boats without engines have also increased in all provinces from 2000 to 2011 (**Figure 4.8**). This increasing trend shows a close linkage with the number of families involved in fishing. However, as shown in **Table 4.4**, fishing families use more fishing boats with engines than without engines.

Between 2000 and 2011, the number of fishing boats – with and without engines – at coastal and provincial levels, showed an increasing trend each year (**Figures 4.8** and **4.9**), with corresponding increasing trend in offshore catch. These figures also express the increasing pressure on marine resources that would in turn impact on the livelihoods of coastal communities if those marine resources were not harvested in sustainable ways.

Figure 4.9: Number of Boats without Engines Used in the Coastal Areas.



Source: Department of Fisheries (2000-2003), Provincial fisheries (2004-2005), Commune Profiles (2006-2011).

4.10 Pressures and Threats

Cambodian coastal fisheries, however, are under threat by direct and indirect factors that lead to the decline of fisheries. The degradation of the marine environment and depletion of fish habitats (e.g., mangroves, seagrass, etc.) and marine resources have occurred due to land encroachment for agricultural activities, fuel wood/charcoal production, sea port expansion/development, salt and shrimp farming, coastal development, human settlement, and population growth and poverty. Various coastal issues, such as lack of effective and transparent implementation of laws, limitation of systems for monitoring coastal development, lack of provincial authorities to control natural resource uses, and overlapping role and responsibilities among line agencies of the government on marine resource management have been discussed in the 6th National Seminar on Coastal Zone Management (CZM, 2006).

Domestic waste is still discharged directly into coastal waters without treatment, resulting in negative impacts on fish and human health. Over-fishing (due to the increased amount of fishing families and fishing boats) and the environmental degradation (due to the coastal habitat loss, conversion of forest land and to agricultural land, and urban development) have put pressure on the sustainability of the fisheries.

Population growth is also a factor causing pressure on coastal fisheries. More and more fishermen employ modern fishing methods and prohibited gears to increase fish catch since the marine fishery resources have declined. This activity creates negative impacts on the environment and fisheries resources. In turn, the catch per unit of effort is declining and the size of fish and other products caught is also declining. This threatens the livelihood of fishing families, and availability of fish for consumption.

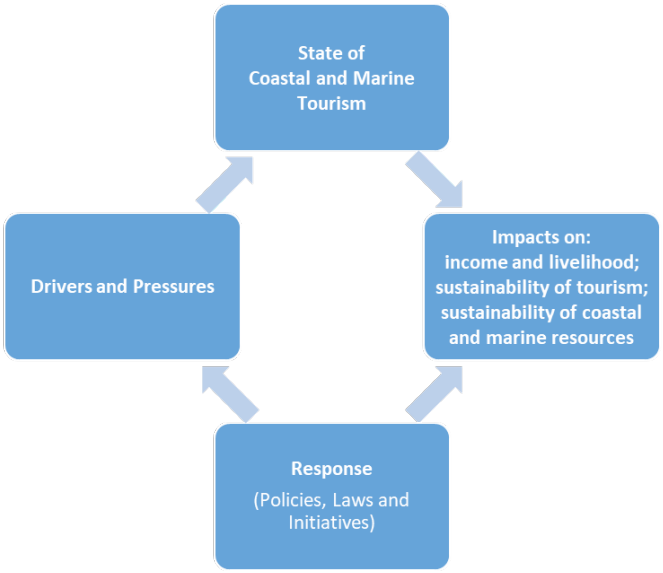
4.11 Response

The Fisheries Administration (FiA) of MAFF is responsible for:

- managing fisheries and aquaculture in Cambodia;
- implementing fisheries-related laws and policies;
- establishing and managing of fish sanctuaries and conservation of habitats;
- controlling illegal fishing; and
- ensuring benefits from aquatic resources.

A sub-decree on community fisheries that aims to empower local communities to participate in fisheries management scheme and address the various pressures has been fully approved in 2005 (MAFF, ASSDP, 2006-2010). The *Fisheries Law* was adopted by the National Assembly on 21 May 2006.

5 Coastal and Marine Tourism



5.1 Major Tourism Sites in Coastal and Marine Areas

Tourism is growing rapidly because international visitors are attracted to the country by its unique archaeological and cultural sites, such as the Angkor temple complex, its unspoiled beaches, and its relatively pristine natural habitats. In the coastal area, there are a number of attractive tourism sites ranging from coastal beaches to island beaches, mangrove resorts, and cultural and historical areas. The tourism sites that are located in the four coastal provinces are the following:

5.1.1 Kampot province

Kampot, the third largest coastal province in Cambodia, shares a border with Vietnam to the east and extends into the Gulf of Thailand to the south. Elegant colonial architecture, spectacular natural attractions, and its rural charm make this province a favourite among locals, expatriates, and more recently, tourists. Kampot's relaxed atmosphere and attractive small-town feel are easy to fall in love with. Many who stay in the province do so on the relaxed riverside, where visitors can swim in waters full of bioluminescent plankton or take a smooth kayak ride down the river.

Kampot is more than just a sleepy riverside town. The province offers many historical and natural wonders, and serves as a common gateway to Bokor National Park, the beaches of Kep, the beautiful rapids of Toek Chhou, and other attractions in southwestern Cambodia.

Bokor National Park is popular for its cool mountain climate and remains a year-round favourite among locals and foreigners alike. The scenery from the top is captivating, especially in the morning hours when one can literally touch the clouds and take in the mountain air.

Other attractions include the Popokvil Waterfall, and the Toek Chhou Rapids. The Prek Ampal Resort, Kampong Trach Mountain Resort, and the Anlong Pring Bird Sanctuary are also worthwhile stops in Kampot.

5.1.1.1 Attraction sites at terrestrial area

Kep Thmey

Kep Thmey, Kampot is a natural wildlife reserve, and is one of the most-visited tourist attractions in Kampot. It is situated in Kep Thmey Village in Beoungtouk Commune in Kampot District in Kampot. It is located 8 km from the Provincial Town of Kampot. The other wildlife parks in and around Kampot are Phnom Chhnok, Phnom Seda Orn, and the Phnom Daung.

Teuk Chhou Resort

The Teuk Chhou Resort in Kampot is a popular picnic place close to the town. It is set on the Prek Chha River, and visitors come for the beautiful rapids and for swimming or bathing. Teuk Chhou is located in Snomprampi village, Makprang commune, Kampot district, about 8 km north of Kampot provincial town. Its main attraction is a stream that flows from Phnom Damrei via Phnom Kamchay. This resort in Kampot is famous among the local people. There are also many kinds of delicious fruits available, including durian, mangosteen, rambutan, mak prang, pineapple, grapefruit, custard apple, and coconut.

Teuk Chhou Zoo

Not far from Teuk Chhou is a zoo and plantation organized by His Excellency Nhim Vanda. The Asian-style mini-zoo displaying a variety of local fauna is found 8 km north of Kampot. Teuk Chhou Zoo and rapids are set among gardens and fruit plantations at the foot of the Elephant Mountains on the west bank of the Teuk Chhou River, 12 km northeast of Kampot. The Teuk Chhou Zoo is home to a wide range of fauna, including tigers, a pair of playful young elephants, lemurs and gibbons while the plantation grows a variety of fruit trees, such as durian, rambutan and other fruits.

5.1.2 Kep Province

Kep, which was a municipality of Kampot Province, was later on established as a separate province through a Royal Decree issued on 22 December 2008. Kep is just a few kilometers from the border with Vietnam. It used to be Cambodia's most popular beach town, but has fallen on hard times (especially due to the Khmer Rouge). Many of Kep's French villas are abandoned. However, some of the town's former splendour is still apparent. Kep appears to be experiencing something of a renaissance, with

several mid-range and luxury guesthouses and bungalows recently opened or still under construction. The seafood is cheap, plentiful, and delicious - particularly the quite famous crabs. Kep is also home to an extensive national park covering some mountains with deep green jungles.

A small section of the beach doubles as a regular crab-trading depot and the Crab Market (Psar Kdam) on the water's edge serves as a popular tourist destination. Fishermen bring in baskets of crabs by the boatload, and waterfront restaurants cook them fresh, usually boiled with a few fragrant sticks of the famous Kampot pepper. Fish, squid and prawns are also offered, often cooked slowly over coals at the front of all the restaurants.

Visitors also often travel to a nearby island – Rabbit Island (Koh Thonsáy), which is only a short boat ride off Kep's coast. Beautiful seaside views, bamboo platforms and basic bungalows can be found here. The following are attraction sites located at the beaches and islands in Kep province.

5.1.2.1 Attraction sites at terrestrial coasts

Kep Beach

This handkerchief-sized strip of sand is Kep's only proper beach. In the pre-war period, powder-white sand was trucked in from other beaches and this practice began again in 2013, ensuring the beach is now in better shape than it has been for years. It is still somewhat pebbly and can get packed on weekends. The eastern end of the shaded promenade along the beach is marked by Sela Cham P'dey, a statue depicting a fisherman's wife waiting for her husband to return.

Coconut Beach

This 'beach' has dining platforms and food shacks. It begins a few hundred meters southeast of Kep Beach, just past the town's famous giant crab statue.

Veal Lumher, Kep City

Veal Lumher in Kep Village of Kep Commune refers to the Koh Puor or the Puor Island. It has become one of the most favorite destinations of tourists who are looking for less crowded places.

5.1.2.2 Attraction site at Island

Koh Ton Say Resort

Koh Ton Say is a natural resort located in southeastern Kep town. The resort has two beaches suitable for swimming. Koh Ton Say has a 250 m-long main beach.

About 20 to 40 minutes by local boat from Kep is Rabbit Island. It is a place of white sandy beaches and coconut palms. Although the waters are clear, there are no corals. Rabbit Island is a place of colored (psychedelic) fish.

5.1.3 Preah Sihanouk Province

Sihanoukville is one of the best beachside destinations in Asia that is yet to be explored. The city bears a short but amazing history of both peace and turmoil, making this place all the more significant. It is indeed heartening to see the city bounce back to life after a prolonged period of political turmoil.

Preah Sihanouk attracts crowds of locals, expatriates, and tourists who enjoy beachside massage, play on the powdery white sand beaches, swim ashore, and go for dinner in any of the local restaurants that serve fresh crabs, prawns, lobsters, fish, and scallops. There are also many sea-based activities for visitors, including boating, island-hopping, fishing, diving and snorkeling. There are dozens of untouched islands off the coast of Preah Sihanouk. Koh Rong and Koh Rong Samloem islands feature uncrowded beaches.

5.1.3.1 Attraction sites at terrestrial coasts

- **Ream National Park.** Ream National Park was declared a protected area in 1993 by royal decree because of its national, scientific, educational and recreational values. It is situated approximately 18 km east of Sihanoukville.
- **Ochheuteal Beach.** Ochheuteal Beach is the most active beach in Sihanoukville and is very popular with travelers and weekenders alike. Thatch-roofed seafood shacks and bars line the beach.
- **Serendipity Beach.** Found next to Ochheuteal Beach, the "Serendipity Beach" is popular with budget travelers, where cheap guesthouses alongside eateries, shops, and bars are located. This stretch of beach never sleeps and is a favourite among foreign tourists.
- **Otres Beach.** Otres Beach is the next beach south of Ochheuteal and in many ways resembles Ochheuteal. The road over the hill from Ochheuteal (through Queen Hill Resort) allows easy access to Otres Beach and is relatively new. Otres beach is largely undeveloped and often more secluded than the other tourist beaches of Sihanoukville. There are scattered grass umbrellas along the beach and few thatch roof beach bars and restaurants clustered toward near the end.
- **Independence Beach.** Independence Beach is a white sandy beach named after the seven-storey Independence Hotel in the area. The Independence Beach is calm, quiet and the perfect place to relax.
- **Sokha Beach.** Sokha Beach Resort takes up and blocks off Sokha Beach from the public to provide privacy for their hotel residents. However, a small part of this stretch of beach is still open to the public. Visitors who want to spend a day on the private, uncrowded shoreline can do so by paying a small fee. The fee also includes use of Sokha Resort's pools and facilities.

- **Victory Beach.** At over two km, Victory beach is quite long but is divided into two by a rocky point and a small hill. The section of Victory Beach that contains the Vietnam-Cambodia Monument (Victory Monument) is popular because it is a bit quieter and more relaxed than Ochheuteal Beach. There are a few food beach bars and restaurants right on the sand. Victory Beach is a particularly good beach from which to view sunsets.
- **Lomherkay Beach**. Lomherkay Beach is also known as "Hawaii Beach, King's Beach, and South Channel Beach." Like the other major beaches, Lomherkay Beach is lined with umbrellas and chairs, and little beach shack bars and seafood restaurants, though not as crowded as Ochheuteal.
- **Hawaii Beach.** Hawaii Beach is peppered by thatched roofed eateries and cafés and has always been quite popular.
- **Kbal Chhay Waterfall.** The 14 m-high Kbal Chhay Waterfalls, approximately 16 km from downtown Sihanoukville on National Road 4, were discovered in 1960 and developed into a source of freshwater for Sihanoukville in 1998. It has emerged as a favorite among local and foreign visitors.

5.1.3.2 Attraction sites at Islands

Approximately 34 islands lie within the jurisdiction of Preah Sihanouk. These include the larger islands of Koh Rong and Koh Rong Samloem to the west; Koh Thmei and Koh Ses – the islands inside Ream National Park; and a number of smaller islands found both close to shore and offshore, stretching as far north as the northern tip of Kampong Som Bay. Many of the islands have small beaches and some have been identified as good for snorkeling. These include Koh Khteah, Koh Chraloh, Koh Ta Kiev, and Koh Chraloh. The island of Koh Tang, Koh Prins and Poulo Wai have good environment for diving. Most of the islands are accessible by regular boat trips.

- **Koh Sang Saa.** In Cambodia's untouched Koh Rong Archipelago, two pristine islands lie side by side. They are known locally as Song Saa – Khmer for 'The Sweethearts'.
- **Koh Rong.** It is situated west of the provincial coast. It offers the strand of beach on its southwest, stretching about 5 km. It has freshwater resources on the island and a bustling fishing community with basic supplies including drinking water, fish, and crab.
- **Koh Rong Sanloem.** It is a bit smaller than Koh Rong and situated on its south. Beautiful beaches are found on the north shoreline facing Koh Rong as well as on the east coast, where a large heart-shaped bay with some shellfish cultivation is located.
- **Koh Puos.** Koh Puos is a quiet and undeveloped island 1 km from the Lomhè Kay Beach. Visitors are advised to travel in groups and to bring their own food and drinks when visiting the island.

- **Koh Russei.** Koh Russei or Bamboo Island has a beach with fine pink or ochre sand, and mysterious forest.
- **Koh Tang.** It is quite far from the main shoreline of Preah Sihanouk Province. Going there requires staying overnight on board. The island offers many interesting diving spots that are seldom explored.

5.1.4 Koh Kong Province

Koh Kong is the most southwestern province of Cambodia. It is one of the biggest provinces in the whole country with a lot of attraction spots, undeveloped coastline, and a mountainous, forested and largely inaccessible interior, which embraces part of the Cardamom Mountains, the biggest coherent rainforest of Southeast Asia. Its tourist attractions include abundant wildlife, big waterfalls, and casinos on the border with Thailand, while an Export Processing Zone and new port facilities are being developed for international trade.

5.1.4.1 Attraction sites at terrestrial coast

Koh Kong Mangrove Forest

About 7 or 8 km outside of Koh Kong City, or Krong Koh Kong, is an enormous mangrove forest where visitors can observe the delicate ecosystem that locals (and NGOs) have turned into a thriving ecotourism project.

Part of the nearly 25,000-hectare Peam Krasop Wildlife Sanctuary, the Boeng Kayak area has a kilometer-long mangrove walk, with elevated cement and wooden platforms snaking through the mangrove forest. Entrance fees (5,000 riel for foreigners; 3,000 for Cambodians) are collected to support the project, which aims to provide local villagers with alternatives to ecologically damaging choices.

The mangrove forests of Cambodia are environmentally important, providing homes to hundreds of species of wildlife, including the famous Irrawaddy dolphins, a pug-nosed species related to the killer whale, which are endangered due to the destruction of their natural habitat.

Koh Sdach

Koh Sdech Koh Kong is located in Kirisakor district, about 81 km south of Koh Kong provincial town. It attracts visitors from Sihanoukville and Sre Ambil districts. Koh Sdech features a long beach, and the sea is filled with a variety of fish. The site is excellent for snorkeling or scuba diving, as the water is clear, and an array of corals can be seen.

According to legend, there once was a king who commanded an army on the island. Because there was no fresh water, the king searched everywhere to find some. At last he found a rock near the sea. Thinking the rock might contain water, the king drew his sword and split open the rock, releasing an endless flow of water that local people still use today.

This small fishing village island sits at the half way mark between Koh Kong and Sihanoukville. Located just a 20-minute boat-ride off the Cambodian coast, Koh Sdach is dominated by a sizeable fishing village that stretches along the side of the island facing the mainland. While fishing is the mainstay of the local economy, the village also has a large ice-making plant, where you can watch ice being made and ferried off by boat to the surrounding islands. On the far side of the island lies the main beach. Koh Sdach is also surrounded by other islands, many of which are still deserted.

Sner Beach

Sner Beach is a frequently visited tourist attraction in Koh Kong. It is located about 17 km from the provincial town of Koh Kong, but can be accessed by car. Sner Beach is in the Dong Tung commune of the Smachmeanchey District of the province of Koh Kong.

5.1.4.2 Attraction site at Island

Koh Moul Resort

Koh Moul Resort Koh Kong, the biggest island in Cambodia, is 22 km long and 7 km wide. It is located in Koh Kong District, about 24 km south of Koh Kong provincial town. Koh Moul is 350 m above sea level. The island has many hills and is rich in natural scenery. Koh Kong Krau has more than 10 waterfalls that range from 6 m to 25 meters in height. Koh Moul features six beautiful beaches known as Deum Dong Beach 1 to 6 that range from 3,000 m to 5,000 m long. All have beautiful white sand and limpid water. The water surrounding the island are full of black and white dolphins that appear along the beach from 9:00 to 10:30 in the morning and 5:00 to 7:30 in the evening.

5.2 National Parks, and Historical, Heritage and Cultural Sites in Coastal and Marine Areas

In the coastal provinces, there are several national parks, a marine protected area, and historical sites that can be considered as attractive, important, and sensitive zone for special care. These areas include:

5.2.1 Kep National Park

Kep National Park was established in 1993, and it covers an area of 5,000 ha. The nearest town lies at Krong Kep. Access to Kep National Park is through an 8-km road open to 4WD vehicles. Kep Lodge may be able to arrange a half-day hike through the park as well as snorkeling excursions, fishing trips and seaborne visits to coastal mangrove areas.

5.2.2 Ream National Park

Ream National Park is located 18 km from Sihanoukville town center on the way to Phnom Penh. It encompasses 210 km^2 (21,000 ha), divided into 150 km^2 (15,000 ha) of terrestrial and 60 km^2 (6,000 ha) of marine habitats. Over 150 species of birds live in the park.

This park (one of the seven national parks in Cambodia) has a reputation for being very well looked after and for keeping the mangroves, beaches and wildlife in very good condition. The activities offered are hikes (e.g., trips to Meditation Mountain and Keng Kong waterfalls) and safari tours. Boat trips along the mangroves of Prek Toeuk Sap River are also possible. There are 35 rangers in the park and some of them speak English. The 200 original inhabitants of the park have been allowed to stay within the area, but no additional residents have been allowed in order to maintain the balance with the ecosystem of the park.

5.2.3 Marine Protected Area of Koh Rong

Cambodia reached a landmark for marine conservation when the Minister of MAFF signed a proclamation in June 2016 declaring a 405 km^2 Marine Fisheries Management Area (MFMA) around the islands of Koh Rong and Koh Rong Sanloem, creating the country's first large-scale marine protection.

The Fisheries Administration (FiA) and conservation organizations have been working tirelessly for more than 5 years within the archipelago to consult with local stakeholders and communities and gather baseline data about the area's biodiversity to support the designation of the site.

The results of these efforts have been impressive. Community fishery patrols have received support and innovative techniques have been employed, such as the use of drones for habitat monitoring and the introduction of the Spatial Monitoring and Reporting Tool (SMART). Extensive surveying and monitoring of the marine habitats around the archipelago's islands have assisted in drawing up zones for the MFMA.

These zones, now formally approved by MAFF, will ensure that the archipelago supports both people and biodiversity by protecting important and vulnerable habitats (such as nursery and breeding sites) while also allowing for other activities – including research, education, anchoring, fishing and tourism – in other zones. The MFMA will help to drive sustainable fishing activities of the community, protect biodiversity, and promote ecotourism, all of which contribute to achieving the goal of the fisheries sector. This is a good management model, as many stakeholders – including development partners, the private sector, local authorities and the local community – are working together to manage the natural resources for sustainable use.

5.2.4 Historical Site of Khun Chhang Khun Phen

Khun Chhang Khun Phen stupa sits on a rock in the middle of the sea tributary, about 1 km from the provincial town. The stupa is 4 m high and made of concrete. Because the site is small – only 40 m^2, including the stupa, it can accommodate only 10 to 15 visitors at a time. The stupa is about 1 km from the provincial town. Koh Kong residents worship there, and often visit the site on national holidays and traditional festivals.

Khun Chhang Khun Phen is related to a Khmer legend:

Once upon a time, there was villager's daughter named Thim, who was loved by a man named Khun Chhang. Khun Chhang was bold-headed and not very handsome, but his family was rich. Thim did not love Khun Chhang, however, they became engaged and Khun Chhang married her.

She later betrayed her husband to love a commander named Khun Phen. When Khun Chhang learned of his wife's affair, he complained to the King. The King decided to cut Thim's body into two parts. After Thim died, Khun Chhang buried her at the same place where she was killed. Because he wanted her to be reincarnated, Khun Chhang put up a soul flag pole on the east bank of the stream, facing where Thim was buried. Then he built a stupa in memory of their love. Later, the west bank of the stream was named Chetdey (a stupa) village, and the east bank was named Dangtung (a flag pole) village.

5.3 Contribution to the Economy and to Income and Livelihood

WTTC reported the following figures for the growing Travel and Tourism industry in Cambodia[13]:

- The direct contribution[14] of travel and tourism to GDP was KHR9,888.6 billion (US$2.4 billion), 12.2% of total GDP in 2016.
- The total contribution[15] of travel and tourism to GDP was KHR22,838.1 billion (US$5.5 billion), 28.3% of GDP in 2016, and is forecast to rise by 9.9% in 2017, and to rise by 6.6% per annum (pa) to KHR47,597.6 billion (US$11.5 billion), 27.3% of GDP in 2027.
- Visitor exports, generated KHR13,833.9 billion (US$3.356 billion), which were 26.5% of total exports in 2016. This is forecast to grow by 11.8% in 2017
- Travel and Tourism investment in 2016 was KHR2,563.7 billion, 15.5% of total investment (US$0.6 billion). It should rise by 5.1% in 2017, and rise by 6.4% pa over the next ten years to KHR5,020.3 billion (US$1.2 billion) in 2027, 14.1% of total investment.

5.3.1 Tourism revenues

The tourism industry has become a major revenue generator in Cambodia and is playing an important role in national development. Over the last decade, the number of visitors to Cambodia has increased rapidly, with an annual growth of between 10%–15%. Currently, this sector is the third largest sector of Cambodia's economy after the agriculture and garment sector, and the second contributor of foreign earnings after the garment sector. For the year 2012, revenue from the sector reached US$2.2 billion, an increase of 15% compared to the previous year. Tourism

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[13] Note: All values are in constant 2016 prices and exchange rates. Source: World Travel and Tourism Council. 2017. Cambodia: Economic Impact of Travel and Tourism 2017. (Downloaded from: www.wttc.org/-/media/files/reports/economic-impact-research/countries-2017/cambodia2017.pdf)

[14] The direct contribution of travel and tourism to GDP reflects the:
   a. 'internal' spending on travel and tourism (total spending within a particular country on travel and tourism by residents and non-residents for business and leisure purposes)
   b. government 'individual' spending: spending by government on Travel and Tourism services directly linked to visitors, such as cultural (e.g., museums) or recreational (e.g., national parks).

   The direct contribution of travel and tourism to GDP is calculated to be consistent with the output, as expressed in National Accounting of tourism-characteristic sectors, such as hotels, airlines, airports, travel agents and leisure and recreation services that deal directly with tourists. The direct contribution of travel and tourism to GDP is calculated from total internal spending by 'netting out' the purchases made by the different tourism sectors. This measure is consistent with the definition of tourism GDP, specified in the 2008 Tourism Satellite Account: Recommended Methodological Framework.

[15] The total contribution of travel and tourism includes direct contribution as well as its 'wider impacts' (i.e., the indirect and induced impacts) on the economy. The 'indirect' contribution includes the GDP and jobs supported by:
   a. Travel and tourism investment spending – an important aspect of both current and future activity that includes investment activity, such as the purchase of new aircraft and construction of new hotels;
   b. Government 'collective' spending, which helps travel and tourism activity in many different ways as it is made on behalf of the 'community at large', e.g., tourism marketing and promotion, aviation, administration, security services, resort area security services, resort area sanitation services, etc.
   c. Domestic purchases of goods and services by the sectors dealing directly with tourists – including, for example, purchases of food and cleaning services by hotels, procurement of fuel and catering services by airlines, and IT services by travel agents.

   The 'induced' contribution measures the GDP and jobs supported by the spending of those who are directly or indirectly employed by the travel and tourism industry.

accounted for 15.7% of the total GDP in 2012. At the same time, there were 3.5 million foreign tourists – an increase of 24% from the previous year.

In 2016, there were more than 5.7 million foreign tourists, generating an estimated revenue of US$3,212 million (MOT, 2016). This growth has granted the sector significant importance for the national economy, and as such, is part of the main national development strategies. Along with the ancient temples of the Angkor Empire, the government is also promoting its coastal areas, especially Sihanoukville. During the last few years this coastal town has emerged as a major tourist destination.

This significant growth is due to the increasing political stability, improvement of tourist destinations as well as the promotion of Cambodia to the rest of the world. However, along with the potential growth, there are challenges that need to be addressed by both the government and private sector, with participation of relevant stakeholders. Nonetheless, despite the obstacles, the tourism industry growth offers an opportunity for investors to gain potential return of investments, particularly in the accommodation, food and beverage, and infrastructure development.

5.3.2 Employment in the tourism sector

Travel and tourism directly supported 988,000 jobs (11.4% of total employment) in 2016. This figure included the employment by hotels, travel agents, airlines, and other passenger transportation service. This is expected to rise by 9.1% in 2017.

In 2016, the total contribution of Travel and Tourism to employment, including jobs indirectly supported by the industry, was 2,252,500 jobs or 25.9% of total employment. This is expected to rise by 6.7% in 2017 to 2,403,500 jobs, and rise by 3.5% per annum to 3,389,000 jobs in 2027 (33% of total). Disaggregated data on employment in coastal and marine tourism are not available.

5.3.3 Tourist arrivals (total, local and foreign, in 2016)

The number of tourist arrivals to Cambodia has been gradually increasing from about 2.88 million persons in 2011 to about 4.50 million persons in 2014, 4.77 million persons in 2015, and more than 5.01 million persons in 2016 (Statistics and Tourism Information Department of the Ministry of Tourism). The international tourist arrivals to Cambodia from 2011 to 2016 are shown in **Tables 5.1** and **5.2**.

Table 5.1: International Tourist Arrivals to Cambodia.

Months	2011	2012	2013	2014	2015	2016
Q1	**778,467**	**995,210**	**1,172,072**	**1,267,922**	**1,307,836**	**1,342,477**
January	274,471	350,257	404,106	442,045	460,577	466,086
February	255,499	321,870	385,760	425,801	430,207	448,468
March	248,497	323,083	382,206	400,076	417,052	427,923
Q2	**606,562**	**761,442**	**920,527**	**933,446**	**994,154**	**1,018,455**
April	223,032	277,304	327,000	332,690	361,139	367,684
May	190,258	233,220	292,115	300,302	314,748	320,601
June	193,272	250,918	301,412	300,454	318,267	330,170
Q3	**699,760**	**820,888**	**964,612**	**998,690**	**1,044,880**	**1,147,483**
July	239,527	284,282	338,761	340,091	364,325	395,761
August	250,429	293,859	342,064	347,211	366,096	406,214
September	209,804	242,747	283,787	311,388	314,459	345,508
Q4	**797,073**	**1,006,767**	**1,152,954**	**1,302,717**	**1,428,361**	**1,503,297**
October	233,190	290,959	334,410	390,637	408,922	414,077
November	265,539	333,482	386,737	411,501	444,640	477,686
December	298,344	382,326	431,807	500,579	574,799	611,534
Total	**2,881,862**	**3,584,307**	**4,210,165**	**4,502,775**	**4,775,231**	**5,011,712**

Source: Statistics and Tourism Information, Department of the Ministry of Tourism. Tourism Statistic Report Year 2016.

5.3.4 Tourist accommodation and access

Accommodation demand for tourists become dramatically increasing from year to year to respond to the increasing number of tourists visiting Cambodia. Tourists have various choices for staying. Most of them choose to stay at hotels, while the rest are interested in staying at guesthouses and home stay.

According to the records released by the Statistics and Tourism Information Department of the Ministry of Tourism, hotel occupancy by tourists was about 65.7% in 2010, and gradually increased to about 68.5% in 2012 to 70.2% in 2015. The number of international tourist arrivals in 1993 to 2015, their average length of stay and hotel occupancy, and tourism receipts are shown in **Table 5.2**. International tourists stayed for an average of 6.3 days in 2016. Around 44% of these tourists visited Siem Riep and Angkor Wat while 56% visited Phnom Penh and surrounding areas (**Table 5.3**).

Table 5.2: International Tourist Arrivals, Average Length of Stays, Hotel Occupancy and Tourism Receipts, 1993–2015.

Year	Int'l Tourist Arrivals		Average Length of Stay (Days)	Hotel Occupancy (%)	Tourism Receipts (Million US$)
	Number	Change (%)			
1993	118,183	-	N/A	N/A	N/A
1994	176,617	49.4	N/A	N/A	N/A
1995	219,680	24.4	8.00	37.0	100
1996	260,489	18.6	7.50	40.0	118
1997	218,843	-16.0	6.40	30.0	103
1998	286,524	30.9	5.20	40.0	166
1999	367,743	28.3	5.50	44.0	190
2000	466,365	26.8	5.50	45.0	228
2001	604,919	29.7	5.50	48.0	304
2002	786,524	30.0	5.80	50.0	379
2003	701,014	-10.9	5.50	50.0	347
2004	1,055,202	50.5	6.30	52.0	578
2005	1,421,615	34.7	6.30	52.0	832
2006	1,700,041	19.6	6.50	54.8	1,049
2007	2,015,128	18.5	6.50	54.8	1,400
2008	2,125,465	5.5	6.65	62.7	1,595
2009	2,161,577	1.7	6.45	63.6	1,561
2010	2,508,289	16.0	6.45	65.7	1,786
2011	2,881,862	14.9	6.50	66.2	1,912
2012	3,584,307	24.4	6.30	68.5	2,210
2013	4,210,165	17.5	6.75	69.5	2,547
2014	4,502,775	7.0	6.50	67.6	2,736
2015	4,775,231	6.1	6.80	70.2	3,012
2016	5,011,712	5.0	6.30	68.9	3,212

Source: Statistics and Tourism Information Department of the Ministry of Tourism. Tourism Statistic Report Year 2016.

5.3.5 Coastal tourism and ecotourism

There were 5,011,712 foreign tourists who visited Cambodia in 2016. Around 13% of foreign tourists also visited the coastal areas, and 1.3% went to the ecotourism sites (**Table 5.3**).

Sihanoukville, located about a 3.5-hour drive from Phnom Penh, has some of the most beautiful beaches in the region, together with diving opportunities to see the coral reefs. The government is also developing infrastructure, and taking measures for the safety of the tourists.

In 2016, Preah Sihanouk province welcomed nearly 2.4 million tourists, generating US$96 million in revenue, following a significant rise in domestic and international tourist arrivals. According to an estimate, the tourism market in Sihanoukville comprised of 70% domestic tourists, and 30% international tourists (Ponna, 2009).

Table 5.3: Foreign Visitor Arrivals to the Regions in 2013–2016.

Region	2013	2014	2015	2016
Phnom Penh and Surrounding areas	1,972,879	2,151,838	2,650,368	2,806,438
Siem Reap Angkor	2,237,286	2,350,937	2,124,863	2,205,274
Coastal areas	N/A	600,367	610,458	643,289
Ecotourism Areas	N/A	60,031	63,261	66,349

Note: Tourists visited more than one place or region.
Source: Statistics and Tourism Information Department of the Ministry of Tourism. Tourism Statistic Report Year 2013, Year 2015, and Year 2016.

5.4 Major Issues

As the country is realizing the potential of the tourism sector for its economic growth, there are major challenges that Cambodia is facing:

- **Revenue loss**: Based on the official data from the Ministry of Tourism, 25% of the revenue from this sector was lost due to importation of materials and agricultural products, which could have been supplied locally. Many reports showed the importation from neighbouring countries to supply the needs of hotels and restaurants in Cambodia. This also showed the weakness of Cambodia's agricultural sector, which accounts for 80% of the total population. The restaurant owners typically turned down local farmers' products or offer a lower price as they consider their quality to be lower than acceptable standards.
- **Limited skilled resources**: Besides the leakage of revenue, there is a lack of skilled human resources and professionalism in the sector. This issue has been acknowledged by the Tourism

Minister who indicated that enhancing the quality of tourism services in the country is a challenge. As the country moves into the ASEAN integration and expects to receive seven million visitors in 2020, the number of professionals will also need to double.

- **Sustainability**: With the increasing number of tourists, there will also be increasing waste generation and pressures concerning carrying capacity of beaches, islands, and coral reefs.

5.5 Response

The Government of Cambodia, as part of the National Development Plan, developed a tourism development strategy for Sihanoukville. This strategy adopted an "Open Sky" policy for investments from around the world for tourism development. The Ministry of Tourism has been promoting investments into coastal tourism as an alternative source of revenue for the government, and as an employment opportunity for local communities. In the coastal areas, along with Sihanoukville, the towns of Koh Kong, Kampot, and Kep are also attracting tourists. Ream National Park and Prem Krasop Wildlife Sanctuary are quite popular tourist destinations.

The "Clean City, Clean Resorts, and Good Services" movement was launched by the Ministry of Tourism in 2011 to encourage responsible businesses. In 2016, the "Clean Beach, Green Sea, and Preservation of Marine Resources" movement was initiated.

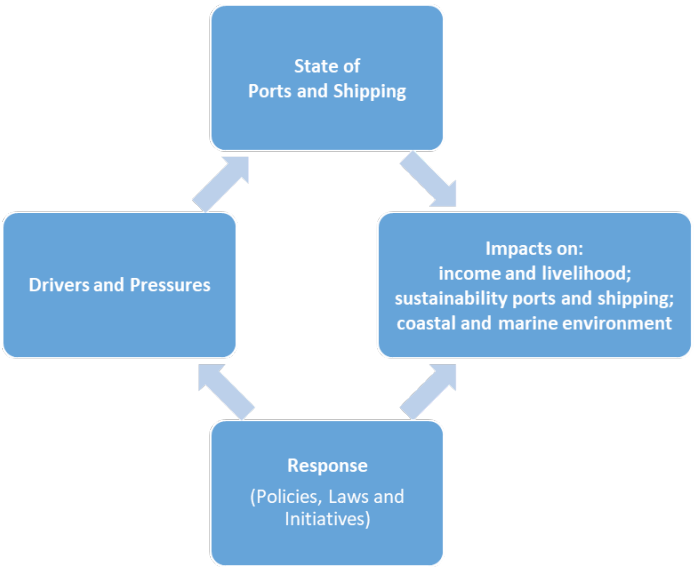
The following are the major programmes for sustainable tourism:

- Ecotourism projects: community-based ecotourism site in Chi Phat
- Island Conservation and Development: Koh Rong
- Beach improvement: Occheateal Beach in Sihanoukville; Pilot project in Otres Beach
- Beach improvement, with wastewater treatment
- Public access
- Cambodia Bay: The government is implementing programs to ensure that it remains among the best beaches in the world, and has identified the following tourist destinations:
    - Beach and island destination
    - Snorkeling, diving, and fishing destination
    - Mangrove destination
    - Historical and natural destination
    - Waterfall destination
    - Seafood destination
    - Agricultural destination

The following are the major laws, regulations, and policies supporting sustainable tourism:

- Regulation 001: Management and Development of Cambodia Coastal Zone
- Draft of Law on Coastal Management and Development
- Prakas Interministries: Ministry of Tourism and Ministry of Environment on Waste Management in the Cambodia Coastal Zone
- Code of Conduct
- Regulations and circulars on coastal development: beach management, buffer zone, and coastal use plan
- Regulations and requirements for island development and for investors
- Beach Management Guidelines
- Beach Clean Up Day
- Beach Eco Label and Beach Competition
- Cambodia Mutual Conservation Fund
- Standards for access and accommodation
- In the process: Establishment of Permanent Forum for Cambodia Bay Management and Development (Follow ICC Angkor, ICC Preah Vihear)
- In the process: Establishment of Marine Park

6 Marine and Coastal Ports and Shipping



6.1 Important Navigational Lanes

Sihanoukville Autonomous Port (PAS) is the main port in Cambodia and is located at the southeast entrance of Kompong Som Bay where several islands are lined up from north to south, namely, Nord Island, Milien Island, and Chenal Island. Koh Rong Island, Koh Rong Samloem Island, Paletuvires Island, and Koh Poah Island act as a natural breakwater and shelter for Kompong Som Bay from the west to southwest waves generated in the Gulf of Thailand.

At present, PAS consists of a commercial port with a total operational land area of 124.76 ha. There are two main navigation channels for PAS: the South Channel and the North Channel.

- The South Channel is a natural channel with length of about 5,5000 m, depth of about -8.4 m and width of about 80 m–100 m. At some point, the sea bed is bare rock
- The North Channel has completed dredging in 2006 with length of about 1,000 m, depth of about -10 m, and width of about 150 m–200 m.

Moreover, there are several fishery facilities of smaller scale in the vicinity of Sihanoukville Port. These smaller scale facilities are administrated by other agencies (Department of Fishery and Municipal Government of Sihanoukville).

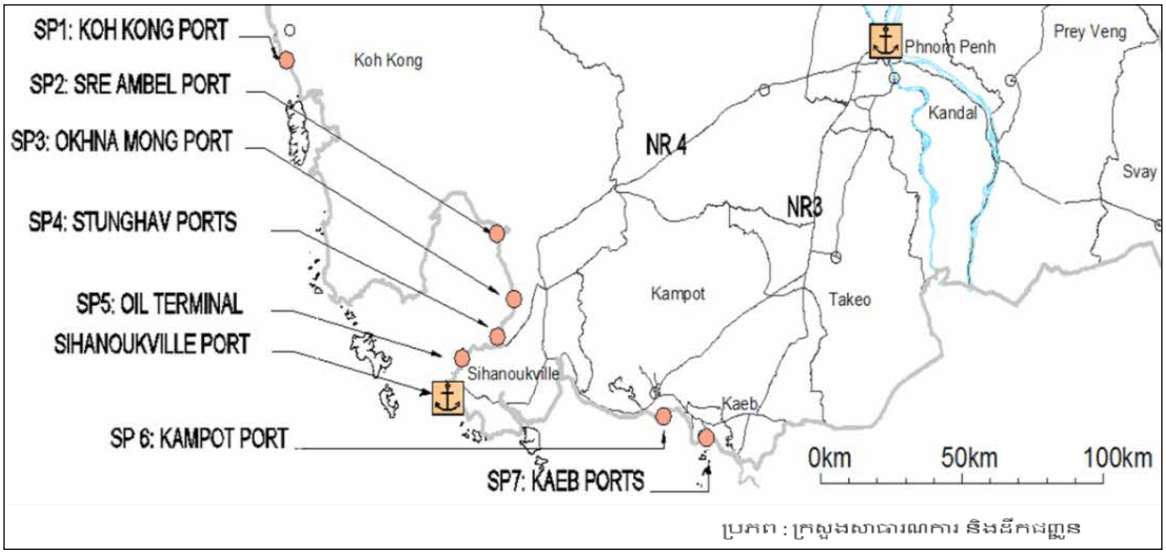
6.2 Ports

Following the Cambodian constitution promulgated in 1993, the government proclaimed several laws on organizations related to maritime activities including the sub-decree on the establishment of the Ministry of Public Works and Transport. Sub-decrees on the establishment of the Sihanoukville Autonomous Port (PAS) and Phnom Penh Autonomous Port (PAPP) were also promulgated in July 1998.

Since then, development of private ports was approved by the government. The construction of Port of Sre Ambel started in 2001, and began its operations in 2003. The construction of Port of Oknha Mong started in 2003 on the east coast of Kompong Som Bay, and opened in August 2004. Two oil jetties were also developed in the north of Sihanoukville Port by oil companies, which replaced the old oil jetty of PAS.

In addition to autonomous ports and private ports, there are local facilities developed by provincial authorities like wooden jetties in Sihanoukville Port, in Stueng Hav District, in Kampot, and other areas. These small jetties, mostly developed in the 1970s, are used for handling general goods and construction materials from Thailand. While provincial and/or municipal authorities and the Waterways Department of MPWT are responsible for the construction and maintenance of these facilities, no construction of local ports was reported since 1990. Many jetties for fishing vessels are observed in Sihanoukville Port and Stueng Hav Port. However, official approval for the construction was not accorded to those facilities.

Figure 6.1: Location of Ports in Cambodia.



Source: Sihanoukville Autonomous Port, 2016. http://www.pas.gov.kh/en/page/navigation-pilotage-facility (accessed June 2018).

6.2.1. Sihanoukville port

Sihanoukville is the location of the main deep-sea port of Cambodia. The Port of Sihanoukville, situated in the Bay of Kompong Som, is the principal and only deep-water maritime port of Cambodia. Kompong Som's natural advantages include deep water inshore and a degree of natural protection from storms provided by a string of islands across the mouth of the bay. The port was built in 1959 with a total capacity of 1.2 million tonnes, encompassing the old French-built wharf and adjacent new facilities. The capacity of PAS, in its present condition, is estimated at about 950,000 tonnes per year, excluding POL, which has separate facilities. This is about twice its present traffic. The port can accommodate ships of 10,000 tonnes-15,000 tonnes deadweight.

The main access to the port is via a 3 km fairway channel, marked by buoys and leading lights for daylight navigation only. In practice, boats of up to about 10,000 dwt can use the port. The port is located 540 nautical miles (1000 km) from Singapore.

On the land side, the port is served by National Highway No. 4 (NH4) (226 km to Phnom Penh), the main link between Phnom Penh and the coast, and the "New" railway line, completed in 1969, which takes a more southerly route via Kampot. The rail distance to Phnom Penh is 263 km. The railway is in poor condition and can handle only some 15% of the port traffic in 1993. Aid from the United States is earmarked for an immediate project to resurface the entire length of NH4 as well as to rebuild several bridges between Phnom Penh and Sihanoukville. Roads within Sihanoukville are all hard surface, albeit somewhat of lesser quality and poorer condition than NH4.

As part of its program to upgrade transport infrastructure in Cambodia, the Asian Development Bank is funding some modest improvements at the port. Immediate investments include the following: new forklift truck for container movement; repair of old jetty; replacement of fenders and navigational aids to allow night navigation; improvement of container storage yard; and installation of area lighting to permit working at night. There are also reports that French assistance may finance a quayside container crane. (Currently, in the absence of a dedicated crane, the port claims to be able to move 200 containers per 24 hours).

6.2.2 Koh Kong port

Koh Kong is situated near the Thai border, and is used by small boats below 500 deadweight tonnage (dwt).

The Koh Kong provincial port is really a system of three ports. Vessels entering Cambodia from Singapore, Malaysia or Thailand call first at Paklong, on the Gulf of Siam about 15 km from the

Thai border, for customs clearance and other formalities. Up to 300-tonne capacity boats can be accepted, or 500 tonnes at anchorage. The 300-tonne boats can then proceed across the bay to Koh Kong town for unloading or transshipment to smaller vessels if required.

Koh Kong is a small provincial capital with no road access to the rest of Cambodia. Road 43 can only be used (with difficulty) by motorcycles at present. Hence, after clearance, most boats proceed to another provincial port at Sre Ambel, at an inlet in the Kompong Som Bay near Road 4, some 170 km from Phnom Penh. However, Sre Ambel can only accept 120-tonne to 130-tonne boats. Traffic that arrives at Koh Kong in larger boats has to be transshipped between vessels at Paklong or Koh Kong town.

Paklong and Koh Kong have quite good but limited facilities, and are very congested, particularly Paklong. There is some warehousing in Koh Kong town to support the transshipment activity. Koh Kong is also quite an important fishing port, from which about 16,000 tonnes were exported to Thailand in 1993.

6.2.3 Other ports

Cambodia's other seaport is at Kampot, 148 km from Phnom Penh along Road 3 or 166 km by rail. The port is situated in the town on a riverbank 4 km from the sea. Of the minor ports, Kampot Port is the most important coastal facility. It was more important before 1975 when it had better facilities and was able to take vessels of up to 150 tonnes or more. It is a lighter port, with two main approaches from the sea, one of which has fairway depths of 10 m to within 11 km of the port. The other southern channel could accommodate vessels of less than 4.6 m draft. There are three channels through which junks and lighters could enter the river to reach Kampot. A wooden jetty can be used by 30-tonne to 40-tonne boats. There is a regular trade with Koh Kong for exchange of goods with Thailand. However, Kampot port is not used for international traffic.

6.3 Port Performance Indicators

There is only the deep seawater port in Cambodia – PAS – has expanded steadily, and it has now 12 berths equipped with modern cargo handling facilities. It has two channels: the South Channel (length 5.5 km, depth 8.4 m, and width 80 m-100 m), and North Channel (length 1 km, depth 10 m, and width 150 m-200 m). The details of the berthing, cargo handling, and storage facilities of PAS are shown in **Tables 6.1** to **6.3**.[16]

[16] Sihanoukville Autonomous Port. http://www.pas.gov.kh/en/page/navigation-pilotage-facility (accessed June 2018).

Table 6.1: Berthing Facilities.

Terminals	Length (m)	Depth (m)
Container Terminal	750	- 8.50
G.C. Terminal	290	- 7.00
Tourist Terminal	290	- 8.50
Sokimex Oil Port	200	- 9.20
Tela Oil Port	220	- 8.50
Oil Concrete Wharf	53	- 4.20

Source: PAS 2017.

Table 6.2: Cargo Handling Facilities of Sihanoukville Port.

Type	Capacity	Quantity (Unit)
1-Super Structure and Container Handling Equipment		
Quay Gantry Cranes	30.5 Tonnes	2 Units
Rubber Tired Gantry Cranes	35.5 Tonnes	7 Units
Super Stackers	45 Tonnes	8 Units
Empty Stacker	7.5 Tonnes	1 Unit
Trailers	20'- 40'	35 Units
2-General Cargo Handling and Transport Equipment		
Mobile Harbor Cranes	60 Tonnes	2 Units
Shore Cranes	10 Tonnes - 50 Tonnes	7 Units
Forklifts	30 Tonnes - 10 Tonnes	8 Units
Trucks for General Cargo	20 Tonnes - 40 Tonnes	19 Units

Source: PAS 2017.

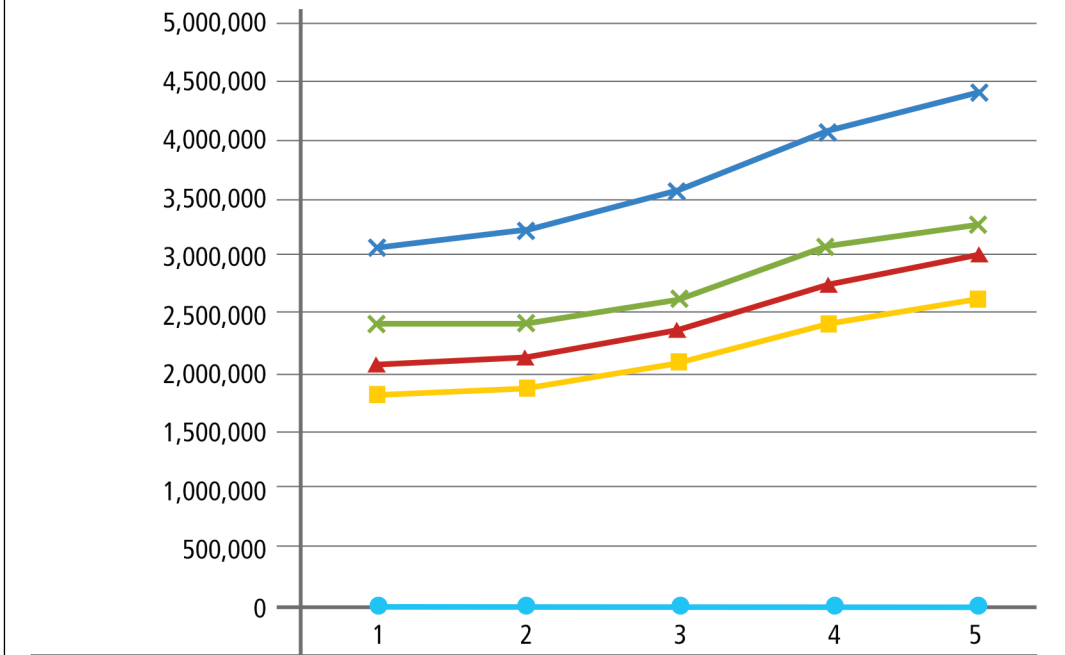
Table 6.3: Storage Facilities of Sihanoukville Port.

Terminal	Size (m^2)	Capacity	Quantity
New Container Terminal	103,000	8,400 TEUs	01
Empty Container Yard	46,000	3,000 TEUs	01
Reefer Container		54 Boxes	09 Sockets
Container Freight Station	6,000	12,000 Tonnes	01 (Warehouse No 4)

Source: PAS 2017.

Although the container cargo throughput of PAS increased steadily until 2008, it sharply dropped in 2009 mainly because of the decrease of garment exports to the American and EU markets, which were affected by the economic crisis in 2008. General cargo throughput also decreased in 2009 due to the decrease in import of construction materials caused by the sluggish domestic real estate market. Container throughput returned to the growth track as the garment export started increasing in 2010. General cargo throughput also sharply increased in 2010, and surpassed the peak volume recorded in 2008. The import of construction materials to be used for various large-scale development projects, and factory construction by the investors surged in 2010 (**Table 6.4**). Cargo handling grew at an annual average of 11.24% from 2011 to 2015 (**Figure 6.2**).

Figure 6.2: Cargo throughput, 2011–2015.



	1	2	3	4	5
Oil	632,235	785,035	932,943	986,986	1,125,253
General Cargo (t)	372,554	302,463	272,463	310,261	258,274
Container (TEUs)	237,941	255,378	286,450	333,904	391,819
Cargo Throughput	1,814,150	1,874,750	2,088,274	2,436,933	2,638,043
Year	2011	2012	2013	2014	2015

Source: PAS, 2016.

Table 6.4: Cargo and Container Throughput of Sihanoukville Autonomous Port.

Type of cargoes	2006	2007	2008	2009	2010
Total cargo throughput (tonnes)	1,586.791	1,818,877	2,057,967	1,874,095	2,217,150
Container throughput (TEU)	231,036	253,271	258,775	207,861	222,928
General cargo throughput (tonnes)	197,573	193,572	291,114	241,494	374,801

Source: PAS, 2010.

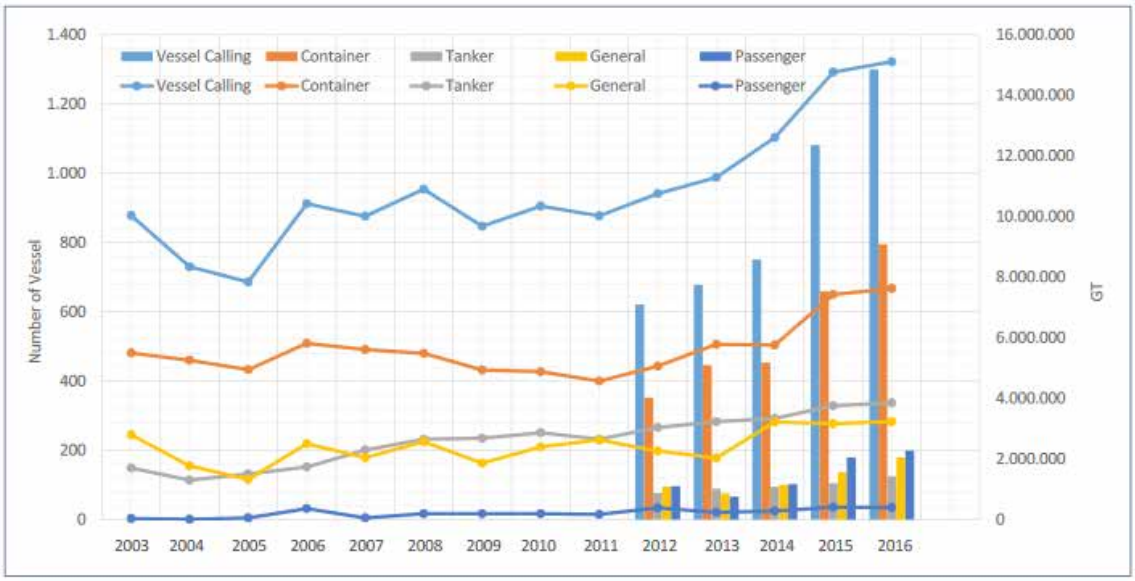
The ship calling frequency and port rotation are shown in **Table 6.5**. The number of vessel calls increased from 878 in 2003 to 1,322 in 2016 (**Figure 6.3**). Vessel calls by type of vessels are shown in **Figure 6.4**. Around 50% of the vessel calls was by container ships.

Table 6.5: Regular Shipping Line Schedules.

Lines	Calling Schedules	Frequency	Port Rotation
MAERSK	1. Mon 08:00 - Mon 24:00 2. Fri 16:00 - Sun 08:00	1 call/week 1 call/week	• SIN-SHV-SGZ-SIN • HKG-SHV-SGZ-HKG-(HPH-TXG-KEL)
RCL	1. Fri 16:00 – Sun 08:00 2. Mon 01:00 – Mon 16:00	1 call/ week 1 call/ week	• HKG-SHV-SGZ-HKG-HPH-HKG-KEL-TXG-HKG • SIN-SHV-SGZ-SIN
SITC (BEN LINE)	1. Sun 09:00 - Sun 21:00 2. Mon 14:00 - Tue 07:00 3. Thu 08:00 - Thu 21:00	1 call/week 1 call/week 1 call/week	• HCM-SHV-BKK-LZP-HPH-FCH-SHK-XMN-INC-TAO-SGH-HKG-SHK-HCM • HCM-SHV-BKK-LZP-HCM-NSA-NBO-SGH-OSA-KOB-BUS-SGH-HKG-HCM • SHV-LCP-BTU-BTG-SGH-HKG-SHV
SAMUDERA	1. Fri 00:01 - Sun 06:00	1 call/week	• SIN-SHV-SIN
EML /ACL	1. Sat 00:01 - Sun 06:00	1 call/week	• SIN-SHV-SIN
CMA	1. Sun 10:00 - Sun 24:00	1 call/week	• PKG-SHV-LCH-PKG-CGP-PEN-PKG
COSCO	1. Fri 01:00 - Fri 09:00	1 call/week	• SHK-SHV-BKK-LCH-NBO-SGH-SHK
KMD/HAS/TSL	1. Tue 08:00 - Tue 21:00	1 call/week	• HCM-SHV-BKK-LCH-SGH-NBO-SHK-HCM
HYUNDAI	1. Mon 00:01 - Mon 14:00	1 call/week	• LCH-SHV-MNL-BUS(T)-BUS(H)-INC-TXG-BUS(H)-USN-BUS(T)-KAN-SGH-HOCH-LCH
NAMYUEN YONG	1. Mon 08:00 - Mon 14:00	1 call/week	• BKK-LCH-SHV-BKK
TOTAL		**~14 Calls / week**	

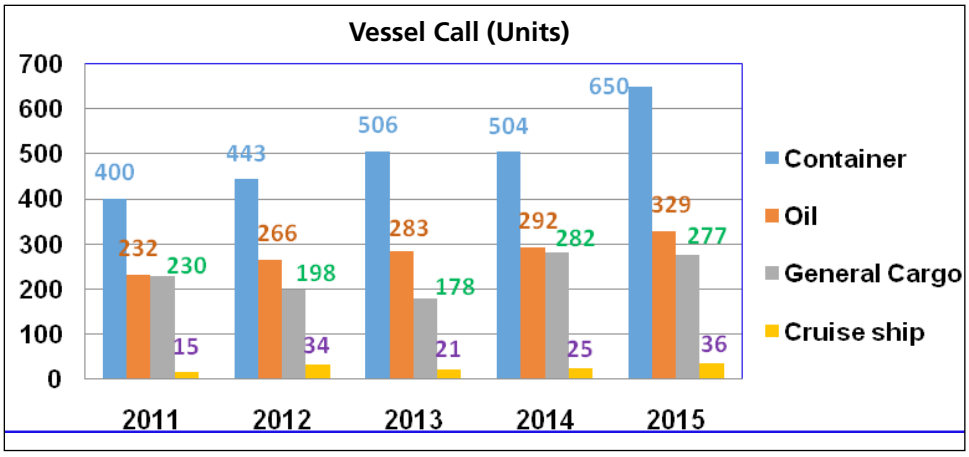
Source: PAS 2017.

Figure 6.3: Vessel Calls, 2003–2016.



Source: Excellency Lou Kim CHHUN, Chairman of PAS, 2017.

Figure 6.4: Ship Calls in Port Autonomous Sihanoukville.



Source: PAS 2016.

There has been an increase in the arrivals of cruise ships, from around 8,000 ships in 2011 to more than 43,500 ships in 2015 (**Table 6.6**). Cruise tourism has the potential to become a major ocean industry, contributing to the growth of both tourism and shipping industries, and to income and employment, especially in the coastal areas.

Table 6.6: Cruise Ships.

Year	No. of Vessel	No. of Passenger
2011	15	7,958
2012	34	20,436
2013	21	16,527
2014	25	21,687
2015	**36**	**43,549**

Source: PAS 2016.

6.3.1 Contribution to income and employment (2015, US$)

Cambodia's ports had earned total revenue of US$70 million in 2016, while the total tonnage rises every year. The recorded cargo shipments at PAS increased to 399,192 twenty-foot equivalent unit (TEU) from January to December of 2016, up by 1.86% over 2015; while cargo shipments via Phnom Penh Autonomous Port (PAPP) reached 150,000 TEU in 2016, up by 8.14% from the previous year.

The PAS's revenue in 2016 alone was approximately US$53 million; an increase of 3.38% compared to a year earlier, while that of PAPP was US$16.95 million, up by 7.79%. In 2014, the revenue of PAS totalled more than US$44 million, up by 15% from US$39 million in 2013.

PAS handles more than 60% of Cambodia's cargo traffic, and has seen an average annual revenue growth rate of 10% since 2012. In 2010 and 2011, the port recorded revenue declines off the back of poor currency exchange rates between the US dollar and the Japanese yen when the company had to repay debts to the Japanese government.

In 2014, cargo traffic at PAS reached 3.4 million tonnes, up by 14% from 3 million tonnes in 2013. The most commonly exported products are garments, rice, and cassava. Imported items included industrial equipment and machinery and construction materials.

6.4 Planned Development

Around six offshore oil fields are being developed or are planned to be developed at the offshore of PAS. A new multipurpose terminal, which will consist of a supply base for those offshore oil fields and a handling area for bulky materials, such as wood chip or coals, is now in the process of detailed design, with assistance from Japan International Cooperation Agency (JICA).

In addition to PAS, there are other smaller ports, such as the Sre Ambel Port, Kampot Port, and Oknha Mong Port. Among them, Oknha Mong Port is quite active for imports of smaller general cargo. Kampot Port is now under expansion works. Kirisakor of Koh Kong has an expansion plan for sugar transportation. There are also plans for developing new ports in Kirisakor of Koh Kong Province (deep seawater port), Steung Hav of Prea Sihanouk Province (international port), and Kep Province (tourist port).

The Sihanoukville Port Special Economic Zone, which occupies 70 ha of the Port Authority's land adjoined to a container terminal of the Sihanoukville Port, was constructed with a soft loan from Japan in October 2009. It became available for investors to start building factories in November 2011, depending on the location of plot.

6.5 Major Issues

Major environmental issues that may arise from shipping and ports activities are associated with water pollution, shipping accidents, oil spill, emission of greenhouse gases, and habitat loss. To date, there is no information on such environmental problems. Due to the port development projects and increasing shipping activities, there is a need to consider the major environmental issues:

6.3.1 Pollution from port activities and development

The project on Sihanoukville seaport rehabilitation was approved by the government in 1998. It involved the construction of port facilities, including a container cargo berth and its handling equipment installation. In constructing this container port, about 1,312,000 m^3 of soil were removed from the berth area, and an additional 465,000 m^3 were dredged from the canal.

There are two main problems to consider when removing soil from the sea. First, there are particles that may be released during the removal of this large amount of soil. If there are many particles and debris generated and suspended in the water, the current will transfer them to other places. In this case, these particles and sediment will pollute the seawater and may affect other places, including fishing grounds, sensitive areas and recreational beaches, which must be protected from any kind of pollution. Second, proper dumping places are required for disposal of the removed soil and dredged materials. It may cause pollution in the sub-soil and groundwater.

6.3.2 Pollution from maritime activities

The number of ship movement at Sihanoukville Port is increasing every year. It is interesting to note that the international community is concerned with new types of marine environmental pollution and other issues that may have an impact on Cambodia waters: invasive species caused by ballast water discharged from ships; ship accidents and oil spills; harmful and toxic substances that may be released from ships; and abandoned ships that affect maritime navigation.

Small-scale pollution can be found in ports in terms of (a) sewage, (b) garbage, and (c) oil spills that are caused during normal operations of ships and ports, and accidents when loading and unloading goods.

6.6 Response

The *Joint Statement on Partnership in Oil Spill Preparedness and Response in the Gulf of Thailand* (GOT Program) aims to enhance national and regional competences on oil pollution prevention, preparedness and response by exchanging information, research, and conducting oil spill response (OSR) exercise for implementation throughout the Gulf. The Joint Statement was initiated by PEMSEA, and signed on January 12, 2006 in Hanoi by Cambodia, Thailand, and Vietnam.

Cambodia also worked together with other ASEAN Member States to combat oil spill by signing the *2014 Memorandum of Understanding (MOU) on ASEAN Cooperation Mechanism for Joint Oil Spill Preparedness and Response*. The objective of this MOU is to promote a regional collaborative mechanism for building capacities and capabilities in preparedness for and response to oil spill incidents, as well as for promoting mutual assistance in preparing for, controlling and combating oil spill incidents in the ASEAN region (Article 1).

The ASEAN MOU also addresses areas of cooperation (Article 2):

1. Each Party shall, subject to the laws, rules, regulations and national policies from time to time in force, governing the subject matter in each country, cooperate to:
   (a) facilitate the implementation of applicable International Maritime Organization (IMO) conventions and regulations, as appropriate, to prepare for, reduce, and control oil spills;
   (b) individually and/or jointly undertake appropriate measures to prepare for and respond to oil spill incidents in the ASEAN region;
   (c) develop a Regional Oil Spill Contingency Plan, to coordinate and integrate response to oil spill incidents:
      - affecting or likely to affect the marine and coastal environment of one or more Parties; or
      - exceeding the response capacity of any one Party.
   (d) develop strategies and action programmes to strengthen capacity and capability of ASEAN Member States including the conduct of regular joint training courses or joint exercises in order to improve the level of preparedness, cooperation and coordination among operational personnel and in particular response teams of the Parties;
   (e) share information to enhance level of preparedness to oil spill incidents and strengthen actual response operations;
   (f) jointly conduct and/or share the results of research and studies on the scientific and technical aspect of oil spill preparedness and response; and
   (g) promote partnerships with relevant stakeholders including ASEAN Dialogue Partners, governmental and nongovernmental organisations, and shipping and petroleum industries.

Details of the cooperation and activities undertaken based on the MoU shall be discussed and agreed by the Parties on a case-by-case basis.

Cambodia has drafted its national Oil Spill Contingency Plan, including the mechanism for the Joint Oil Spill Response in the Gulf of Thailand. (Its adoption is still pending.)

In addition, the *Environmental Sensitivity Index (ESI) Mapping* in Cambodia has been completed with support from PEMSEA and Korea International Cooperation Agency. The ESI Atlas is useful for the oil spill contingency planning, responding to oil spill incidence, and protecting the coastal and marine resources along the Gulf of Thailand.

7 Other Ocean Economic Activities

7.1 Fish Ports

Landing locations are not separated from fishing locations in the official statistics. However, most fish are landed in Sihanoukville (21,200 tonnes) and Koh Kong (17,750 tonnes) (2001). Harbour facilities are also limited. Much of the catch is transferred on the ocean to Thai vessels for landing in Thailand.

Sihanoukville and Koh Kong host the two major sea fishing ports. As of January 2018, there are around 7,379 fishing vessels (See **Table 4.4**).

The coastal fishery is characterized by small family-scale fishing operating in fishing zone 1, which extends from the coast to a depth of 20 m. Boats used are either without engines or with engines of less than 50 hp. The numbers of boats per horsepower category are shown in **Table 4.4**. Licenses are not required for boats with no engine or with engine below 33 hp. Boats with more than 33 hp engine pay a license fee of KHR27,000 (equivalent to US$7) per horsepower per year. Fishing activities that are not allowed include trawling, light fishing, and illegal fishing gear.

The commercial fishery is characterized by large-scale fishing from 20 m depth to the limit of the EEZ. Boats, in general, use engines of more than 50 hp. These boats pay the fee of KHR27,000 per horsepower per year. They use all different kinds of fishing gears, including single trawling. Just like the coastal fishery, the prohibited fishing gears and methods for commercial fishery include pair trawling, light fishing, and other illegal fishing gear.

The marine fisheries sector of Cambodia is a multi-species fisheries industry. There are numerous fishing vessels targeting specific species. Remarkably, most of the fishing fleet operating in Cambodia seasonally change fishing gear according to the abundance of particular species and market demand. Sometimes the catch of non-targeted species (i.e., by-catch) may be much higher than the targeted species. However, if the non-targeted species commands a much lower price, it is termed ‘trash fish’.

7.2 Ship-building

There is neither a shipbuilding industry nor a modern shipyard in Cambodia, except for small boatyards and facilities operated by local people to repair fishing boats.

There are four small-scale landing yards along the coastal line of the Gulf of Thailand (Steung Hav, Koh Kong, Sre Ambel, and Sihanoukville). All of these are very small scale, and are mainly for wooden

fishing vessels of 10 gross tonnage (GT) and under. There is also a landing yard in Sihanoukville Autonomous Port, but it is dedicated to the ships that belong to the port. The biggest scale among the four is the Steung Hav shipyard, but the maximum capacity is 50 GT. All the Cambodian vessels greater than 50 GT are obliged to go to Thailand or Vietnam for dry docking and repair.

Steung Hav is situated along the coastline of Kampong Som Bay near Sihanoukville, around 30 minutes by car from National Road No.4 utilizing bypass roads. It is said that there are more than 5,000 fishing vessels along the Cambodian coastline of the Gulf of Thailand. About 95% of 5,000 families in Steung Hav Municipality earn their living partially or totally by fishing. Most of the fishing vessels of 10 GT and over utilize this shipyard. Thus, the shipyard plays a vital role for fishing industries along the Cambodian coastline of the Gulf of Thailand. The activities of the shipyard, however, is declining every year due to the deficiencies in the facilities.

The yard has an area of around 4 ha (3 ha are utilized for building site):

- **Dry-docking facility:** It includes a rail and truck system with a 4-meter width rail, and equipped with three Lifting Cradles (length: 6 m; width: 5 m). The lifting capacity of the winch is 30-40 tonnes. Guide rails are distributed from the winch up to the shore (around 150 m). The guide rail is extended into the sea for 200 m to keep the depth up to 4 m. The guide rail system is also built around the building site so that 10-15 ships can be dry docked at the same time.
- **New Shipbuilding:** They are capable of new wooden shipbuilding up to 50 GT. They are capable of building 10 GT type of wooden fishing vessels within 1.5 months. The contruction of vessels made of fiberglass-reinforced plastic (FRP) had been tried previously, but only up to the design stage due to the higher price of the materials compared to wood.
- **Ship Repair:** The main facilities are composed of building sites, a machinery factory, an electric generator, and a winch. All facilities are badly maintained. The original capacity of the winch was 100 tonnes. At this capacity, they could build and repair up to 400 GT wooden and steel vessels. However, they can cater to ships of up to 50 GT only mainly because of the limited winch lifting capacity.
- In usual cases, two ships are dry-docked every day, and 10 ships are on the building site at the same time. About 95% of the users are fishing vessels; others are cargo vessels and passenger vessels. The repaired ships number around 500 vessels or more in one year.
- **Engineer:** 10 ship carpenters are stationed in the building site. They employ welders, electric engineers, and machinery engineers on a temporary basis from Steung Hav municipality. The salary is from US$30 to US$50 per month.
- **Docking Charge:**
  - Below 10 GT, 66 Hp: US$25/ship/month,
  - Larger Vessel: US$50/ship/month

PART 3

DEVELOPMENTS IN BLUE ECONOMY

8 Blue Economy Initiatives

8.1 Drivers of Future Growth, Innovations and Sustainability

The development of the blue economy can make use of the National Green Growth Roadmap which can be applied in the coastal and marine areas. The Roadmap is focused on addressing seven "Accesses":

- Access to clean water and sanitation;
- Access to renewable energy;
- Access to information and knowledge;
- Access to means for better mobility;
- Access to finance and investments;
- Access to food security (agriculture) and non-chemical products; and
- Access to sustainable land-use.

These accessibility needs will be addressed through green economic growth projects and programmes, including eco-efficient and resource-efficient innovations, which can create opportunities and new "green jobs". However, this roadmap is focused more on terrestrial activities. Additional 'accesses' are needed for the blue economy. Nevertheless, the roadmap can be applied to support innovations and sustainable and inclusive growth in the coastal and marine areas.

8.2 Innovative and Sustainable Economic Activities for Blue Economy

8.2.1 Sustainable fisheries and ecosystem conservation

There is limited marine aquaculture development in the coastal area. Most seafood supply comes from capture or catch from the sea and mangroves. The fisheries industry is small scale and household level where limited technologies are used to catch fish. Seafood includes crab, mollusks, shrimp, squids, and fishes, and they are supplied by local fishermen using traditional fishing gears.

To ensure sustainability of marine fisheries as well as food security, Cambodia has zoned areas for fish sanctuaries, and seagrass and coral reef conservation (**Table 8.1**). Kong Rong has been designated as an MPA. Furthermore, there are four reserves that have marine components: Botum Sakor National Park, Ream National Park, Dong Peng Multiple Use Area, and Peam Krasoab Wildlife Sanctuary, which includes the Koh Kapi Ramsar site (SoECCsr, 2013).

Table 8.1: Fish Sanctuaries and Conservation Zones for Coral Reefs and Seagrass.

Province	Fish sanctuary zone (ha)	Coral reef and seagrass conservation zone (ha)	Total (ha)
Kampot	35	1500	1535
Kep		600	600
Koh Kong	705	128	833
Preah Sihanouk	332	600	932

Source: 3rd SoECCsr 2013; Coastal Fishery Conservation Map, FiA 2011.

More inclusive fisheries production

In response to pressures on both inland and marine fisheries and in favor of strengthening local resource co-management, the government focused on supporting community-based fisheries and reduction of commercial fishing lots. The government's fishery reform in 2012 involved the release of 538,000 ha (56%) and release of former inland private fishing lots for public access. This reform indicated the strong government commitment to sustainable management and protection of fisheries resources while securing local community livelihoods. The organization and redefining of boundaries of fishing lots and the fisheries community, particularly for the marine fisheries, have been successfully undertaken. Community-based fish sanctuaries, enforcement of anti-illegal fishing, and habitat conservation have also been improved by the government.

Under the Preah Sihankouk ICM program, a revolving fund for households was set up to support supplemental livelihood projects as well as put up micro-enterprise projects to reduce fishing pressure.

8.2.2 Climate-smart aquaculture and integrated farming system

In the coastal provinces, Cambodia implemented the Vulnerability Assessment and Adaptation Project for Climate Change in the Coastal Zone of Cambodia Considering Livelihood Improvement and Ecosystems (VAAP). One of the main activities for livelihood improvement is the application of integrated farming systems (IFS), which was adopted and integrated in the Commune Development Plans (CDPs) and Commune Investment Plans (CIPs) by the commune councils and provincial development authorities (PDAs). The model of Climate-resilient IFS has also been adopted and included in the Climate Change Action Plan (CCAP) for Agriculture, Forestry and Fisheries 2014–2018 to enhance the resilience of farmers and farming communities in the coastal area and climate adaptation in agriculture and livelihoods. Climate-resilient IFS should also be expanded to other areas, supported by a new phase of CCAP.

The application of IFS has met some satisfaction due to climate change. For example, at the Demonstration Pilot areas, IFS training showed a positive impact, where 10 families receiving IFS training has helped in addressing pest control and rice cultivation. However, in Koh Kong, only five out of the 10 families undertaking the IFS training are continuing the practice, while the other five families have reverted back to traditional techniques (not climate smart agriculture). IFS implementation is very dependent on farm size, labour availability and season. (The IFS approach is far better for small farms.) These factors should be considered in any future replication strategy that may be adopted. For the replication of IFS training, the cost for each farmer would be between US$50–US$100 per farmer.

The VAAP project also supported the setting up of a local marine protected area at Peam Kraosob and all associated supporting regulations. The VAAP has strengthened institutional capacity and policy coordination by providing a platform from which to mainstream climate change policy into national and local development plans. Capacity has certainly been enhanced especially on how to undertake climate vulnerability assessment, and adaptation planning work. A considerable knowledge base has also been gained on tools, techniques, and approaches – ranging from IFS, mangrove planting, and dyke rehabilitation – to help reduce vulnerability of productive lands to floods, thereby improving the resilience of coastal livelihoods to climate change (project intended impact).

8.2.3 Ecotourism/sustainable tourism

Coastal and island ecotourism is considered as a key driving sector for economic growth in the coastal and marine areas. Tourists visiting these areas can enjoy clean beaches, mangrove forests, coral reefs, diving, swimming, and fresh seafood.

In 2016, Preah Sihanouk province alone welcomed nearly 2.4 million tourists (of which about 30% are foreign tourists), generating around US$96 million in revenue, following a significant rise in domestic and international tourist arrivals. Many tourists visited Koh Rong and other islands to enjoy the clean sandy beaches, dive in the coral reefs, and eat fresh seafood. At night time, tourists also enjoy other recreational places as well.

Coastal use plan and zoning

The coastal use zoning (CUZ) scheme was developed in Sihanoukville as part of its ICM program to ensure optimal use of the coastal and marine resources and reduce multiple use conflicts, while promoting sustainable activities along the coast, in particular tourism and recreation. The CUZ was adopted by the National Steering Committee in 2005. Zoning is being enforced in beach

areas and protected areas, such as Occheauteal Beach (3 km), Serendipity Beach, Otress (3.7 km), and Kampong Smach (3,000 ha). Sea use zoning is also being implemented in Kampot Province. Coastal use plans and zoning schemes are also being applied along rivers and streams, and for sustainable island development.

The improved management of Occheauteal Beach in Sihanoukville, for example, resulted in several key outcomes as observed by the Ministry of Tourism: (a) increased number of tourists in Sihanoukville; (b) increased length of stay of tourists in the beach; (c) higher earnings for establishments along the beach, and increased number of people employed in the beach area; (d) strengthened government and private sector partnership; (e) higher public awareness on the importance and benefits of coastal management; and (f) greater political commitment for coastal management.

8.2.4 Sustainable ports

Cambodia does not have a green port policy yet; but the Sihanoukville Autonomous Port is undertaking environmental sustainability activities, such as water and energy conservation, air pollution reduction, wastewater and solid waste management, and other sustainable development and sustainable business practices. The international seaport of Sihanoukville has been upgraded and new facilities are installed with efficient resource-use equipment. It has put in place the Port Safety, Health, and Environmental Management System (PSHEMS), with support from PEMSEA.

For the semi-autonomous seaports and private ports, water and energy are targets for conservation to increase savings. Regarding waste, those seaports have contracted a local waste collection company to collect and transport solid waste to dumpsites. PAS offers solid waste collection for incoming cargo and passenger ships.

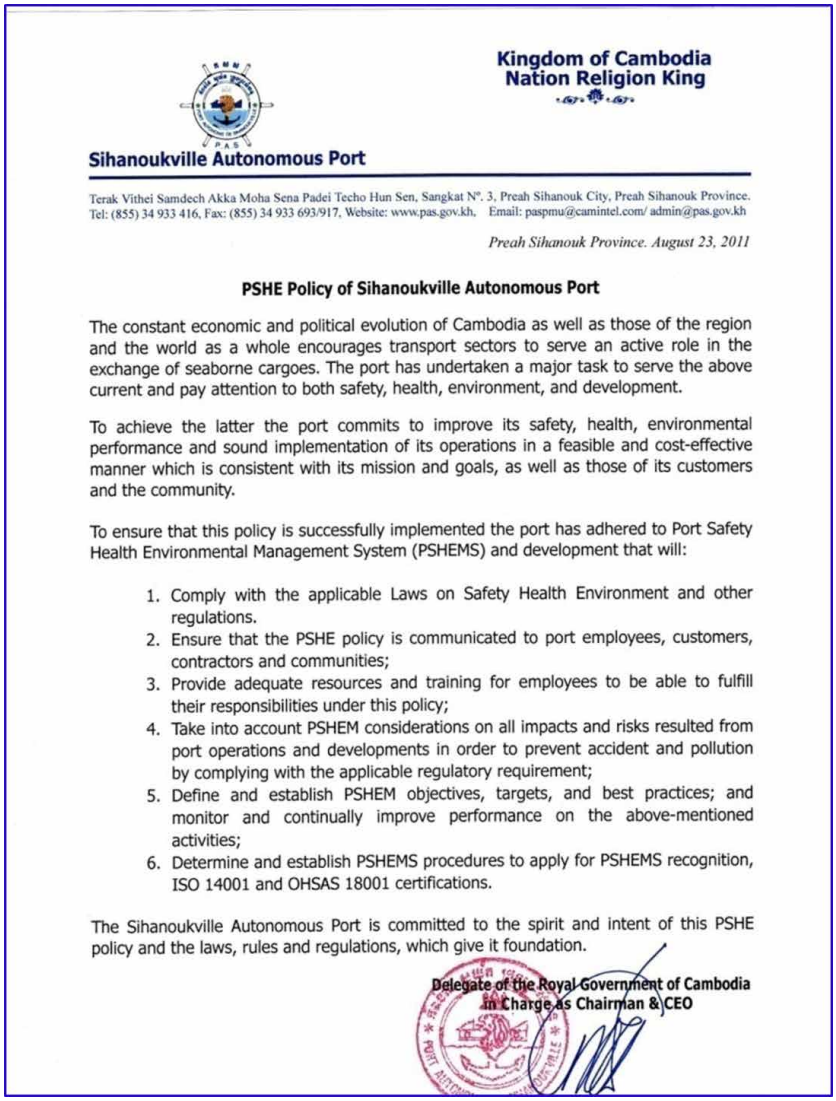
With support from PEMSEA, PAS is implementing the **Port, Safety, Health and Environmental Management System (PSHEMS)**. PAS issued a circulation on 23 August 2011 for the implementation of the PSHEMS policy at PAS (**Figure 8.1**). The development and implementation of its PSHEMS resulted in concrete economic, social, and environmental benefits. The PSHEMS is also being implemented in the Phnom Penh Autonomous Port (PAPP), the main river port in

Cambodia. Technical assistance and capacity development provided by PEMSEA from 2012 to 2017 involved the following:

- Phase 1: PSHEM Code, PSHEMS Understanding and Implementation; PSHEMS Initial Status Review
- Phase 2: PSHEMS Strategic Planning
- Phase 3: PSHEMS Development and Documentation
- Phase 4: PSHEMS Implementation and Monitoring
- Phase 5: PSHEMS Internal Audit
- Phase 6: PSHEMS Management Review and Continual Improvement

Both Autonomous Ports of Sihanoukville and Phnom Penh have completed the Stage 1 Audit, and are expected to be awarded their PSHEMS certification in 2019.

Figure 8.1: PSHEMS Policy of Sihanoukville Autonomous Port.



Kingdom of Cambodia
Nation Religion King

Sihanoukville Autonomous Port

Terak Vithei Samdech Akka Moha Sena Padei Techo Hun Sen, Sangkat N°. 3, Preah Sihanouk City, Preah Sihanouk Province.
Tel: (855) 34 933 416, Fax: (855) 34 933 693/917, Website: www.pas.gov.kh, Email: paspmu@camintel.com/ admin@pas.gov.kh

Preah Sihanouk Province. August 23, 2011

PSHE Policy of Sihanoukville Autonomous Port

The constant economic and political evolution of Cambodia as well as those of the region and the world as a whole encourages transport sectors to serve an active role in the exchange of seaborne cargoes. The port has undertaken a major task to serve the above current and pay attention to both safety, health, environment, and development.

To achieve the latter the port commits to improve its safety, health, environmental performance and sound implementation of its operations in a feasible and cost-effective manner which is consistent with its mission and goals, as well as those of its customers and the community.

To ensure that this policy is successfully implemented the port has adhered to Port Safety Health Environmental Management System (PSHEMS) and development that will:

1. Comply with the applicable Laws on Safety Health Environment and other regulations.
2. Ensure that the PSHE policy is communicated to port employees, customers, contractors and communities;
3. Provide adequate resources and training for employees to be able to fulfill their responsibilities under this policy;
4. Take into account PSHEM considerations on all impacts and risks resulted from port operations and developments in order to prevent accident and pollution by complying with the applicable regulatory requirement;
5. Define and establish PSHEM objectives, targets, and best practices; and monitor and continually improve performance on the above-mentioned activities;
6. Determine and establish PSHEMS procedures to apply for PSHEMS recognition, ISO 14001 and OHSAS 18001 certifications.

The Sihanoukville Autonomous Port is committed to the spirit and intent of this PSHE policy and the laws, rules and regulations, which give it foundation.

Delegate of the Royal Government of Cambodia
in Charge as Chairman & CEO

Source: Sihanoukville Autonomous Port, (Retrieved from http://www.pas.gov.kh/en/page/navigation-pilotage-facility, on June 2018)

8.2.5 Renewable energy

Cambodia is interested in renewable energy production, but wind power, wave, current, and tidal energy are not developed in Cambodia due to natural limitations, access to technologies, and cost involved.

Biogas is the main alternative being used by the locals who have more than two cattle per family. Biodigesters treat wastewater and sludge, and produce energy, which can be used to fuel lighting and cooking appliances.

With technical assistance from IUCN Mangroves for the Future (MFF), and other international and local NGOs, farmers are using biogas digesters, which help them reduce the collection of firewood from the mangrove forests.[17]

[17] Cambodia Country Report on National Activities, 2015-2016. Presented by Lou Vanny, National Coordinator for Mangroves for the Future (MFF) – Cambodia, at the Thirteenth Regional Steering Committee Meeting, 25-26 October 2016, Cox Bazar, Bangladesh.

9 Investment Opportunities for Blue Economy

There are a number of investment opportunities along Cambodia's coastline, e.g., investments in wastewater treatment facilities, solid waste management facilities, sustainable tourism with beach and waste management, habitat conservation, green port development, etc. The following are examples of existing programs and facilities that need to be replicated, improved and scaled up:

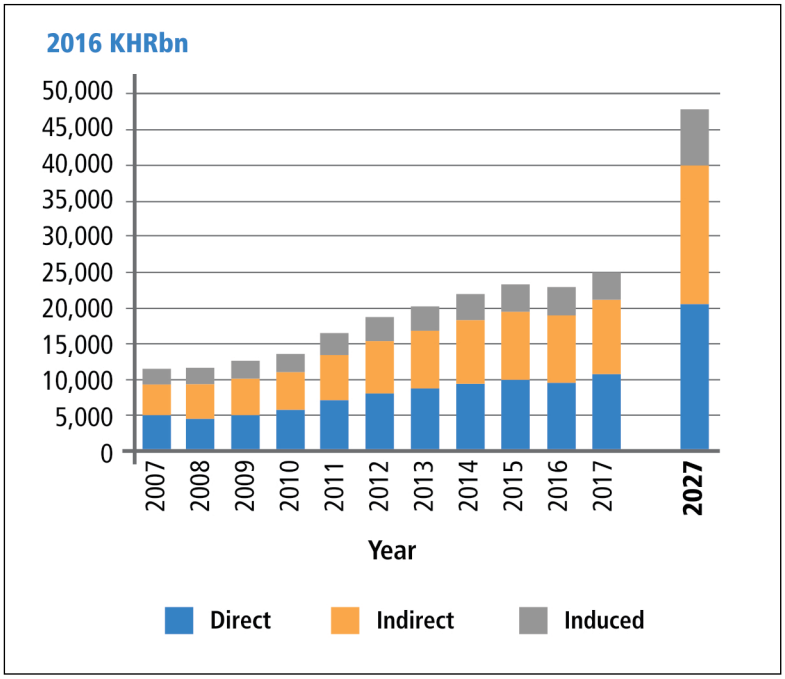
9.1 Investment in Sustainable Tourism

The growth potential of the tourism industry and its contribution to the country's GDP is significant as shown in **Figure 9.1**. Coastal and marine tourism is gaining traction due to the developments in the coastal provinces and islands, and its contribution to local incomes and livelihood. There is opportunity to make this sector "blue" or sustainable at the early stage, by implementing the zoning schemes for the beach areas and islands, and putting in place the environmental infrastructure, e.g., solid waste and wastewater management facilities. Involvement of the local stakeholders is also crucial. Best practices and lessons learned from Sihanoukville are shown in (**Table 9.1**)

Table 9.1: Sustainable Tourism in Sihanoukville.

Blue economy initiative	**Sustainable tourism development**
Initiative/program/project	Enhance local environment and improve livelihood
Location	Krong Preah Sihanouk and other provincial tourist destinations
Innovations and best practices	• Coastal Land Use plan and zoning schemes for beach area, buffer zone/beach corridor; business area, green space, public accessibility, public roads, sanitation facilities • Sound solid waste management practices • Wastewater treatment facilities
Benefits and outcomes	Higher incomes for stall owners, hotels/homestay; Public accessibility of beach and other tourist attraction sites; Erosion and pollution being addressed; Biodiversity conservation and eco-tourism gained; Increasing contribution to GDP (**Figure 9.1**)
Supporting policies and institutional arrangements	• Policies and laws: Sub-Decree on Solid Waste Management, Sub-Decree on Water Pollution Control, Environment and Natural Resources Code (to be adopted), etc. • National policy on setback zoning and coastal use plan
SDGs being achieved	SDG 8 (sustainable tourism and green job created, promotes local culture and products); SDG 12 (sustainable consumption and production); SDG 14 (sustainable use of marine resources)

Figure 9.1: Contribution of Travel and Tourism to GDP.



Source: WTTC, 2017.

9.2 Investment in Sustainable Ports Development

There are investment opportunities and initiatives in PAS. **Figure 9.2** shows the expansion and phased development plan of the port.

1. **Special Economic Zone:** The total land area is 70 ha behind the PAS. This zone will have two components:
   - ***Export Processing Zone***, where export-oriented manufacturing companies are primarily located; and
   - ***Special Economic Zone***, where logistics and service providers will be located.

2. **A new multi-purpose terminal** is being built in the PAS with Japan's ODA, as a supply base for offshore oil fields and a handling base for bulky materials, such as woodchips or coal.

These expansion plans should include investments in transforming PAS into a 'green port', such as facilities for water and energy conservation, waste management, greenhouse gas emission reduction, faster shir turnaround time, etc.

Table 9.2: Sustainable Port in Sihanoukville.

Blue economy initiative	**Towards green ports development**
Initiative/program/project	Apply waste reception facilities; sustainable resource use; port safety, health and environmental management system (PSHEMS)
Location	Sihanoukville Autonomous Port
Innovations and best practices	• Oil Spill Contingency Plan (to be approved) • Environmental Sensitivity Map • Apply appropriate technologies for waste reception and facilities • Apply efficient resource-use and energy-use practices to reduce carbon emissions and operational costs
Benefits and outcomes	• Environmental and economic benefits (e.g., improved water quality; energy savings; etc.) • Met international standards on port and environmental management schemes
Supporting policies and institutional arrangements	• Policies and laws: Sub-Decree on Solid Waste Management, Sub-Decree on Water Pollution Control, Environment and Natural Resources Code (to be adopted), etc. • Apply international conventions related to shipping and port, such as MARPOL, SOLAS, and other environmental frameworks • Multilateral agreements implementation met
SDGs being achieved	SDG 7 (sustainable and modern energy for all); SDG 11 (reduce environmental impact of the cities); SDG 12 (sustainable consumption and production); SDG 14 (life below water; reduce marine pollution)

Figure 9.2: Port Development in PAS.

Source: PAS 2016.

9.3 Maritime Insurance

Since 2000, Cambodia made a transition to a free market economy that allowed the growth of the insurance market in Cambodia. The Government has updated laws and regulations that were promulgated during 1990–1999. For example, the Law on Insurance Business Establishment was amended with 56 Articles, and adopted by the National Assembly on 20 June 2000. Thereafter, the Sub-Decree on Insurance was adopted on 22 October 2001.

After the Law and Sub-decree on Insurance were promulgated, the Ministry of Economy and Finance issued several Prakas and Circulars. During this period, there were many important developments made. These include:

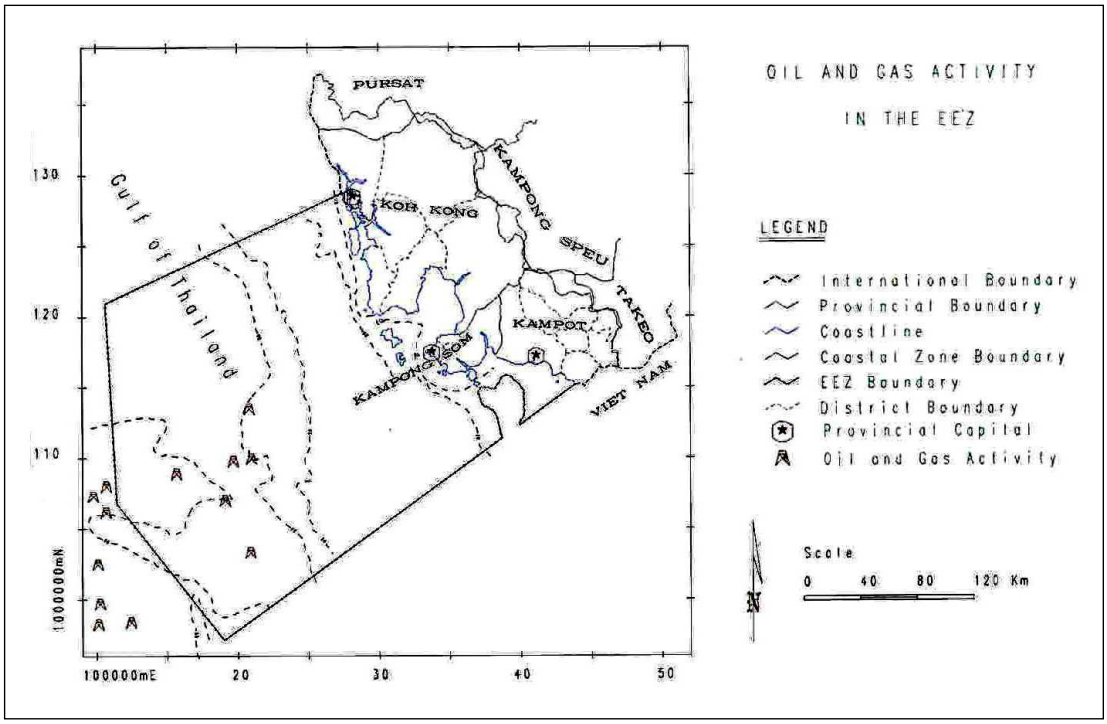
- On 17 August 2000, the Ministry of Economy and Finance issued Prakas on Organizing and Functioning of the Financial Industry Department, which defined the roles and responsibilities of the Insurance Division.
- On 8 April 2001, the Government of Cambodia (Ministry of Economy and Finance) signed Protocol 5 on ASEAN Scheme of Compulsory Motor Vehicle Insurance with ASEAN member countries.
- On 31 December 2001, RGC decided to set up a public enterprise in the form of a state-owned company, the Cambodian National Insurance Company (Caminco), under technical control of the Ministry of Economy and Finance.
- On 24 January 2002, RGC decided to set up another public enterprise in the form of a state-owned company, the Cambodian Reinsurance Company (Cambodia RE), under technical control of the Ministry of Economy and Finance.
- On 09 December 2002, the Ministry of Economy and Finance issued the Circular on Temporary Licensing with the purpose of fostering insurance businesses in line with the scope of the market at that time.
- In 2003, three Caminco's Agents were transformed to general insurance companies and a temporary license issued for 5 years.
- On 14 October 2005, General Insurance Association of Cambodia (GIAC) was established with the approval of registration from the Ministry of Interior. The objective of the GIAC is to strengthen the general insurance market through various means as stated in Articles and Memorandum of the GIAC.

Maritime insurance would be a new industry that could contribute to the ocean economic growth.

9.4 Offshore Oil and Gas

Oil and gas exploration within the Gulf of Thailand has the potential to grow. There are mining areas and exploration blocks set offshore of Cambodia. Appraisal drilling is being conducted at some areas (**Figure 9.3**).

Figure 9.3: Oil and Gas Activity in the EEZ, Cambodia.



Source: Ministry of Environment, GIS Office, 1998.

Development of offshore oil fields is an important project as it can have a large impact on Cambodia's economic development. In case a large-scale profitable offshore oil field is found and commercial production begins on a major scale, a huge amount of equipment and materials is needed for construction and operation of offshore drilling platforms. Thousands of people working on the project will need a large number of daily commodities like food, housing facilities, hotels, commercial facilities, and shopping centers. It is also assumed that a supply base for offshore drilling platforms would have port facilities, such as berths with 9-m draft and cargo handling equipment as well as a large expanse of land of 50 ha to 100 ha. On the other hand, in case profitable offshore oil fields are small, the required terminal for oil supply base will be small scale with berths of around 6-m depth. Therefore, future port development plans should take into account the movement in offshore oil field development. More over, there should be an assessment of environmental impacts of the offshore oil and gas activities and port operating contingency plans, and mitigation measures.

9.5 Renewable Energy, Ocean Energy and Energy Security

Cambodia has been investing in energy from small and medium hydropower plants to complement the major supply from fossil-fuelled power plants. Biogas from treated wastewater and sludge is also being used in rural areas as fuel for lighting and cooking. Marine renewable energy, such as offshore or coastal wind, tidal, and current power plants, however, face natural constraints like limited wind speed, and low current strength. Solar power can be an option for investment, but cost effectiveness and economic viability are potential issues for investors.

9.6 Investment in Waste Treatment Facilities

Solid waste and wastewater treatment facilities are essential for blue economy development, improvement of health and well-being of the people, and protection of oceans and ecosystems.

Table 9.3: Solid waste and waste management systems in Sihanoukville.

Blue economy initiative	**Environmentally-sound waste management**
Initiative/program/project	Build waste management systems for both solid waste and wastewater
Location	Krong Preah Sihanouk and other provincial towns
Innovations and best practices	• Selection and application of appropriate technologies for wastewater treatment and management • Sanitary landfill, and community-based solid waste collection system • Collection of user fees to support the community-based and municipal-wide solid waste collection system, sanitation and connection to the wastewater treatment facility • Apply Integrated Resoruces Recovery Center (IRRC), zero waste policy, and transfer of green technologies
Benefits and outcomes	Increased coverage; improved knowledge and capacity on solid waste management as well as wastewater management;
Supporting policies and institutional arrangements	Sub-Decree on Solid Waste Management, Sub-Decree on Water Pollution Control, Environment and Natural Resources Code (to be adopted), etc.
SDGs being achieved	SDG 6 (clean water and sanitation); SDG 11 (reduce environmental impact of the cities); SDG 12 (sustainable consumption and production); SDG 14 (life under water)

PART 4

STATE OF OCEAN HEALTH UNDERPINNING THE BLUE ECONOMY

10 Natural Conditions

10.1 Oceanography

10.1.1 Bathymetry

Cambodia has a 435-km long coastline with 55,600-km^2 exclusive economic zone (EEZ) and shares marine borders with Thailand and Vietnam, in the Gulf of Thailand. The seabed of the Gulf of Thailand is a pan-like shape with deepest point of about 80 m, and the main deep channel lies in the middle of the gulf. The depth of Cambodia seabed is 20 m to 70 m.

In terms of oceanographic conditions, the difference between high water level (HWL) and low water level (LWL) is 1.43 m. The general current movements are from northwest to north with the maximum velocity of about 50 cm/sec, which occurs in various directions.

According to the 1997 JICA report,[18] the offshore waves with height not exceeding 0.5 m occupy 92.3% while those exceeding 0.75 m height are estimated to account for only 0.8%. However, the maximum significant offshore wave is calculated as 2.6 m in height with a 5.6 second-wave period from the west direction using the SMB[19] method, and with a return period of 50 years.

Fine sand, with silt of N-value less than 10, forms the upper part of the soil layer, and sandstone layer follows beneath it. However, the characteristics of the subsoil condition differ widely depending on the location.

10.1.2 Currents and tides

The ocean current is generated by the sea surface wind, which can produce a movable layer of water mass that is called the Ekman layer (50 m of the Ekman layers are generally found in oceans; 30 m - 40 m are found in the Gulf of Thailand). The movement of the water mass is called Ekman[20] transport. Theoretically, in the Northern Hemisphere, the layer of water mass from the surface is moved at an angle of 45 degrees to the right of the surface wind, and the angle is increasing in the deeper layer until they reach at the bottom of Ekman layer. The net transportation of water mass is at an angle of 90 degrees to the right of the surface wind. At this point, the direction of wind is totally opposite of the movement of water mass.

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[18] *The Study on the Master Planning and Feasibility Study of the Sihanoukville Port in the Kingdom of Cambodia: Final Report Vol.2* Master Planning June 1997.

[19] SMB: Sverdrup, Munk and Bretschneider. *The SMB method is used to measure wave height and other wave parameters, and estimate wave predictions*.

[20] http://marinegiscenter.dmcr.go.th/km/oceanography-of-the-gulf-of-thailand/?lang=en#.WdK88Yhx0cA

The water current generated by rivers or freshwater discharged from the rivers, which produces gravitational circulation, is suspended in the upper layer because of the lower density of freshwater and the higher density of saline water at the lower layer. The mixing of both fresh and saline water is influenced by currents and waves. Generally, the salinity in the Gulf of Thailand is extremely affected by freshwater discharge. However, the impact of salinity on the variation of current circulation in the Gulf of Thailand is not significant because the annual volume of the freshwater discharged into the gulf is very small compared with the total quantity of water mass in the Gulf of Thailand.

10.1.2.1 Tides

Daily tide cycle is mostly found in the Gulf of Thailand where only one high tide and one low tide occur each day. Since the Gulf of Thailand is shallow with rough seabeds, the movement of tidal waves is not consistent. When the waves approach the shorelines, they will then move back to the sea again and interfere with other waves. As a result, only single low and high tides per day remain. Some locations experience a mixed tide where two uneven tides a day occur. The Cambodian coastal tidal range is about 1 m.

10.1.2.2 Waves

The generation of waves in the Gulf of Thailand is influenced by monsoons. The northeastern monsoon produces the larger waves in the western Gulf of Thailand, while the southwestern monsoon produces the larger waves in the eastern Gulf of Thailand. The waves in the upper gulf are not too large because the southwestern monsoon is minor and occurs in a short period of time. Generally, the waves in the Gulf of Thailand are relatively small with the average height of 1 m – 2 m. Wave period should be considered because of the impact of waves on shorelines. For example, the impacts of a small wave with a long period are higher than the impacts of a large wave with a short period.

The strong wind occurs mostly during the Southwest Monsoon season in which the maximum wind speed is around 25 meters per second (m/sec).

10.1.3 Rainfall

In a year, there are two typical seasons: the Northeast Monsoon and Southwest Monsoon. The climate has no large seasonal change, and is tropical throughout the year. The coolest month is January with an average temperature of around 26°C, and the hottest month is April with an average temperature of around 29°C. The annual average temperature is nearly 27°C. The annual mean rainfall is about 3,000 mm to 4,000 mm. The average monthly rainfall in the rainy season is 300 mm to 700 mm; and in the dry season, it is less than 100 mm.

10.1.4 Coastal and offshore geology

The Cambodian coast is quite shallow along the coastal areas, which provide productive fishing grounds. Most of the streams, water channels, and rivers in southwestern Cambodia drain into the Gulf of Thailand. Many streams flow into the coastal areas, mainly Prek Kampot, Prek Kampong Som, Prek Teuk Sab, Stung Tatai, Stung Koh Pen, etc. Being shallow, water exchange in the coastal area is slow, and the strong water inflow from the streams/stungs make the Gulf of Thailand low in salinity and rich in sediments. Water with a higher salinity flows into the Gulf of Thailand from the South China Sea only at greater depths, filling the central depression below a depth of 50 m.

10.2 Water Resources

10.2.1 Rivers

The Mekong River and its tributaries comprise one of the largest river systems in the world. The central Tonle Sap – the Great Lake – has several input rivers, the most important being the Tonle Sap River, which contributes 62% of the total water supply during the rainy season. Direct rainfall on the lake and the other rivers in the sub-basin contribute the remaining 38%. Major rivers are the Sen River, Stung Sen River, Stung Pousat River, Sisophon River, Mongkol Borei River, and Sangkae River.

Smaller rivers in the southeast, the Cardamom Mountains, and Elephant Range form separate drainage divides. To the east, the rivers flow into the Tonle Sap, while in the south-west, rivers flow into the Gulf of Thailand. Toward the southern slopes of the Elephant Mountains, small rivers flow south-eastward on the eastern side of the divide.

The Mekong River flows southward from the Cambodia-Laos border to a point south of Kratié (town), where it turns west for about 50 km, and then turns southwest towards Phnom Penh. Extensive rapids run north of Kratie City. From Kampong Cham Province, the gradient slopes very gently. Inundation of areas along the river occurs at flood stage from June through November – through breaks in the natural levees that have built up along its course. At Phnom Penh, four major water courses meet at a point called the Chattomukh (Four Faces). The Mekong River flows in from the northeast while the Tonle Sap River, which emanates from the Tonle Sap, flows in from the northwest. They divide into two parallel channels, the Mekong River proper and the Bassac River, and flow independently through the delta areas of Cambodia and Vietnam to the South China Sea.

The flow of water into the Tonle Sap is seasonal. In spring, the flow of the Mekong River, fed by monsoon rains, increases to a point where its outlets through the delta cannot handle the enormous volume of water. At this point, the water pushes northward up the Tonle Sap River and empties into the Tonle Sap Lake, thereby increasing the size of the lake from about 2,590 km^2 to about 24,605 km^2 at the height of the flooding. After the Mekong's waters crest – when its downstream channels can handle the volume of water – the flow reverses, and water flows out of the engorged lake.

As the level of the Tonle Sap retreats, it deposits a new layer of sediment. The annual flooding, combined with poor drainage immediately around the lake, transforms the surrounding area into marshlands, unusable for agricultural purposes during the dry season. The sediment deposited into the lake during the Mekong's flood stage appears to be greater than the quantity carried away later by the Tonle Sap River. Gradual silting of the lake would seem to be occurring; during low-water level, it is only about 1.5 m deep, while at flood stage it is between 10 and 15 m deep.

10.2.2 Streams

Along the 435-km coastline on the Gulf of Thailand, the streams drain waters from the Cardamom Mountains, and the catchment areas are about 15% of the land area. The coastal watershed comprises an area of approximately 18,300 km^2. Streams that flow into the Gulf of Thailand are relatively small with water levels increasing and decreasing significantly depending on the volume of rainfall. Streams in the coastal area are very short, and have their sources in the hills with height of about 500 m to 600 m. They flow between hills and fall in cascades before reaching the plains, which are located 15 - 20 km from the sea. In delta areas, the streams divide into many estuaries where the level of turbidity is usually high, and significant marsh areas are covered by mangrove forests.

There are many streams located in the coastal areas, which usually dry up in the dry season. The sea influences most of the streams in the coastal zone. During the dry season, the outer parts of streams are saline. In Sihanoukville, there are many waterways running into the sea. Most of the waterways are small streams. These are Prek Tropeang, Prek Kountany, Prek Kountaveit, Prek Proh, Prek Sangké, Prek Toil, Prek Teuk Thlar, Prek Kampong Chen, Prek Banteay Prey, Prek Prapeang Sa-oy, Prek Pha-ao, Prek Kampong Smach, Prek Pring, Prek Toul Totoeung, Prek Teuksap, Prek Koki or Moatpeam, Prek Treng, Prek Rolous, Prek Thmor Roung, and Prek Takun.

Beside the small streams mentioned, there are many major streams, namely: O-Thom Stream, Chech Stream, Klorng Stream, Tapang Stream, Krong Klang Stream, Chamnar 1 Stream, Chamnar 2 Stream, Ouknha Heng Stream, Tasek Stream, Kambot Stream, Trao Stream, and Cheu Teal Stream. These major streams discharge water directly into the sea.

Most of the streams stated above transport solid and liquid wastes from households, factories, hospitals, restaurants, etc. to the sea. These pollutants affect seawater quality, corals, seagrass, etc., and endanger marine life. Notably, small streams that are most heavily polluted are the ones running behind the Angkor Brewery to O-Cheu Teal and O-Sam Art beaches, and a small stream discharges close to Sokha Motel.

11 Water Quality

Cambodia's sub-decree on water pollution control, issued in April 1999, provides the standards for public water quality and for supporting aquatic lives (**Table 11.1**). According to the 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013, only water quality monitoring at *preks*[21] that were collected and analysed between 2004 and 2006 are available (**Figures 11.1** to **11.4**). The samples were collected from 12 different preks that flow to the coastal area. This shows that an exvironmental monitoring system needs to be set up, with facilities and skilled staff.

Table 11.1: Marine Water Quality.

Parameters	Water Quality Standard[a]	Rating of coastal waters[b]
pH	7.0-8.3	
Dissolved oxygen (DO)	7.5-2.0 mg/l	Good
Chemical oxygen demand (COD)	2-8 mg/l	
Total nitrogen	0.2-1.0 mg/l	Good
Total phosphorus	0.02-0.09 mg/l	Good
Total suspended solids (TSS)	1-15 mg/l	Good
Oil	0 mg/l	
Coliform	<1000 MPN/100ml	
Heavy metals		

Sources: [a] Sub-decree on water pollution control, 1999; [b] UNEP/GEF Transboundary Water Assessment Programme, 2015; Millennium Ecosystem Assessment 2005.

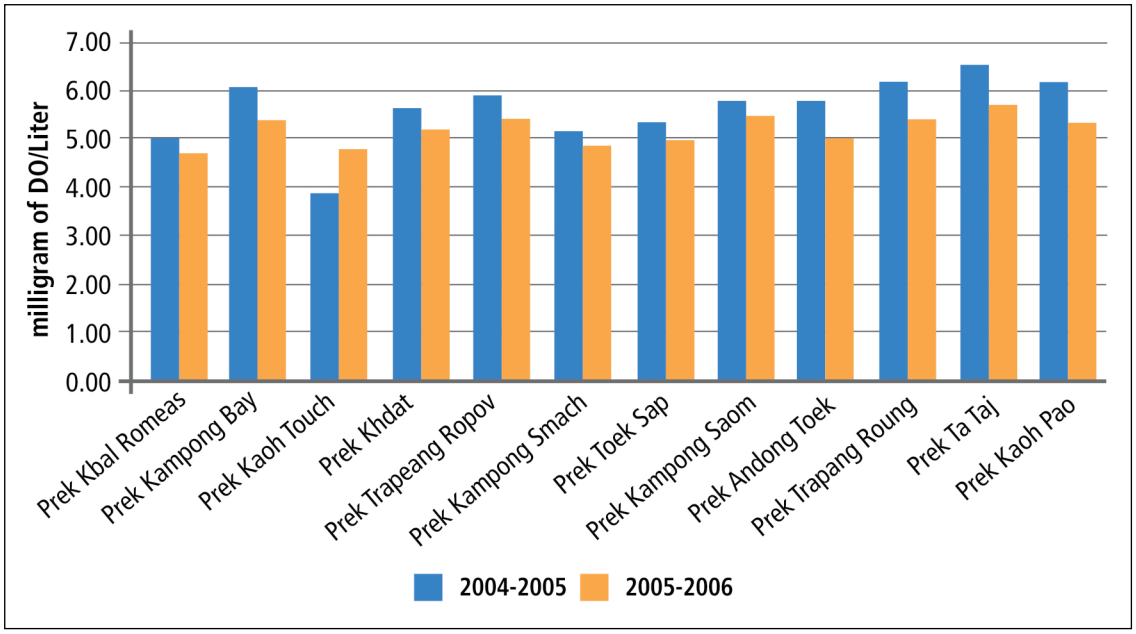
Dissolved Oxygen (DO). The average dissolved oxygen concentration in the coastal areas is about 5 mg/l. The lowest levels were found in Prek Kaoh Touch, and the highest levels were recorded in the most western streams/preks (Prek Ta Taj). See **Figure 11.1** for more information.**Biological Oxygen**

Demand (BOD). BOD is the amount of dissolved oxygen needed by organisms to aerobically break down organic material present in a given water sample at certain temperature over a specific time period. Most pristine rivers will have a five-day BOD (BOD5) below 1 mg/l.

Between 2004 and 2005, BOD showed the worst conditions in Prek Khdat and partly in Prek Kampong Bay at more than 1 mg/l. BOD was lower than 1.5 mg/l in all the other streams. Between 2005 and 2006, BOD in all streams in the coastal area was recorded to be lower than 1 mg/l (**Figure 11.2**). This indicated a decline in BOD for these years or an improvement in water quality. Between 2005 and 2006, among the 12 streams, the highest BOD was found in Prek Kampong Smach with approximately 1 mg/l, while Prek Kaoh Touch has the lowest BOD of less than 0.5mg/l.

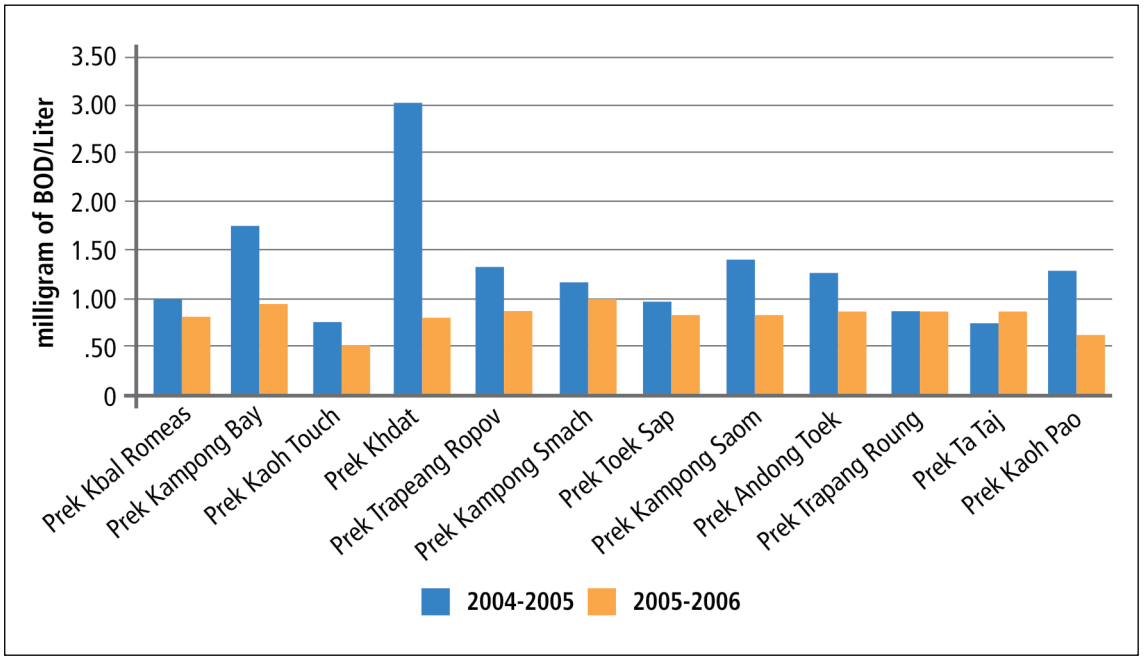
[21] *Preks* are streams flowing to the sea.

Figure 11.1: Average Dissolved Oxygen Levels (mg/l) in the Streams in the Coastal Zone.



Source: 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013.

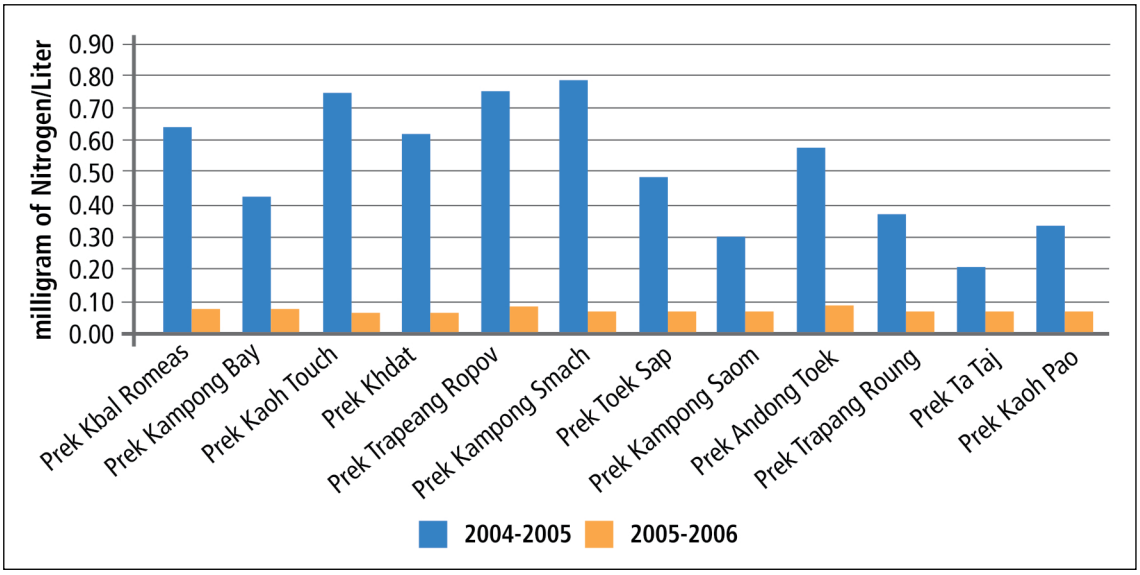
Figure 11.2: Average BOD Levels (mg/l) in the Streams/Preks in the Coastal Zone.



Source: 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013.

Total Nitrogen. The average concentration of total nitrogen between 2004 and 2005 shows the highest levels in the eastern areas, where there is higher rice production and also greater density of humans and livestock (**Figure 11.3**). Levels higher than 0.4 mg/l were recorded in Prek Kbal Romeas, Prek Kampong Bay, Prek Kaoh Touch, Prek Khdat, Trapang Ropov, Prek Kampong Smach, Prek Toek Sap and Prek Andong Toek. Prek Kaoh Touch has a total nitrogen concentration of about 0.07 mg/l, lower than other streams between 2005 and 2006. As compared to the data recorded during 2004 and 2005, it is noteworthy that between 2005 and 2006, the average concentrations of total nitrogen in all streams have generally dropped to less than 0.10 mg/l. However, this drop needs further examination. Moreover, the values are also very similar and should be considered as doubtful.

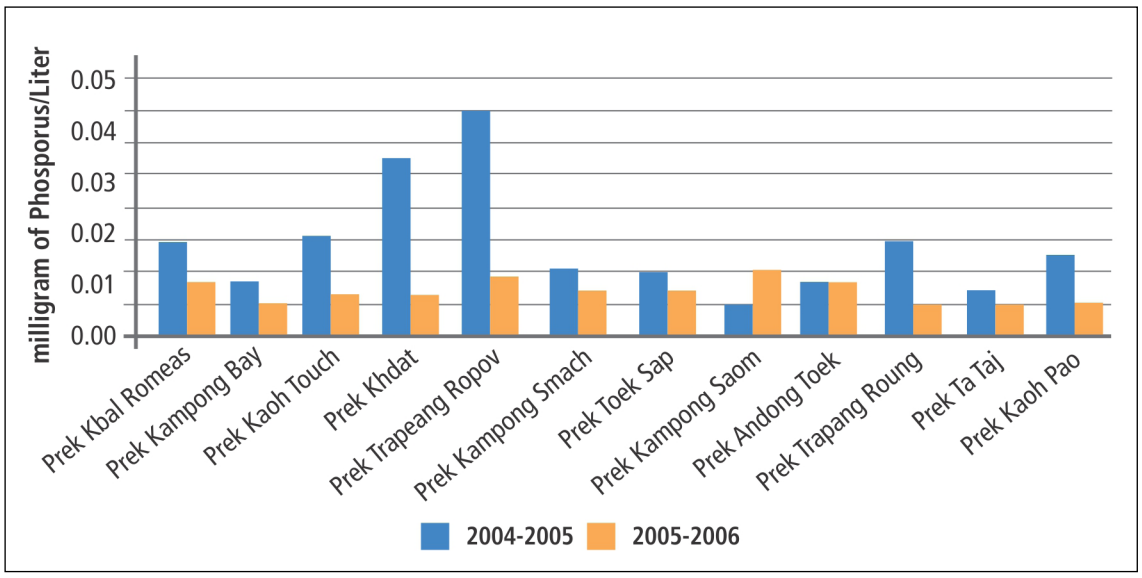
Figure 11.3: Total Nitrogen Concentrations in the Coastal streams.



Source: 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013.

Total Phosphorus. Between 2005 and 2006, the values of total phosphorus showed the highest levels in Prek Kampong Som and Prek Trapang Ropov, which were higher than 0.01 mg/l (**Figure 11.4**). In the western area, relatively low levels were recorded in Prek Trapeang Roung, Prek Ta Taj, and Prek Kaoh Pao. In the eastern streams, a low level was recorded in Prek Kampong Bay. In 2006, only the values of total phosphorus in Prek Kampong Som got higher than those measured in 2005. As compared to the data recorded during 2004 and 2005, the total phosphorus concentrations in the coastal streams have significantly dropped to approximately 0.01 mg/l, reflecting the trend of better conditions of freshwater quality in the coastal area, except those recorded in Prek Kampong Som.

Figure 11.4: Total Phosphorus Concentrations in the Coastal streams.



Source: 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013.

Between 2005 and 2006, the values of total phosphorus showed the highest levels in Prek Kampong Som and Prek Trapang Ropov, which were higher than 0.01 mg/l. In the western area, relatively low levels were recorded in Prek Trapang Roung, Prek Tatai, and Prek Kaoh Pao. In the eastern streams, a low level was recorded in Prek Kampong Bay. In 2006, only the values of total phosphorus in Prek Kampong Som got higher than those measured in 2005. As compared to the data recorded during 2004 and 2005, the total phosphorus concentrations in the coastal streams have significantly dropped to approximately 0.01 mg/l, reflecting the trend of better conditions of freshwater quality in the coastal area, except those recorded in Prek Kampong Som.

12 Coastal and Marine Ecosystems and Biodiversity

12.1 Mangroves

Cambodia's wetlands are an important habitat and are dominated by mangrove forestry. The mangrove consists of 74 species and they are relatively pristine forests growing in four major species zones from the shoreline to the landward edge.

In 1992, the total area of mangrove forestry in Cambodia is 85,100 ha, of which 63,200 ha grow in the Koh Kong province, 13,200 in Sihanoukville, 7,300 ha in Kampot, and 1,400 ha in Kep Municipality (Forestry Department, personal communication, and Mekong Remote Sensing Landsat, 1992). Abundant mangrove forest areas are located in the large estuary of Peam Krasob/Koh Sralao in the Koh Kong province. These areas are also reputed to be some of the best pristine mangrove forest left in the region. Many other estuaries are also growing mangrove on a small scale, such as at Koh Por, Koh Yor, Dong Tong, Andoung Tuk, and Sre Ambel.

The change in mangrove distribution in the coastal districts is indicated in **Tables 12.1** and **12.2**. The data has been derived based on the Forest Cover Monitoring 1993 and 1997, JICA 1997 Land Use Data; MoE 2002, 2005 and 2011 Interpretation. Some changes in classification and scale have occurred between these different surveys resulting in some uncertainty in areas actually covered by mangroves.

Table 12.1: Change in Mangrove Distribution from 1992 to 1997.

District	1992/1993	1996/1997	Change	% Change
Kampong Trach	1162	1162	0	0
Kampot	726	726	0	0
Kampong Bay	363	363	0	0
Botum Sakor	18520	16656	-1864	-10.1
Kiri Sakor	5741	5741	0	0
Koh Kong	13395	12971	-424	-3.2
Smach Meanchey	3133	2703	-430	-13.7
Mondul Seima	10811	10811	0	0
Srae Ambel	10817	8700	-2117	-19.6
Prey Nob	586	586	0	0
Stung Hav	10518	10518	0	0
Damnak Chang'aeur	672	672	0	0
Kep	74	74	0	0
Total	**76518**	**71683**	**-4835**	**-6.3**

Source: Department of Forestry and Wildlife. February 1999. Forest Cover Monitoring Book. This statistic information is supported by GTZ according to Forest Cover Monitoring.

There is a total reduction of 4,835 ha from 1993 to 1997, with the major reductions occurring in Botum Sakor, Smach Meanchey and Srae Ambel districts. The reductions were from 3% to 20% of the distribution in 1993.

Table 12.2: Change in Mangrove Distribution from 1997 to 2011.

Districts	1997 (ha)	2002 (ha)	2005 (ha)	2011 (ha)	Change 1997-2002	Change 1997-2005	Change 1997-2011
Kampong Trach	3854	319	350	1191	-3535	-3504	-2663
Tuek Chhou	1179	660	667	759	-519	-512	-420
Kampot	585	408	431	365	-177	-154	-220
Damnak Chang'aeur	952	666	710	538	-286	-242	-414
Kaeb	130	165	154	132	35	24	2
Botum Sakor	12889	11216	11502	9127	-1673	-1387	-3762
Kiri Sakor	4360	4203	4421	2507	-157	61	-1853
Kaoh Kong	11150	11044	10388	8099	-106	-762	-3051
Khemarakphumint	2085	2265	2108	1628	180	23	-457
Mondol Seima	6027	6889	6137	6282	862	110	255
Srae Ambel	11112	10452	10234	9518	-660	-878	-1594
Preah Sihanouk	146	45	45	115	-101	-101	-31
Prey Nob	7402	7479	7206	9351	77	-196	1949
Stueng Hav	352	490	929	769	138	577	417
Kampong Seila	818	0	0	55	-818	-818	-763
Coastal Zone	**63041**	**56301**	**55282**	**50860**	**-6740**	**-7759**	**-12181**

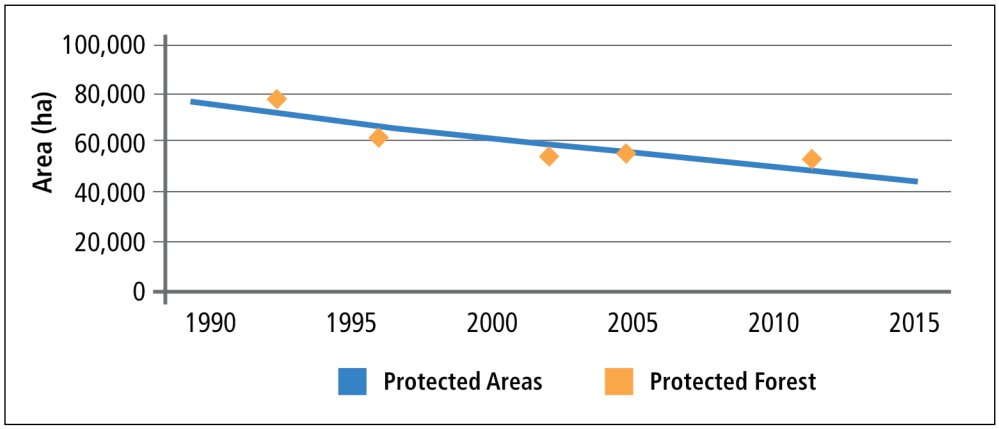
Source: SOECCSR. 2013. JICA 1997 Land Use Data; MoE-CCU. 2002, 2005 and 2011 Interpretation.

Table 12.3 shows that in the coastal area, there is a total reduction of 6,740 ha from 1997 to 2002, from which the major reductions were found in districts of Kampong Trach and Botum Sakor. From 1997 to 2005, approximately 7,759 ha of mangrove forest were degraded mostly in the districts of Kampong Trach and Botum Sakor. From 1997 to 2011, about 12,181 ha of mangrove forests were remarkably degraded mostly in the districts of Botum Sakor, Koh Kong, and Kampong Trach.

In the period from 1997 to 2002, the data shows a significant reduction in the mangrove distribution in Kampong Trach, Botum Sakor, and Kampong Seila. If the classification in 1997 in Kampong Seila was correct, there was also a significant reduction in this area. In some areas, a re-growth of mangroves is indicated, but this is questionable (SOER, 2005).

Figure 12.1 shows the forecast of change in mangrove coverage in the coastal area based on the trend from 1993 to 2011. From 1993 to 2011, approximately 12% of the mangrove forest declined or about 2% of the mangrove forest was reduced from 2002 to 2005 reflecting the trend of increasing pressure on marine biodiversity. Despite this, local participation in sustainable natural resource management is being promoted in a number of protected areas and in various projects in the coastal zone. For example, the Participatory Mangrove Resource Management and the Biodiversity Corridor Initiatives were implemented in Peam Krasoab Wildlife Sanctuary.

Figure 12.1: Forecast of Change in Mangrove Coverage in the Coastal Area Based on Trend from 1993 to 2011.



Source: MOE. 2013. 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013.

12.2 Coral Reefs

Coral reefs are another relatively important habitat for fish and other marine aquatic organisms. They exist along and around the coastline of the mainland and islands. There are 24 species of hard coral, and 14 of soft coral and sea fans. Some coral reefs are in poor condition probably because of sedimentation particularly around Polowii Island (Koh Wai). Abundant coral reefs can be found around Koh Karang located in the Kampot Province. Meanwhile, coral reefs are very rare at Koh Daung. Most of the Cambodian islands are reported to be abundant in coral reefs. However, detailed information of its species and quantities are not yet available.

Coral reefs are reported from almost all areas around the islands of the coast of Cambodia. Around 70 coral species are found in Cambodian waters. In particular, at least 70 species of corals in 33 genera and 11 families have been recorded at Koh Tang, in Sihanoukville (Nelson, 1999). The coral habitat is home to many different species of fish.

There is limited information on the species distribution and composition and coral reef condition or health. The coral reef surveys were conducted in some coastal waters under Phase 2 of the Environmental Management in the Coastal Zone Project and additional work has been carried out by the Department of Fisheries (DoF). Data on coral reefs have not been updated for this report. Therefore, data from SOER (2005) and SOECCSR (2013) are used. Based on the data available, an estimate of the area of coral reefs has been made for the coastal area. These data indicate that most coral reefs are found in Kampot, Koh Kong, and Preah Sihanouk Provinces (**Table 12.3**).

Table 12.3: Estimated Coral Reef Area, by Province (ha).

Kampot	Koh Kong	Sihanoukville	Kep	Total
953	602	1198	52.5	**2,805.5**

Source: SOECCSR. 2013.

The accuracy of the actual distribution is uncertain, and the quality of the corals at the different locations is difficult to ascertain. Coral communities in Cambodia are mostly distributed as fringing reefs along parts of the mainland, especially headlands, and around many islands. Coral communities near the shore are those that have adapted to living in turbid environments, whereas offshore coral communities have higher species diversity.

Based on previous studies, coral reefs in Cambodia are in fair to good condition, with coral cover ranging from 23.1% in the Sdach Island group of Koh Kong Province to 58.1 % at Takiev Island group of Sihanoukville (UNEP/GEF, 2007; Vo et. al., 2013). The major continuing threats to the coral reefs are over-fishing, use of dynamite and other illegal fishing practices, harvest of coral reefs for trade, and degradation of water quality.

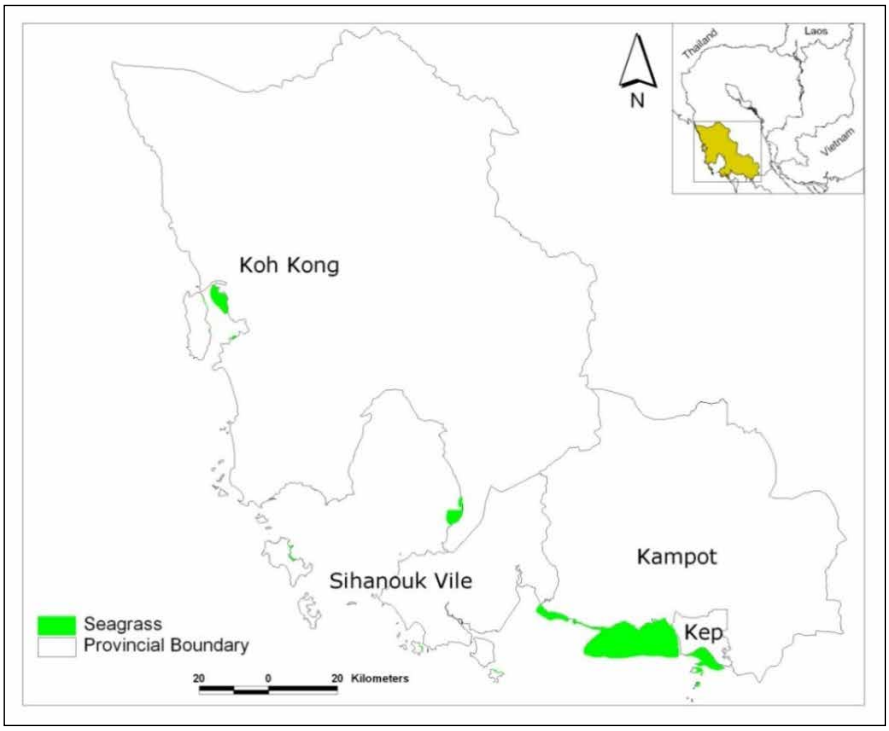
12.3 Seagrass

Seagrass in Cambodia can be divided into two types: extensive seagrass meadows along the mainland and paths of seagrass interlinked with coral reefs around islands. Stretches of shallow areas often provide habitats for seagrass. The seagrass beds provide cover for juvenile fish and perform nursery functions for many different fish species.

Cambodia's seagrass beds, however, are vulnerable to impacts from two main sources: degradation of water quality caused by land-based pollution and destructive fishing practices, such as push nets and trawling in the seagrass beds. The change in water quality that affect the seagrass isdue to increasing siltation because of illegal logging, increasing use of fertilizer and pesticides in the coastal agricultural areas, discharge of domestic and industrial wastewater, and other human activities as mentioned previously.

The distribution of seagrass in Cambodia's coastal waters is shown in **Figure 12.2**, and the area by province is indicated in **Table 12.4** based on data from the Department of Fisheries. According to the seagrass mapping, the greatest area of seagrass can be found in Kampot Province and the smallest area in Preah Sihanouk Province. These areas are proposed to be established as marine sanctuaries, but still pending official approval.

Figure 12.2: Seagrass Distribution in the Coastal Waters.



Source: Department of Fisheries, MAFF.

Table 12.4: Estimated Seagrass Area, by Province (ha).

Kampot	Koh Kong	Sihanoukville	Kep	Total
25,241	3,993	164	3,096	**32,494**

Source: SOECCSR 2013.

The seagrass beds have been partly surveyed and identified during Phase 2 of the Environmental Management in the Coastal Zone Project. These activities have been continued by the Department of Fisheries (DoF) funded by the United Nations Environment Programme (UNEP). Maps of specific seagrass beds have been produced. Data on seagrass beds have not been updated for this report and the SOER 2005 is used, considering that the data on seagrass are assumed to have not changed so much. (This needs to be verified by new surveys.)

12.4 Beaches

Sihanoukville's beaches are one of the province's most valuable economic resources with varying degrees of commercial exploitation. The beaches listed below do not include yet any of the beaches in the islands.

- **Ochheuteal Beach:** Ochheuteal Beach is a 3.3 km long strip of white sand beach lined with Casuarina and Tamarisk trees, grass umbrellas, rental chairs, and around 30 standardized beach huts, which serve meals and drinks. Some also serve as nighttime party spots. Well-established, middle-class hotels and high-profile residences flank the beach along its northern part. The sustainability of Ochheuteal beach was a primary consideration of various stakeholders, which brought about the development of a tourism development and management plan in 2005. The southern half remains – apart from some hotels at its far end – essentially undeveloped.
- **Serendipity Beach:** Technically, the western end (roughly 1/5 or 600 m) of Ochheuteal beach, is very popular with Western tourists and has a few small guesthouses right on the beach. It has been named by an American fellow, who came here in the 1990s. Struck by its (then) unspoiled beauty and pristine condition, he came up with the term, which quickly entered common vocabulary.
- **Otres Beach:** The beach is around 4.6 km long and beyond the small "Queen hill" headland at the southern end of Ochheuteal Beach. Its long white sand strip, also completely lined with Casuarina and Tamarisk trees, is far less developed and commercialized than Ochheuteal Beach and was built into a preferred lodging place for Western visitors. From 2004 to 2011, the beach was occupied by numerous bungalows and dormitories run by Western people. Due to the element of illegality of on-beach accommodation, among other reasons, police cleaned up the area in May 2011, removing the greater part of the beach-side bungalows. Permanent structures beyond the beach road supplement the remaining places since 2012. It is a very popular, well-established holiday retreat, where prices have risen considerably over the course of the last years.
- **Sokha Beach:** Sokha Beach is around 1.2 km long and is located west of Serendipity Beach. The beach is privately owned by - and its southern half occupied by the Sokha Beach Hotel, the first five-star luxury beach hotel in Cambodia. While the beach is well kept and many facilities are provided, visitors have to pay for their use and beach vendors are not allowed.
- **Independence Beach:** Independence Beach is around 1.3 km long and located north-west of Sokha Beach. The beach is named after the Independence Hotel, towering on top of a rock at its northern end.
- **Victory Beach:** Victory beach is around 300 m long and situated at the furthest north of the peninsula of Sihanoukville. It was heavily used by backpackers and is still popular with budget travelers. The deep-water port is located at the northern end of the beach. A consortium

of Russian business people undertook large-scale development here. The beach is regularly maintained.

- **Lamherkay/Hawaii Beach:** It is the southern succession of Victory Beach situated north of Independence Beach. It is a strip of similar length as Victory Beach - around 300 m. Here is the very place where the French/Cambodian construction team's groundwork began for the construction of the Sihanoukville Autonomous Port in 1955.
- **Treasure Island Beach:** South of Lamherkay/Hawaii Beach, it is less than 50 m long and its entire length is fringed with concrete steps and wooden pavilions of a big Cambodian seafood restaurant.
- **Hun Sen (Prek Treng) Beach:** The northernmost beach of the city with a length of around 1.5 km situated behind the local port. Essentially empty without beach huts and bars, it sees only weekend and holiday visitors. The water is very shallow, but the area is lacking favorable infrastructure and is not regularly cleaned.
- **Ream Beach:** Situated south of Otres beach with an overall length of around 7.7 km, it consists of several sections with occasional stretches of rocks and vegetation. Koh Ta Kiev Island lies just 800 m off its southern end.
- **Beaches inside the National Park:** At Ream National Park's southern coast exist several unnamed beaches with an approximate length of 10 km.
- **Beaches of Steung Hav and Prey Nob Districts:** Beyond Sihanoukville's oil port lie two sizable beaches inside the Komong Som bay, belonging to the Prey Nob District.

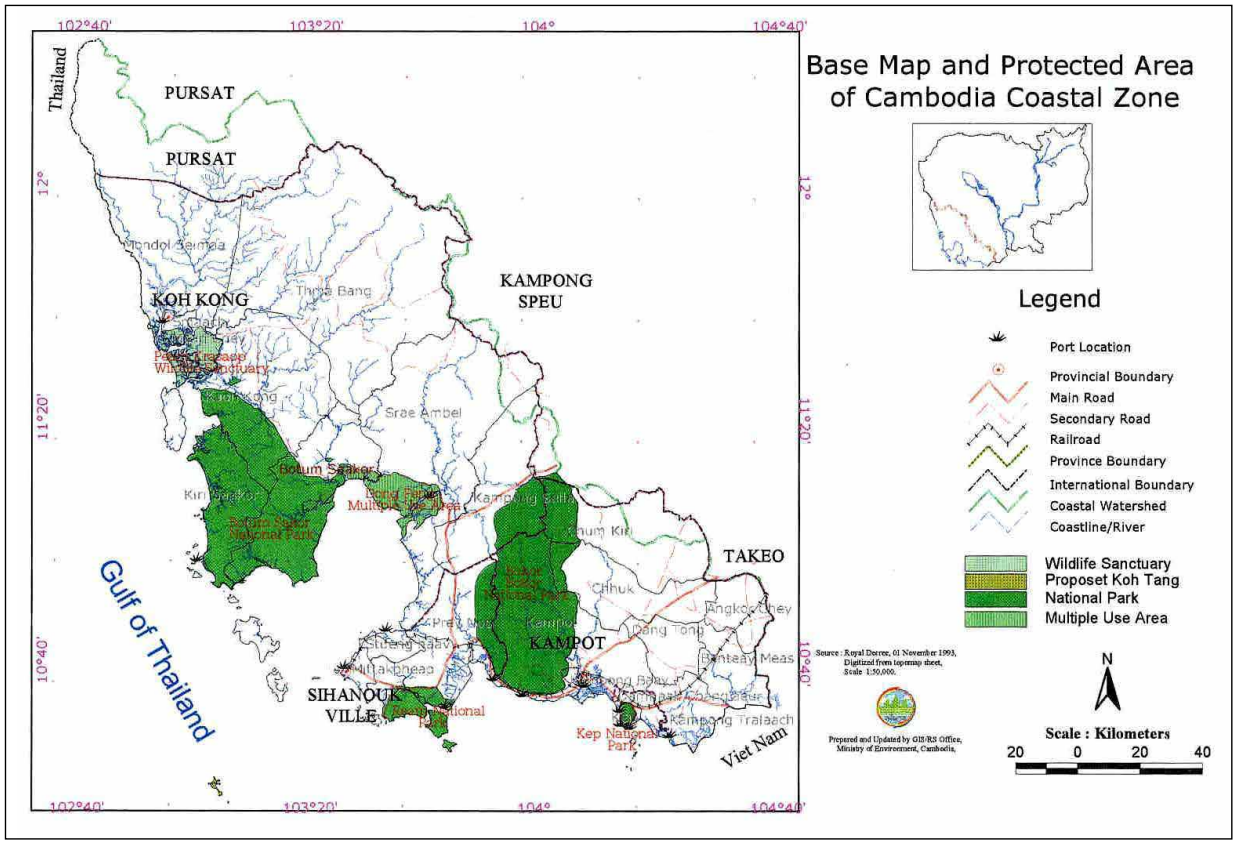
12.5 Estuaries, Mudflats, Tidal Flats

Most of Cambodia's marine estuaries are located in protected areas, namely, Botum Sakor National park, Ream National Park, Dong Peng Multiple wildlife use area, Peam Krasoab sanctuary, and Koh Kapik Ramsar site. Those areas are influenced by inter-tidal levels and water flow from highland areas.

12.6 National Parks, Sanctuaries, and Marine Protected Area

There are at least six areas in the coastal provinces that are under protection. One is the offshore marine protected area known as Koh Rong area of Preah Sihanouk Province. The other five protected areas are Botum Sakor National Park, Ream National Park, Dong Peng Multiple Use Area, Peam Krasoab Wildlife Sanctuary, and Koh Kapik Ramsar Site. The total area of these parks and protected areas is 388,700 ha (**Table 12.5**). **Figures 12.3** and **12.4** show the location of the national parks, wildlife sanctuaries, and marine protected area.

Figure 12.3: Coastal Protected Areas.



Source: GIS Office, Ministry of Environment. 1998.

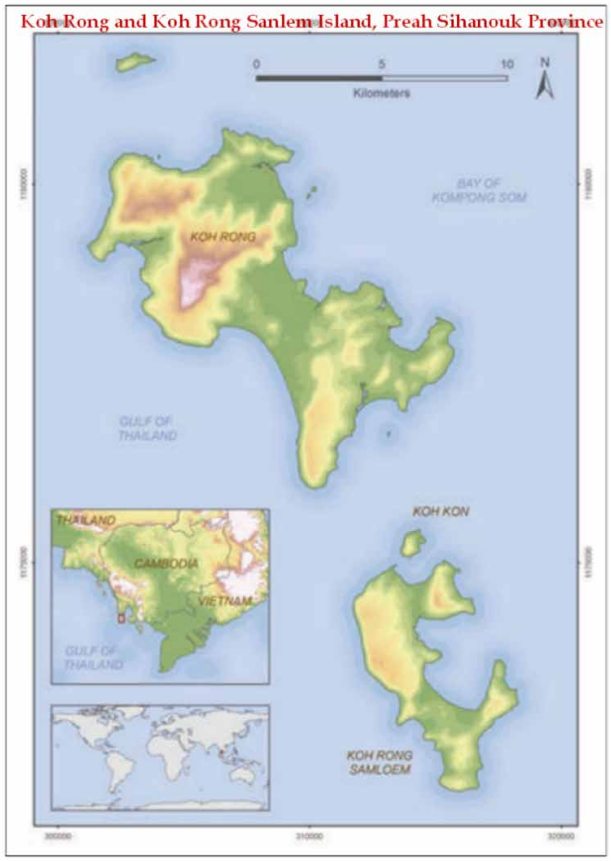


Figure 12.4: Koh Rong National Marine Park.

Source: Coral Cay Conservation. 2011.

Table 12.5: Protected Areas in the Coastal Provinces.

Protected Areas	Total area (ha)
Bokor National Park	140,000
Kep National Park	5,000
Ream National Park	21,000
Botum Sakor National Park	171,250
Dang Peng Multiple Use Area	27,700
Peam Krasoab Wildlife Sanctuary	23,750
Total	**388,700**

Source: GIS, Ministry of Environment.

12.6.1 Botum Sakor National Park

Botum Sakor National Park is the biggest national park of Cambodia. It is situated on the coast of the Gulf of Thailand. Botum Sakor (or Botumsakor) is a peninsula projecting southwest from the Cardamom Mountains.

The majority of Botum Sakor's area comprises of gently sloping lowland covered by evergreen wood and grasslands, emerging in coastal flood plains with mangrove and swamp forests. The Park is surrounded by sea in the east, south and west, and the coastline is fringed with relatively intact mangrove forests.

The national park of Botum Sakor has a very rich and varied wildlife that is unique in the world. The park is home to many endangered species, such as the Asian Elephant, Indochinese Tiger, Clouded Leopard, Turtle, and Sun Bear, to name a few. Most of the many reptiles of Botum Sakor are snakes, such as the king cobra and the Malay pit viper. Snakes are, however, regularly seen and subsequently hacked to death by local residents at local plantations. There is also a known small population of Siamese crocodiles in some of the parks and creeks. Cambodia in fact, retains the world's largest population of this critically endangered species, which was recently thought to be extinct.

The larger saltwater crocodile is also found here and although it is of least concern from a global conservational viewpoint, they are endangered in Southeast Asia. In Cambodia, saltwater crocodiles are thought to be restricted to Koh Kong Province. The park is a very important environmental area with critical habitat.

12.6.2 Ream National Park

Registered in 1995, the Ream National Park is located 18 km from Sihanoukville and is a must-see destination when in Southern Cambodian. The park, which has been opened since 1993, encompasses 21,000 ha, including 15 000 ha of terrestrial and 6000 ha of marine habitats.

This Cambodian national park offers secluded beaches, mangrove forests, tropical jungles, 155 different species of birds, monkeys, and during the months of December, January and February, the infamous white freshwater dolphin can be seen.

The landscape of the park is mountainous, with a range of habitats and ecosystems including mangrove forests, freshwater wetlands, seagrass beds, evergreen forests, beaches, coral reefs, streams, and islands. The Park is divided by a freshwater stream called the Prek Teuk Sap, which flows through the Park to the ocean. Land to the west of the stream is dominated by two larger hills. These hills are separated by the Prek Sampouch watercourse. Located on the most western side of the park is Phnom Mollou. At a height of 277 m, it is the highest peak within the Park. The other hill rises to a height of 196 m. Between the hills and the estuary of the Prek Teuk Sap lies a narrow discontinuous belt of wetlands. These wetlands are protected by a thin band of degraded mangrove forest. The islands of Koh Thmei and Koh Seh comprise the eastern third of the park.

Wildlife found or reported in the national park includes, but is not limited to: rhesus monkeys, dugongs, turtles, dolphins, mouse-deer, Sarus crane, and pelicans. Vegetation habitats of the park include lowland evergreen forest, melaleuca forests, and mangrove forest.

Despite all these, the National Park is a substantial local economic resource. Almost 30,000 people or 5,500 households live in the five communes that overlap or border Ream National Park. Population growth rates are estimated at nearly 3%. About four of these communes are located on the boundary of Ream, and a total of 13 villages have land lying within the Park's boundaries.

12.6.3 Dong Peng Multiple Use Area

Dong Peng is a protected, multiple-use management area in the Koh Kong Province of Cambodia. It is located on the north end of the Bay of Kompong Som, with total area of about 27,700 ha.

The area is used for many purposes, such as sustainable use of water resources, timber, wildlife, fish pasture, and recreation with the conservation of nature primarily oriented to support these economic activities.

There is very limited information on Dong Peng Multiple Use Area related to their environmental, socio-economic development and livelihood as well natural resources. This area is mostly associated with agricultural activities, non-wood production, and services. Environmental studies related to ecological function, species, natural phenomena, manmade pollution, etc., remain unknown.

12.6.4 Peam Krasoab Wildlife Sanctuary

Peam Krasop Wildlife Sanctuary is located in south-western Cambodia. The area is known for its mangroves and numerous islands separated by a maze of bays. The Sanctuary is protected by the Cambodian government. The area is influenced by inter-tidal levels and water from highland areas. Peam Krasaop Wildlife Sanctuary provides favourable conditions for fishery and other resources. Around 10,000 people are living here. Many of those people have resided and done various occupations for their livelihoods. They are dependent upon the natural resources in the area, including intensive shrimp aquaculture, large-scale charcoal production, and other purposes. The estuarine areas are the intersection between freshwater and saltwater, especially during the rainy season.

Villagers remain highly dependent on their environment: aquatic resources are used for subsistence and income generating purposes; mangroves provide breeding grounds and protection for aquatic resources and other wildlife; and mangroves are a source of fuel wood. People are poor – resources are declining; houses leak during the rainy season; there is inadequate water supply in most villages; there are few schools and those that are open only offer grades one and two; and there are few clinics in any of the villages.

12.6.5 Koh Kapik Ramsar Site

The Koh Kapik and Associated Islets Wetland of International Importance are located in the southwest of the country along the Cambodian coastline near the border with Thailand to the west. The site is located approximately 15 km southeast of Koh Kong Town the main administrative center of Koh Kong Province. Around 60% of Kok Kapik Ramsar site is located inside the Peam Krasoap wildlife Sanctuary. Another 40% is locate outside the site. There is no change to the original boundary location. However, there are several coordination and integration efforts through donor-supported projects and/or programs as well as through the government policy of decentralization to provide greater clarification and strategic zonation to the site's demarcation.

The Koh Kapik and Associated Islets Ramsar Site are made up of alluvial islands immediately off the main land of Koh Kong Province. Most of the land lie below 2 m and much is inundated during the spring tides only. The area is characterised by substantial tracts of intact mangrove forest.

The fresh water inflow from the two streams (Prek Koh Pao in the North and Prek Khlang Yai/ Stung Kep in the South) is most important for the maintenance of the brackish-water character of the site, which is then essential to the existence of an assemblage of brackish-water plankton and fish populations, which are the food base for the majority of the birds making use of the site and for driving fisheries activities of coastal fisheries communities.

That estuary-mangrove system plays a critical role as a nursery ground and nutrient resort for the adjacent coastal fish populations, which support very valuable fisheries providing the main income for coastal fishermen communities in Cambodia.

12.6.6 Koh Rong archipelago

The government's Fisheries Administration has designated Koh Rong as the country's first large marine protected area (known in Cambodia as a Marine Fisheries Management Area), which aims to ensure that fishery resources are managed sustainably while also encouraging tourism, reducing poverty, and maintaining biodiversity (See **Figure 12.4**). In February 2018, the Royal Government of Cambodia issued a Sub-Decree establishing Koh Rong as the country's first National Marine Park (NMP).

The marine protected site encompasses a total area of 520 km^2, of which the sea area is 400 km^2 around the Koh Rong Archipelago. It lies 20–25 km off the coastal town of Sihanoukville in the Gulf of Thailand.

The Koh Rong Island stretches from south-east to north-west, with roughly elongated shape, and encompasses an area of 78 km^2. The terrain is predominantly hilly with a sizable mountain with height of 316 m at the island's north-west. The hills provide water for countless creeks and estuaries. The island's interior is almost completely forested, concealing a number of seasonal waterfalls. Koh Rong has around 43 km of delicate beaches. No less than 23 beaches of varying length and coloration—from (predominantly) white to light brown to rose-colored sands—are found along most of the coastline. Bays, protruding capes and impressive sandstone rock formations contribute to the island's scenic panorama. The southern coastline—exposed to the weather and open sea, is particularly spectacular; whereas the eastern coast, which faces towards the land, is characterized by a sequence of smooth hills, gently sloping towards the numerous crescent-shaped beaches, inlets and bays. The center of the island is a flat "belt" of sediments that joins the two hilly massifs of the south-east and north-west. Here is a small savanna—the result of human activities and cultivation.

Several small islets and many reefs provide an abundance of natural habitat for a great variety of marine life. There are mangroves with an area of 117 ha and seagrass beds with an area of 28 ha (Mulligan and Longhurst, 2014). The coral reefs in Koh Rong Archipelago are valued at US$117 million–US$500 million (Coral Cay Conservation, 2011).

Tiny Koh Tuich Island lies off the southeast and the twin islands of Koh Bong-Po'own or Koh Song-Saa lie off the northeast of Koh Rong. To its south lies the uninhabited island of Koh Koun, followed by Koh Rong Sanloem Island. These five islands comprise the Sangkat Koh Rong or Commune 5 of Mittakpheap District, Preah Sihanouk Province.

Koh Rong Archipelago is home to about 3000 indigenous inhabitants and some of the most rural poor in Cambodia who rely on the natural wealth of the sea for their food security and economic well-being.

To establish the NMP, the MFF and MoE adopted a bottom-up approach, in which input and concerns from relevant local, provincial and national stakeholders were taken into consideration at all levels of the consultation process. MFF and the MoE also surveyed biodiversity and condition of the coral reefs, and consulted with local and provincial stakeholders, such as the local Fisheries Administration. This NMP will play a significant role in protecting marine and terrestrial biodiversity, and in empowering local coastal communities through the services provided by NMP ecosystems. It will also prevent human development activities from putting additional pressure on the ecosystem.

12.7 Rare, Threatened and Endangered Species

Cambodian coastal waters are considered among the richest areas in biodiversity resources, including significant aquatic resources and marine endangered species, such as green turtles, dolphins, sharks, sea turtles, rare tortoises and dugongs (UNEP, 2005).

There are about 525 marine fish species classified in 202 genera and 97 families with a total stock estimated at 50,000 metric tons found in Cambodia's sea water.[22] However, the number of reef fish species and invertebrates are unknown. Furthermore, 20 species of marine crabs, 42 species of marine gastropods, 24 species of marine bivalves, and 11 species of marine mammals were observed.

In terms of the rare, threatened and endangered species, marine mammals (dugong) and marine dolphins are considered as endangered. The dugong populations were recorded at Sihanoukville and Kampot Bay, Cambodia (Hines et al., 2007; UNEP, 2008b). The Irrawaddy dolphin and Spinner dolphin were also found in Sihanoukville and Kampot Bay (UNEP, 2008b). Other species

[22] UNEP. 2009. *UNEP/GEF Project: Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand*.

of cetaceans known to exist in Cambodia's coastal waters are the Indo-Pacific humpback dolphin (*Sousa chinensis*), common dolphin (*Delphinus delphis*), bottlenose dolphin (*Tursiops truncatus*), spinner dolphin (*Stenella longirostris*), and finless porpoise (*Neophocaena phocaenoides*).

The green turtle had been included in the list of endangered marine species while the hawksbill turtle is in the list of critically endangered marine species, under the IUCN Red List of Threatened Species (http://www.iucnredlist.org). These two sea turtles are also commonly observed and known to nest along the coastline of Cambodia.

Reef fish is also considered as the most valuable and targeted marine species. This species includes sweetlips (*Haemulidae*), snapper (*Lutjanidae*), barramundi cod (*Cromileptes*), grouper, humphead wrasse, bumphead parrotfish, and other parrotfish. These have been collected in all sizes including juveniles and pre-adults. These types of reef fish have been collected and re-cultivated in cages along the coast and when they reach commercial sizes, they are mostly sold alive to both local restaurants and international markets.

12.8 Large Marine Ecosystems (LMEs) and Transboundary Issues

Cambodia is located within the Gulf of Thailand and South China Sea's large marine ecosystem (LME).

The Gulf of Thailand is bordered by Cambodia, Thailand, and Vietnam. It occupies a seabed area of 304,000 km^2 from 6°N to 13°30'N latitude and 99°E to 104°E longitude. The northern tip of the gulf is the Bay of Bangkok at the mouth of the Chao Phraya River. The southern boundary of the gulf is defined by a line from Cape Bai Bung in southern Vietnam (just south of the mouth of the Mekong River) to the city of Kota Bharu on the Malaysian coast.

The gulf is relatively shallow: its mean depth is 58 m (190 ft) and the maximum depth is only 85 m. This makes water exchange slow and the strong water inflow from the rivers reduce the level of salinity in the gulf (3.05%–3.25%) and enriches the sediments. Only at greater depths does water with a higher salinity (3.4%) flow into the gulf from the South China Sea. It fills the central depression below a depth of 50 m. The main rivers, which empty into the gulf, are the Chao Phraya, including tributaries from Thailand and Cambodia.

The seabed morphology in the central depression of the gulf is characterised by the presence of elongated mounds and ridges arranged parallel to the axis of the basin. This morphology, widespread within the gulf in water depths exceeding 50 m, covers an area of tens of thousands of square kilometers. It reflects an interaction between sediment dewatering and the erosional

activity of the present-day bottom currents. The sediment dewatering and fluid seepage result in the formation of numerous small pits and pockmarks. The long-term erosion imposed by currents of stable orientation modifies pockmarks into long tunnels and depressions, and ultimately leads to the formation of the large fields of elongated mounds and ridges, as well as the residual outliers of un-eroded mud and clay sheets.

The key transboundary issues in the Gulf of Thailand and South China Sea include:

- Overfishing and destructive fishing;
- Modification, degradation, and loss of coastal and marine habitats;
- Marine- and land-based pollution (e.g. nutrients, marine debris, sediments, oil spills);
- Decline and loss of biodiversity and key marine species;
- Soil erosion; and
- Impacts of climate change

13 Risks and Threats to Blue Economy and Ocean Health

13.1 Human Activities and Environmental Damage

There are a number of closely interrelated threats resulting from urbanization, industrialization, and the commercialisation of agriculture. Ongoing activities that could damage coastal water quality, ecosystems, and fishery habitats include dredging, untreated domestic and municipal waste, and related heavy construction work associated with port and harbour improvement, maintenance and building. The impact of these activities has led to an increase in the fragility of the coastal ecosystems, coastal water pollution and eutrophication (due to high concentration of nitrogen, phosphate and oily-water), public health deterioration, nearshore fisheries decline, etc. **Table 13.1** lists the major threats due to unsustainable human activities.

Table 13.1: Major Threats to Cambodia's Ocean and Coastal Areas.

Threat	Sources/Causes
Waste from residential areas and industries	• Waste disposal of increasing population and industry sector mainly in Sihanoukville • Poor management of wastewater issues
Waste from recreation areas	• Waste disposal of the rising tourism sector • Land use conflicts between agriculture, protected areas, and tourism • Additional pressure on coral reefs due to poor diving, snorkeling, and anchoring practices
Waste from agricultural activities	• Discharge of more chemicals due to modernization of agriculture • Increased sediment runoff due to expansion of rice fields, charcoal production, salt harvesting, and aquaculture
Pollution from port and maritime activities	• Ballast water discharged from ships • Ship accidents, which release oil and other harmful substances • Abandoned ships, which can disturb maritime transport and fishing activities
Pollution from offshore development	• Oil and gas exploration platforms causing discharge of solid and liquid waste, and accidental oil spills
Illegal Fishing Practices	• The use of dynamite and poisonous substances by fishermen

Source: IUCN 2011: Cambodia coastal situational analysis.

A staggering amount of solid waste, garbage and pollutants, such as oil, fertilizer, sewage, and toxic chemicals enter the sea each year. These represent one of the most serious threats to coastal and marine environments. These cause both environmental and human health issues.

The following are the major underlying governance issues affecting the coastal and marine habitats and biodiversity:

- Conversion of key habitats – mangroves, coral reefs, seagrass, forests;
- Lack of protection for endangered species, and culturally important species;
- Few marine protected areas established;
- Lack of monitoring system to regularly assess the status of habitats, protected areas, and marine water quality;
- Inadequate management system for MPAs and fish sanctuaries;
- Limited environmental inputs into the urban, infrastructure and tourism development plans; and
- Poverty and lack of alternative livelihood.

13.1.1 Overfishing and destructive fishing methods

Overfishing is catching more fish than the maximum sustainable yield, leading to depleted fish stocks as the fishing rates exceed the biological capacity for replenishment. Related to overfishing are the fishing methods. Certain types of fishing methods destroy or damage the seafloor and habitats where many species of fish and other benthic animals reside. Certain fishing methods are notorious for catching large amounts of bycatch – fish, sea turtles, seabirds, and marine mammals – that are unintentionally caught and often incidentally killed in fishing operations.

Bottom Trawling: Among all the fishing methods, bottom trawling is the most destructive to our oceans. It uses a large net with heavy weights that is dragged across the seafloor, scooping up everything in its path. Bottom trawling is unselective and severely damages the seafloor ecosystems. The net indiscriminately catches every life and object it encounters. Thus, many creatures end up mistakenly caught and thrown overboard dead or dying. This collateral damage called bycatch, can amount to 90% of a trawl's total catch. In addition, the weight and width of a bottom trawl can destroy large areas of seafloor habitats that give marine species food and shelter. Such habitat destruction can leave the marine ecosystem permanently damaged.

Blast fishing: Blast fishing or dynamite fishing is the practice of using explosives to stun or kill schools of fish for easy collection. This often illegal practice can be extremely destructive to the surrounding ecosystem, as the explosion often destroys the underlying habitat (such as coral reefs) that supports the fish and kills many other organisms.

13.1.2 Harvest of live specimens

There is a big demand for certain tropical marine species that are harvested alive for the aquarium trade, traditional medicine, and for curios. Cambodia is no exception to this with the coastal area witnessing illegal fishing boats targeting many marine animals, including fish, giant clams, seahorses and even the coral itself. This demand comes mainly from neighbouring countries, and brings high prices that push local communities to use any means necessary to supply the demand. Limited protection for culturally important species needs to be addressed.

13.1.3 Conversion of habitats

Cambodia has lost more than a quarter of its remaining forest since 2000, making the country third in the world for primary forest loss (FAO 2005). From 2002 to 2006, around 93,000 ha of forest cover per year was lost.

Coastal forest areas have also been converted due to agriculture and agro-industry expansion, infrastructure development, and demand for more food and housing area. Land concession, illegal and unsustainable forest land use, and land encroachment are the key drivers that lead to loss of biodiversity and habitats. Improper agricultural practices, particularly wrong use of chemicals, lead to loss of topsoil properties and sedimentation. When soil properties are lost, the agricultural products will be also reduced. Farmers will then increase the use of fertilizers or use more pesticides to control pests, and sometime clear nearby forest area with higher fertility for agriculture. These further increase the negative impacts on the coastal biodiversity and habitats.

It was also estimated that the annual rate of degradation of mangroves is 1.9% (CMDG 2010). The mangrove forests have experienced threats from charcoal production, expansion of salt farms, and widespread shrimp aquaculture.

Cambodia's coral reefs and seagrass are in trouble, threatened by an increasing array of impacts from unsustainable and destructive fishing practices, erosion and sedimentation, waste dumping, and increasing population and development in coastal areas as well as rising sea temperatures and climate change. "Anthropogenic impacts to the local reefs included sedimentation, pollution, overfishing and limited coral breakage due to anchors and fishing gear. Sedimentation from land run-off poses a serious threat to the reefs, hampering their recovery from the mass-bleaching event (due to higher sea water temperature). Any effort to provide reefs with the best possible chance of surviving future impacts will therefore need to address the issue of sedimentation from both the islands and mainland Cambodia. Although there was a higher abundance of some fish families such as Butterflyfish (*Chaetodontidae*) and Parrotfish (*Scaridae*), predatory fish families such as Groupers (*Serranidae*) and Snappers (*Lutjanidae*) showed marked declines compared to results from similar surveys done in the area in 2003. Commercially valuable species of invertebrates

that included lobsters and sea cucumbers were found to be very low to non-existent on most reef sites. These results highlight the vulnerability of these key reef fish families to continued fishing and warrant the establishment of a no-take MPA as proposed by the Fisheries Administration."[23]

The rapid decline and loss of these marine ecosystems has significant social, economic and environmental consequences, and will ultimately lead to increased poverty and a reduction in quality of life for the people of Cambodia.[24]

13.1.4 Marine Debris

The amount of human debris entering the marine environment is of significant concern. Direct impacts of marine debris include aquatic wildlife starvation, suffocation and poor health, as well as human health and safety hazards. Indirect impacts of marine debris include ecosystem alteration, and tourism and fishing losses. Items, such as plastic bottles and bags, food packaging, and fishing gear, are the most commonly sighted. Fishing nets over the corals suffocate the polyps causing their deaths. The plastic that enters the sea undergoes physical degradation due to the water movement, which breaks it into suspended microplastic pieces. Microplastics are easily ingested by fish, invertebrates and even plankton. There is growing scientific evidence linking them to the passage of deadly, persistent chemicals through the environment, making them more concentrated in larger, predatory marine life.

13.1.5 Poor sanitation and discharge of untreated wastewater

According to research reports on the Economic Impact of Sanitation in Cambodia (World Bank 2008), poor sanitation leads to economic losses of US$448 million per year, which translates into loss of approximately US$32 per person. These economic losses are equivalent to 7.2% of Cambodia's GDP in 2005. This amount is roughly equivalent to the contribution of the fishery sector to the GDP, or twice the forestry's contribution. While these economic costs are not all tangible, the immediate money 'in the hand' losses (financial losses) amount to about US$160 million per year, which is roughly 2.5% of the GDP. This is equivalent to nearly US$12 per capita.

In the economic cost estimation, it is found that health impact is the largest contributor of quantified costs. It amounts to US$187 million accounting for 42% of the total economic costs.

The next main contributor is the water costs attributed to the cost for accessing cleaner drinking water, and the cost for accessing other domestic water uses, as well as the loss in fish production due to polluted water, which is roughly 33% of the total economic losses being nearly US$150

[23] Coral Cay Conservation. 2011.
[24] The National Biodiversity Steering Committee. 2014. *The fifth national report to the Convention on Biological Diversity*.

million. Moreover, the tourism sector, which may also be affected by poor sanitation and hygiene practice in the country, is also estimated to lose about US$74 million per year, making 16% of the total costs. The last economic loss caused by the loss of time due to unimproved sanitation is roughly US$38 million, or 9% of the total economic costs. This particular cost is incurred by those practicing open defecation (journey time) and shared toilet users (waiting time).

13.1.7 Pollution from offshore development

Oil and gas exploration in Cambodia's coastal waters within the Gulf of Thailand is becoming feasible. There are about 10 exploration blocks, which are all located in Cambodian waters (**Figure 9.3**). These platform installations, oil exploitation and offshore drilling operations create various forms of pollution that have considerable negative effects on marine and other wildlife. The environmental impacts can be classified into four main categories: physical, operational discharge effects (solid and liquid waste, drilling muds), accidental loss, and accidental spill, including flow line and pipeline leaks.

13.2 Pressures and Underlying Causes

13.2.1 Lack of impact assessment of infrastructure development and inadequate environmental improvement infrastructure

The threats and pressures to Cambodia's coastal areas are caused by unplanned urbanisation and industrialisation along the coastline. Most urban developments, and industrial and tourism facilities are located along the coast of Kep, Kampot, Preah Sihanouk, and Koh Kong Provinces. Cement factories are located in Kampot. Breweries, handicraft manufacturing, petrol storage, local and international ports, hotels, recreation beaches, eco-tourism facilities, and restaurants are increasingly being developed in Sihanoukville. Infrastructure development, e.g., road, airport, coastal town development, proposed oil refinery, and deep sea ports are on-going in the four coastal provinces. However, there is lack of environmental infrastructure development, e.g., sanitary landfills, wastewater treatement facilities, etc.

There is current limitation in incorporating environmental inputs, impacts, and mitigation/ management plans into the infrastructure development, urban planning, and zoning activities, as well as inadequate integrated management plans, regional plans, research, and monitoring programs. These are the main issues that need to be addressed for the sustainable development of coastal and marine areas.

13.2.2 Inadequate protection and effective management of habitats, protected areas, and fish sanctuaries

There is no recent assessment of the coastal and marine habitats and islands and marine water quality. Monitoring of the implementation of the Royal Decree on protected areas, and the status of protected areas and the buffer zone needs to be regularly done in collaboration with the coastal communities and scientists. More effective management system for fish sanctuaries and marine protected areas is also critical.

The existing laws are not well implemented or enforced resulting in uncontrolled development pollution, and illegal activities. Technical constraints, inadequate human and financial resources, lack of patrolling and monitoring equipment, deficient collaboration among key stakeholders, lack of a monitoring system to regularly assess the status of habitats and protected areas, and lack of protection for rare, threatened and endangered species and culturally important species are also causing pressures on coastal and marine ecosystems and biodiversity.

13.2.3 Poverty and lack of alternative livelihood

Poverty and lack of alternative livelihood may also cause threats to coastal and marine ecosystems and biodiversity. The depletion of mangrove forests and marine resources has occurred due to land encroachment for agricultural activities, fuel wood/charcoal production, human settlement, and population growth and poverty.

13.3 Natural Hazards and Climate Change

13.3.1 Meteorological and climatic processes

Cambodia's climate is tropical, with characteristically high temperatures. There are two seasons recognized in the country: a monsoon-driven rainy season (May to October) with south-westerly winds ushering in clouds and moisture that accounts for anywhere between 80%–90% of the country's annual precipitation; and a dry season (November to April), with cooler temperatures, particularly between November and January. Average temperatures are relatively uniform across the country and are highest (26°C–40°C) in the early summer months before the rainy season begins. Temperatures remain at 25°C to 27°C throughout the rest of the year.

The wet season arrives with the summer monsoon in May through November, bringing the heaviest rainfall to the southeast and northwest. Mean monthly rainfall at this time of year can be more than 5000 mm in some areas. Inter-annual variations in climate result from the El Niño Southern Oscillation, which influences the nature of the monsoons in the region and generally bring warmer and drier than average conditions across Southeast Asia. Meanwhile, La Niña episodes bring cooler than average conditions.

In Cambodia, port authorities like in Sihanoukville collect data on tide while meteorological stations collect necessary meteorological and surface water level data. Although attempt was made to obtain this data, it was not made available during this study. Therefore, detailed analysis of sea-level rise for the Cambodian coastline was not possible because of the absence of high quality, high frequency (hourly) sea-level data. Therefore, results from other studies were used.

The higher sea levels in the 21st century will result in an increase in the frequency of sea-level extremes. Hunter 2012 demonstrated that even for a 0.5 m sea-level rise, what is currently a 1-in-100-year flooding event at many locations could be occurring annually by 2100. This effect will mean more frequent flooding events for coastal regions and adjacent low-lying areas that are currently subject to occasional flooding events.

Most studies to date have argued that changes in mean sea level are the dominant factor in projected changes in the frequency of extreme sea levels (Sterl et al., 2009; Lowe et al., 2010; Seneviratne et al., 2012; Colberg and McInnes, 2012). Changes in storminess (frequency or intensity), however, would also lead to changes in the frequency of extreme sea levels.

There remains uncertainty in the range of sea-level projections for Cambodia. Assuming small changes in storminess, Hunter et al. 2013 has combined this uncertainty with the currently observed frequency of extreme sea level to estimate an "allowance" for sea-level rise. If infrastructure was raised by this allowance, the current risk of coastal flooding would be maintained rather than rise with time. Again, such studies have not been completed for the Cambodian coast.

13.3.2 Natural hazards

So far, there were no volcanic eruptions, earthquakes or tsunami that have happened in Cambodia's coastal provinces. However, coastal provinces are highly vulnerable to the adverse impacts of climate change, particularly floods and droughts, which affect agriculture – the primary source of income for most Cambodians. The frequent floods, windstorms and droughts during the last decade caused severe damage to agriculture and reduced the rice yields, resulting in food insecurity and undernutrition for many rural people, especially children.

From **Table 13.2**, it is observed that in 2011, about 522 households were affected by drought, while another 5,642 households were affected by floods. In contrast, in 2012, about 6,792 households were affected by drought, while 703 households were affected by floods. Besides drought and floods, windstorms also occurred in the coastal area and affected about 311 and 421 households in 2011 and 2012, respectively.

Kampot, Koh Kong and Preah Sihanouk Provinces experienced frequent floods and droughts. Among the coastal provinces, Kampot Province faces the highest frequency and severity of floods, affecting people and causing severe damage to agriculture and the environment. Around 5,623 households were affected by flooding in the rainy season in 2011; while in the 2012 dry season, about 6,505 households were affected by drought. The districts of Kampong Trach, Banteay Meas, and Dang Tong (in Kampot Province) were particularly exposed to severe and frequent floods and droughts.

Most coastal provinces, except Kep, were exposed to strong windstorms. It is also noted that frequent and strong windstorms occurred in Kampot, Koh Kong, and Preah Sihanouk in 2011 and 2012, which severely affected 365 families in 2012 in Kampot Province.

Farmers reported that in the rainy season, the increased storms (thunders, lightning, and windy-rain) threatened and affected people, houses, fishing boats, crops, and tourism facilities. Some coastal cities face a deficiency of freshwater due to prolonged drought and irregular rainfall.

Table 13.2: Families Affected by Extreme Weather in Coastal Provinces and Districts, 2011-2012.

Location	Families affected by storm		Families affected by flood		Families affected by drought	
	2011	2012	2011	2012	2011	2012
Coastal Zone	**311**	**421**	**5,642**	**703**	**522**	**6,792**
Kampot	**130**	**365**	**5623**	**639**	**427**	**6505**
Angkor Chey	13	35	0	0	0	93
BanteayMeas	10	1	2767	454	0	1689
Chhuk	18	20	0	0	360	524
Chum Kiri	15	33	8	0	0	464
Dang Tong	30	118	31	0	67	3068
Kampong Trach	12	22	2817	185	0	657
TuekChhou	29	55	0	0	0	10
Kampot	3	81	0	0	0	0
Kep	**28**	**19**	**0**	**0**	**0**	**277**
Damnak Chang'aeur	28	15	0	0	0	277
Kaeb	0	4	0	0	0	0
Koh Kong	**113**	**33**	**0**	**35**	**85**	**0**
BotumSakor	30	1	0		0	
KiriSakor	0	7	0		0	
Kaoh Kong	0		0		0	
Khemarakphumint	2	2	0		0	
MondolSeima	69	14	0		0	
SraeAmbel	12	9	0	35	85	
Thma Bang	0		0		0	
Preah Sihanouk	**40**	**4**	**19**	**29**	**10**	**10**
Preah Sihanouk	30		0		0	
Prey Nob	6	4	19		0	
StuengHav	0		0	29	0	
Kampong Seila	4		0		10	10

Source: Commune Database/Profiles.

For agriculture, there were over 8,400 ha of cultivated land in Kampot Province destroyed by severe floods in 2011, especially in Banteay Meas and Kampong Trach Districts. Drought was reported to damage about 60 ha of cultivated land in Banteay Meas District (Kampot). However, in 2012, the cultivated land was damaged by severe drought. About 6,476 ha of cultivated land in Kampot Province was damaged, especially in Banteay Meas (2,834 ha), Dang Tong (2,206 ha), Kampong Trach (668 ha), and Tuek Chhou Districts (587 ha). Cultivated land in the two districts, Dang Tong and Kampong Trach of Kampot Province, and Thma Bang District of Koh Kong Province, were also severely damaged by floods.

Pests also affected the agricultural production, especially rice and other seasonal crops. Approximately 620 ha of land under cultivation, mostly in the Kampong Trach District of Kampot

Province, were affected by pests in 2011. In Chhuk, Kampong Trach, and Tuek Chhou districts, pests destroyed about 897 ha of cultivated land in 2012.

From **Table 13.3**, it is observed that over 9,000 ha of cultivated land in the coastal area were damaged by floods, drought, and pests each year. Due to its large and low-lying agricultural areas, Kampot Province experiences higher exposure to climate-related hazards, as compared with the other coastal provinces.

Kep Province also faced disasters, but less than in the other coastal provinces. During the dry season, pests seem to be a major threat to areas under cultivation. For example, **Table 13.3** shows that pests destroyed about 900 ha of cultivated land in 2012. This suggests that in the coastal area, the pest issue should not be overlooked.

Table 13.3: Families Affected by Extreme Weather in Coastal Provinces and Districts, 2011-2012.

Location	Flood (ha)		Drought (ha)		Pests (ha)	
	2011	2012	2011	2012	2011	2012
Coastal Zone	**8,882**	**1,522**	**63**	**6,497**	**619**	**897**
Kampot	**8,423**	**956**	**63**	**6,476**	**547**	**863**
Angkor Chey	15	15				
BanteayMeas	4,719		62	2,834		
Chhuk	4		1	132		258
Chum Kiri	10	5		49	5	
Dang Tong	225	793		2,206		57
Kampong Trach	3,450	143		668	542	447
Tuek Chhou				587		101
Kampot						
Kep	**23**			**21**		**5**
Damnak Chang'aeur				15		
Kaeb	23			6		5
Koh Kong	**373**	**556**			**41**	**29**
Botum Sakor						2
KiriSakor	165					1
Kaoh Kong						
Khemarakphumint						
Mondol Seima	40	40			9	4
Srae Ambel	168				17	20
Thma Bang		516			15	2
Preah Sihanouk	**63**	**10**			**31**	
Prey Nob	58				31	
Stueng Hav		10				
Kampong Seila	5					

Source: Commune Database/Profiles.

The extreme weather that occurred in Cambodia's coastal area did not only affect the people's wellbeing and livelihoods by destroying agricultural productions; it also affected the country's economy. **Table 13.4** shows that over 50 km of roads and 40 bridges were destroyed by severe floods in 2011, and in 2012, 18 km of road and 263 bridges were destroyed or damaged. These damages were particularly severe in Kampot, Preah Sihanouk and Koh Kong Province, especially in Banteay Meas, Chhuk, Kampong Trach and Tuek Chhou Districts (Kampot Province), Prey Nob, Stueng Hav and Kampong Seila Districts (Preah Sihanouk Province), and Thma Bang District (Koh Kong Province). Notably, it is recorded that no less than 247 bridges were damaged by floods in Prasat Phnom Khyong Commune, Kampong Trach District of Kampot Province in 2012.

Table 13.4: Infrastructure Damaged by Extreme Weather in the Coastal Provinces and Districts, 2011–2012.

Location	Roads damaged by flood (m)		Bridges damaged by flood (number)	
	2011	2012	2011	2012
Coastal Zone	**50,235**	**18,064**	**40**	**263**
Kampot Province	**37,785**	**4,899**	**35**	**250**
Angkor Chye	50	15		
BanteayMeas	25,958			
Chhuk	2,027		26	1
Chum Kiri	855	456	2	
Dang Tong	45	315	3	2
Kampong Trach	6,850	2,113	4	247
TuekChhou	2,000	2,000		
Kampot				
Kep Province				
Damnak Chang'aeur				
Kaeb				
Koh Kong Province	**2,000**	**5,550**	**3**	**8**
BotumSakor		50		4
KiriSakor				
Kaoh Kong				
Khemarakphumint				
MondolSeima	500	500		
SraeAmbel				
Thma Bang	1,500	5,000	3	4
Preah Sihanouk Province	**10,450**	**7,615**	**2**	**5**
Preah Sihanouk				
Prey Nob	7,950	3,000	1	1
StuengHav		1,600		4
Kampong Seila	2,500	3,015	1	

Source: Commune Database/Profiles.

13.3.3 Climate change

A hydrologic cycle means a continuous movement or phase change of global water mass distributed in the hydrosphere, atmosphere, and lithosphere. If the amount of seawater is increased, it influences the change of sea water level that further affects the coastal areas and the organisms living in the areas. Nowadays, it is clear that using lots of fossil fuels causes global warming and climate change. The glaciers located on the poles are melting due to the increase in the average global temperature, and the sea level becomes elevated.

A recent study on peoples' perceptions (Christian Aid, 2011) states: "The Cambodian people are uncertain whether climate change will continue to affect them in the long-term. Many Cambodians are making decisions about how to respond without receiving information or support from any source outside of their communities. Most Cambodian farmers have not changed their agricultural practices due to resource constraints, risk aversion, lack of information and technical assistance, and lack of crop insurance. Subsistence farmers in Cambodia are understandably resistant to change and lack willingness to take risks. These are same barriers in other developing countries.

Due to resource constraints, Cambodian farmers may not be able to adapt to climate change without support from outsiders. Water management schemes based on and better climate change information are potentially cost-effective ways of climate change adaptation in Cambodia, but innovative systems will usually be far beyond the resources available to farmers and communities. These measures will require significant assistance from industrial countries (World Bank 2014). Due to the fact that climate change has not yet affected Cambodia significantly, and is considered a long-term problem with much uncertainty, the issue is seen by local people as less interesting than more pressing needs. Local voices are missing due to lack of appreciation by local leaders and policy-makers, thus leading to small farmers being excluded from roundtable discussions."[25]

In summary, the major challenges are:

- Limited information on local impacts;
- Low awareness about governance and administration;
- Limited institutional, personnel, and technical capacities;
- Weak cross-sector and cross-regional coordination;
- Lack of suitable technologies and data;
- Lack of reliable disaster control and forecast mechanisms; and
- Insufficient budgetary funds.

[25] Cambodia coastal situational analysis, IUCN.

13.3.3.1 Sea level rise

According to the IPCC, temperatures in the Southeast Asian region will increase in the range of 1.5°C–3.7°C for the period 2081–2100. Moreover, there will be an increase in rainfall. These projections have come about as a result of a study of 21 climate models for the Region. UNDP/Oxford predicts a similar situation. The implications of these changes are nothing short of devastating for the region in particular, and the world in general.

In the report on assessing key vulnerabilities and the risk from climate change, IPCC (Climate Change 2013) notes that the global mean temperature increase would cause sea level rise that will affect humans and coastal environment. This will be an important issue for Cambodia – both because of direct effects on Cambodia's coastline, and the possible indirect effects in the rest of the country. In 2007, a rise of 0.18 cm to 0.56 cm in sea level by 2100 was predicted (IPCC). However, a number of reports since then have concluded that the IPCC was overly optimistic in their prediction and around a 1 m rise is much more likely.[26] Again, local effects, such as land subsidence, may amplify the global effect.

It is observed that sea level rise (SLR) will increase ocean waves (and sea tide) that cause coastal erosion and flood low-lying coastal areas. In addition, the combined effects of sea-level rise and increases in sea surface temperature can create unexpected major climate-related disasters on coastal ecosystems. Coastal erosion at popular beaches might reduce their tourist attraction, while increase in saltwater intrusion will affect surface and groundwater quality. Some coastlines in Koh Kong, Kep and Preah Sihanouk provinces have encountered significant coastal erosion. Coastal cities and coastal water supply and the agricultural and industrial sectors will also be affected by sea level rise.

A study indicated that in case of a 1-m rise in seawater, it would result in inundation of 56% of Koh Kong city, and an area of over 4,400 ha of natural habitat would be submerged (MoE 2005). The low-lying agriculture and urban lands would be badly

[26] Rahmstorf 2007 in: http://weadapt.org/knowledge-base/vulnerability/Cambodia.

affected throughout the coastal areas. Cambodia already faces salinization of surface and groundwater resources in its coastal provinces. These climate changes will only serve to amplify these issues. In addition, even a minor rise in sea level will increase coastal erosion and may eventually lead to the inundation of coastal villages and economically important coastal infrastructure, such as ports and coastal resorts. Anything more than a slight increase in sea level is likely to increase flooding from storms and storm surges.

Based on topographical analysis of areas lower than 1 m above mean sea level,[27] it has been found that among the four coastal provinces, Koh Kong Province is the most vulnerable to such impacts due to its low-lying geography in some parts (**Table 13.5**). The analysis further found that if the sea level rises by 1 m, about 8,342 ha of land in Koh Kong Province, including villages and built up areas, cultivated areas including paddy fields and orchards, salt farms, and other natural land would become submerged (even when disregarding tectonic land subsidence).

Similarly, in Preah Sihanouk Province, an area of about 3,446 ha would be below mean sea level. In Kampot and Kep provinces, the affected areas would be about 2,442 ha and 343 ha, respectively. Human settlements, attractive eco-tourism sites and other recreational facilities along the coastline, and the natural resources in the provinces (including fish species, coral reefs and seagrass and other aquatic resources) would be seriously damaged.

Saltwater intrusion in groundwater aquifers will impact many agricultural and lowland areas, especially those that rely on groundwater for potable and agricultural uses. Total agriculture areas of about 4,300 ha in Koh Kong and 3,138 ha in Preah Sihanouk will be affected particularly during the dry season.

[27] The mean sea level (of about 1.8 m) is assumed to be the level of an average of daily low tide and high tide prediction (of about 0.8 m) from 1971 to 2011, plus 1 m elevation of topographic map. EDM is the estimated sea level based on the World Geodetic System (WGS84) ellipsoid and sea level prediction is related to the gravity of earth at the actual location.

Table 13.5: Estimated Land Areas Affected by a 1-m Sea Level Rise.

Year		Area (ha)
Kampot	Field crop	321
	Orchard	1
	Paddy field	445
	Aquaculture/salt farm	510
	Grass/barren land	58
	Natural forest	551
	Village/built up area	558
	Total	**2,443**
Kep	Field crop	7
	Paddy field	37
	Aquaculture/salt farm	90
	Grass/barren land	5
	Natural forest	140
	Village/built up area	64
	Total	**343**
Koh Kong	Field crop	793
	Orchard	6
	Paddy field	3,499
	Aquaculture/salt farm	13
	Grass/barren land	1,147
	Natural forest	2,421
	Village/built up area	463
	Total	**8,343**
Preah Sihanouk	Field crop	148
	Orchard	14
	Paddy field	2,975
	Grass/barren land	24
	Natural forest	205
	Village/build up Area	80
	Total	**3,447**
Total for Coastal Area		**14,575**

Source: CCU, MoE, 2012.

SLR will also affect the productivity, the diversity and the overall health of the mangrove forest (**Table 13.6**). As a result, the mangrove forest may become less productive, withdraw from the seaward edge, and shift landwards. However, this depends on the sediment inputs, the topography and human intervention (Ellison 2012). There are about 9,240 ha of mangroves within 1 m above today's mean sea level, or about 5,560 ha in Koh Kong, 3,530 ha in Preah Sihanouk, 130 ha in Kampot, and 13 ha in Kep Province. Changes of the mangrove systems can cause loss of coastal lands and reduce the general climate change resilience of areas near the coast.

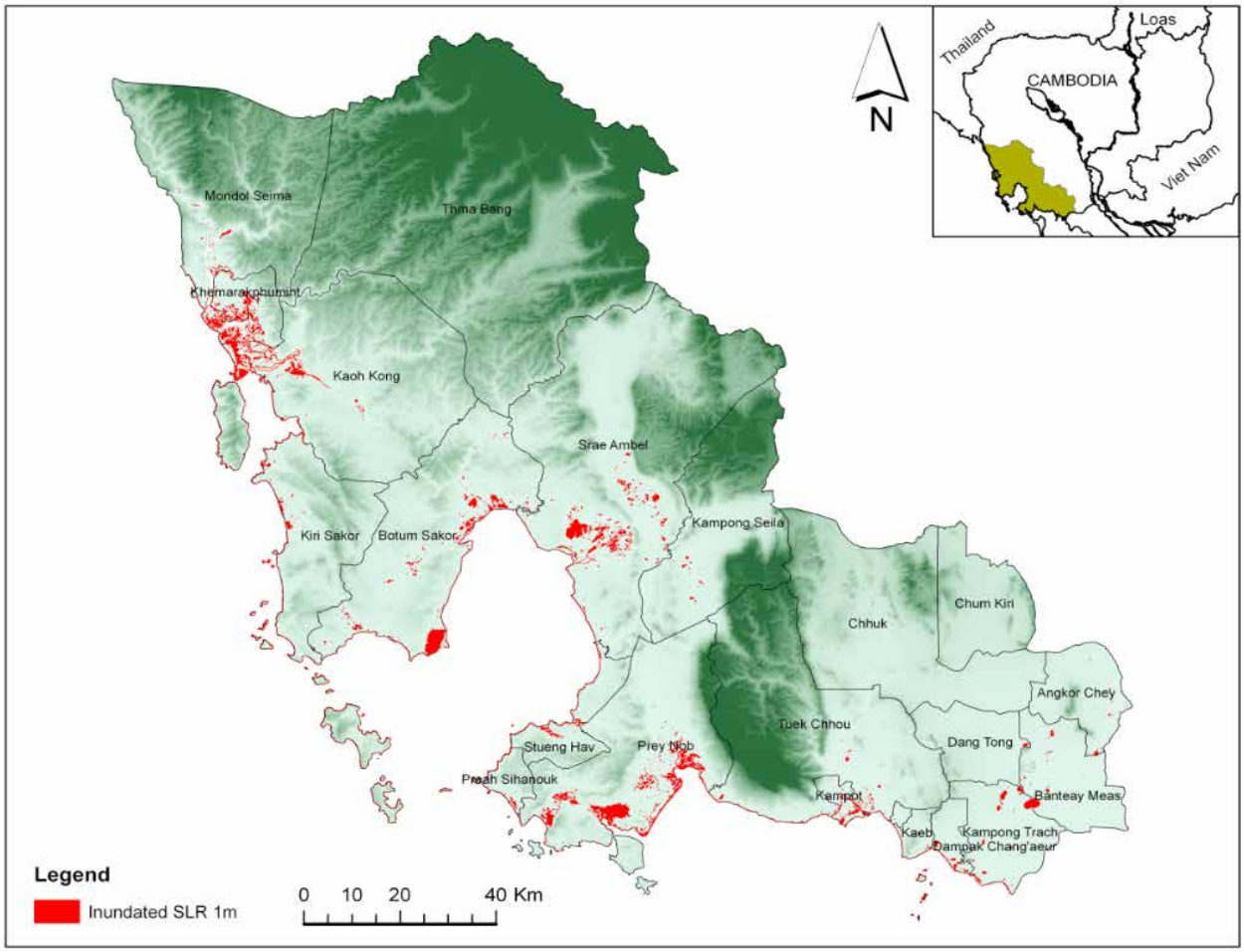
A map of SLR impacts shows that Mondul Seima, Sre Ambel and Botum Sakor Districts of Koh Kong Province and Prey Nob District of Preah Sihanouk Province will be severely affected if the sea level rises by 1m (**Figure 13.1**). The same is the case for the districts of Kiri Sakor in Koh Kong Province, Stueng Hav in Preah Sihanouk Province, Kampot, Tuek Chhou and Kampong Trach in Kampot Province, and Damnak Chang Eaur in Kep Province. According to information collected from field surveys and communication with local communities, some areas in Prey Nob Commune of Preah Sihanouk Province have already experienced saltwater intrusion. Some areas in Peam Krasoab are severely inundated if the high tide reaches a level of 1.80 m. Rice fields, salt farms, roads, human settlements and communities' livelihood have been damaged by such events. Farmers noted that the high tide is currently higher than in previous years. For example, in November 2009, some rice fields in Prey Nob Commune were inundated, while the dike was sinking. Farmers in Peam Krasoab Commune of

Table 13.6: Estimated Mangrove Areas Affected by a 1-m Sea Level Rise.

Province	Areas (ha)
Kampot	130
Koh Kong	5,561
Preah Sihanouk	3,531
Kep	17
Total	**9,239**

Source: CCU, MoE 2012.

Figure 13.1: Estimated Areas Affected by a 1 m Sea Level Rise.



Source: MOE, 2013: 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013

Koh Kong Province also reported that in December 2011, a part of the commune was inundated, and many people's assets and livestock were affected. The farmers in Samaki, Teuok Laak, and Teuo Thla communes of Prey Nob District, Preah Sihanouk Province have experienced some parts of their rice fields being flooded by sea water every year, so that the yield is affected if harvested after November or December.

13.3.3.2 Ocean acidification

In theory, ocean acidification is the process by which the ocean becomes increasingly more acidic (or pH gets lower) due to atmospheric CO_2 dissolving into the surface water. This happens because the partial pressure or concentration of CO_2 in the atmosphere is greater than the partial pressure or concentration of CO_2 in the surface water layer, so that CO_2 moves from higher (atmosphere) to lower (surface water) concentration. This increase in surface layer CO_2 increases the acidity of the surface ocean and also the deep ocean if the surface waters are subsequently subjected to downwelling into deeper waters. Since the Industrial Revolution, surface ocean pH has decreased by 0.1 pH units. Experimental studies show that a doubling of pre-industrial atmospheric CO_2 levels (from 280 ppm to 560 ppm) may decrease coral calcification and growth by up to 40% through the inhibition of aragonite formation. An atmospheric CO_2 concentration of 560 ppm is expected by the middle of this century.

On this issue, there is no scientific study, data and information available on ocean acidification in Cambodia seawater in the Gulf of Thailand.

Nevertheless, the study done with assistance of the Phuket Marine Biological Centre (PMBC) since December 2013 focused on total alkalinity, dissolved inorganic carbon and pH in some chemical analysis in the upper Gulf of Thailand. In addition, laboratory experiments were conducted to investigate the influence of pH on the larval development and settlement of the corals, *Pocillopora damicornis* and *Acropora millepora*.

The results showed that pH had a potential effect on the settlement and development of coral larvae of *Pocillopora damicornis*: when pH decreased, the settlement rates decreased; larval development was delayed and was not able to complete in low pH. In addition, pH also affected the fertilisation and settlement rates of *Acropora millepora*.

The PMBC is one of the five research centres conducting studies related to the ocean acidification. From 2007 to 2012, PMBC had implemented three projects focusing on internal wave and ocean acidification-related parameters – ORCAS Project, Bioassay Project, and Calcification on Marine Organisms Project.

PART 5

GOVERNANCE STRUCTURE AND MECHANISMS SUPPORTING BLUE ECONOMY DEVELOPMENT

14 Institutional Arrangements

14.1 Policies, Legal and Regulatory Framework

Many Royal decrees, laws, sub-decrees, and other regulatory frameworks have been issued, while some are being developed. These are: Law on Environmental Protection and Natural Resources Management; Land Law; Royal Decree on the Creation and Designation of Protected Areas; Sub-Decree on Environmental Impact Assessment (EIA); Water Pollution Control; Fisheries and Forestry laws; and Law on Land Management Urbanisation and Construction.

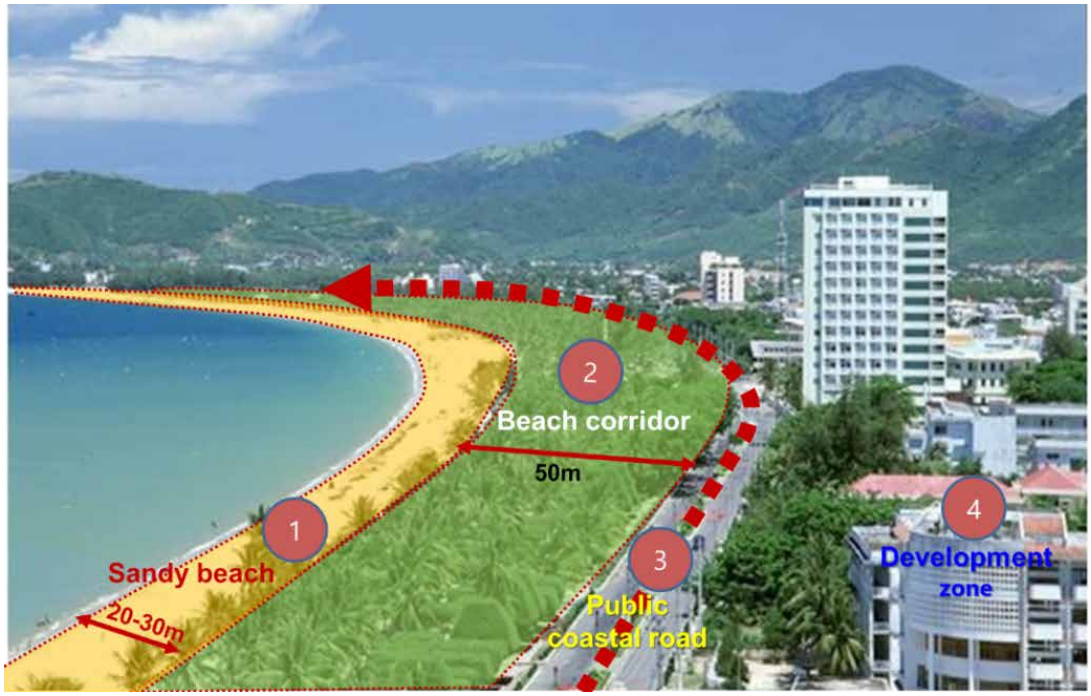
14.1.1 Laws and policies

The following are some of the key laws and regulations relevant to coastal area management:

- *Royal Decree on Creation and Designation of 23 Protected Areas* (01 November 1993)
  - Address the process of national resource management in line with the United Nations' List of National Parks and Protected Areas.
- *Law on Environmental Protection and Natural Resource Management* (24 December 1996)
  - Protect and promote environmental quality and people's health by curbing, reducing and managing pollution.
  - Conduct EIA before release of Government's decision on proposed projects.
  - Ensure conservation, development, management, and sustainable and suitable uses of the natural resources of the Kingdom of Cambodia.
  - Prevent all activities harmful to the environment.
- *Law on Fisheries* (21 May 2006)
  - Establish a framework to manage, protect, conserve, use, exploit, and restore the flooded forests, and develop the fisheries sector to ensure long-term sustainability of environmental, social, and economic benefits.
- *Law on Protected Areas* (15 February 2008)
  - Manage and conserve in an effective way the biodiversity, and sustainably use the natural resources in protected areas.
  - Implement conventions, protocols, and regional and national agreements on the protection of ecosystems and biodiversity.
  - Define responsibilities and involvement of local communities.
  - Define standards and tools for the management of protected areas.

- *Sub-Decree on Water Pollution Control* (06 April 1999)
  - Define the pollutants, criteria and standards to prevent and reduce water pollution, and protect human health and biodiversity.
- *Sub-Decree on Solid Waste Management* (27 April 1999)
  - This sub-decree is intended to define technical and safe control of solid waste to ensure the public health protection, environmental quality, and biodiversity conservation.
- *Sub-Decree on Environmental Impact Assessment* (11 August 1999)
  - Conduct EIA on private and public projects and activities as well as establish monitoring and evaluation (M&E) system by MOE before submission to the Government for approval.
  - Define types and scopes of projects for EIA.
  - Promote public participation in EIA processes.
- *Sub-Decree on the Establishment of the National Climate Change Committee* (24 April 2006)
  - Prepare, coordinate, and show the implementation of the Government's policies, strategies, laws, plans, and programmes to address climate change issues in the country.
  - Share and collaborate on the protection of environment and natural resources.
  - Prepare and coordinate plans and programmes on climate change mitigation and adaptation.
- *Sub-Decree on Community Fisheries Management* (March 2007)
  - Manage the inland and coastal fisheries areas.
  - Manage fisheries resources in a sustainable manner, and ensure the equitable sharing of benefits from fisheries resources for Khmer citizens.
  - Increase Khmer citizens' understanding and recognition of the benefits and importance of fisheries resources through direct participation in managing, using, and protecting fisheries resources.
  - Provide a legal framework that makes it easy for Khmer citizens living in local communities to establish community fisheries projects.
  - Develop the community fisheries to improve the standard of living of Khmer citizens and contribute to poverty reduction.
- *Sarachor (Circular) on the Development of Coastal Areas of Kingdom of Cambodia* (03 February 2012)
  - This Sarachor aims to guide ministries, concerned institutions, and sub-national administrations to manage, use, maintain, protect, and develop coastal areas in the Kingdom of Cambodia, including terrestrial domains, islands and waters with plans to manage and develop coastal areas in a right, effective, and viable way. **Figures 14.1** and **14.2** illustrate the zoning scheme as stated in this circular.

Figure 14.1: Coastal Use Plan.



Note: Coast shall be determined from the highest of high tide line of the sea up to the line prohibiting the tenure or other construction in stone or sand, and is determined as area for public use and classified as state public land.

1. **Beach.** The size of the beach shall be determined as below:
   - *Inclined beach; low slope:* beach area shall be determined at least 30 m off the highest of high tide line to mainland.
   - *Steep beach; high slope:* beach area shall be determined at least 20 m off the top of steep beach to mainland.
2. **Beach corridor.** This area of coastal reserved land (buffer zone) is the public land from the upper coastal line to the mainland and coastal road.
   - Width of coastal reserved land shall be determined at least 50 m off the upper coastal line to the mainland coastal road.
3. **Public coastal roads** are the roads which are constructed next to the coastal reserved land or beach corridor. (15 m from central line)
4. **Development zone:** for housing, commercial and industrial establishments, schools and government buildings.

Source: Ministry of Land Management, Urban Planning and Construction.

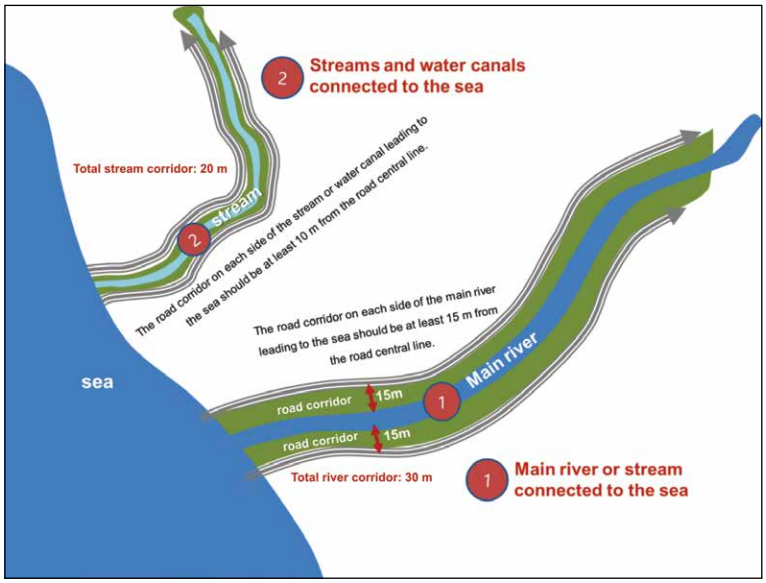


Figure 14.2: Coastal and river use zoning scheme.

Source: Ministry of Land Management, Urban Planning and Construction, 2016

- *Environment and Natural Resources Code*
  In the context of blue economy, Cambodia is trying to establish an umbrella law called "Environment and Natural Resources Code (ENR Code)". The ENR code will compile all environmental and natural resource-related regulations, including international environmental legal instruments that Cambodia is a party to, into a single legal binding law.

  The issue related to coastal zone management has been addressed in the draft ENR Code, under Book 4 (Sustainable Management of Natural Resources), Title 7 (Coastal Zone Management). There are three chapters and 12 articles under Title 7, which covers provision related to the establishment of the National Committee on Coastal Development and Management (NCCDM), the requirements of EIA, coastal subzone, climate change-related issues, etc. Furthermore, the ENR Code will address the effective implementation of the international environmental conventions and agreements, which Cambodia is party to.

- *Proclamation on Koh Rong Marine Fisheries Management Area (MFMA)*
  On 16 June 2016, Cambodia reached a landmark for marine conservation when the Minister of MAFF signed a prakas declaring a 405 km^2 Marine Fisheries Management Area (MFMA) around the islands of Koh Rong and Koh Rong Sanloem, creating the country's first large-scale marine protection.

- *Sub-Decree on Establishing Koh Rong as Marine National Park* (February 2018)
  In February 2018, the Royal Government of Cambodia issued a Sub-Decree establishing Koh Rong as the country's first Marine National Park.

14.1.2 Strategic plans

In addition to these regulations, there are some strategic frameworks related to marine and coastal zone management that were developed. The following are some examples of such strategic plans:

- *National Strategic Development Plan* (2009–2013; 2014–2018)
  - This strategic plan reviews all existing regulations, major problems, key stakeholders, and detailed programmes to ensure the improvement and sustainable management of the environment for the benefit of health, society, and the environment.
- *Coastal Environmental Management Action Plan* (2007–2011)
  - This action plan subscribes to the concepts of the ICM process in developing plans and joint decisions on multidisciplinary activities related to forests, fisheries, solid and liquid waste, habitats, as well as coastal use zoning.
- *Strategic National Action Plan for Disaster Risk Reduction* (2008–2013; 2014–2018)
  - This Action Plan aims to reduce the vulnerability of the people, especially the poor, to the effects of natural, environmental, and human-induced hazards.
  - This strategic national plan covers six main themes: (1) Ensure that Disaster Risk Reduction (DRR) is a regional and national priority; (2) Strengthen communities and sub-national

stakeholders based on risk management; (3) Conduct risk assessment and monitoring, and promote early warning systems; (4) Share knowledge and conduct education programs to ensure safety and advancement; (5) Mainstream DRR into programs and policies of relevant ministries; and (6) Strengthen risk prevention measures.

- *Cambodia Climate Change Strategic Plan* (2013–2023)
  - This strategic plan aims to: (a) mainstream climate into national, sub-national and sector level planning to achieve climate resiliency and green development; (b) reduce vulnerability to climate change impacts of critical systems and most vulnerable groups; (c) shift towards a green development path by promoting low-carbon development and technologies; (d) enhance resource mobilization from international climate finance, public-private partnerships, and national budgetary allocation to support climate change responses; and (e) improve equity in accessing opportunities for climate change responses and strengthen education, research and capacity development in providing climate-related services.
- *Strategic Planning Framework for Fisheries* (2010-2019)
  - This strategic plan framework is intended to support the achievement of Cambodia's Millennium Development Goals (MDGs), Sustainable Development Goals (SDGs) National Strategic Plans, and Rectangular Strategy for Growth, Employment, Equity, and Efficiency to protect and conserve critically endangered and vulnerable species and prevent the introduction of invasive and alien species into Cambodia.
- *National Action Plan for Coral Reef and Seagrass Management in Cambodia* (2006–2015)
  - The goal of this action plan is to protect and manage coral reefs and seagrasses to ensure sustainable fisheries resource utilization and development for the reduction of poverty and improvement of quality of life for all Cambodians.
- (Draft) Sustainable Development Strategic Plan of Southeast Asia for Cambodia to protect coastal environment for 2012–2016 (October 2012)
  - This strategic plan aims to effectively implement the Government's policies and strategies to protect the environment to promote public health, prevent erosion, and ensure the effectiveness of natural resources management and protection.

14.2 Implementing Agencies and Institutional Arrangements

There are a number of institutions with statutory power in implementing the policy and legal frameworks in coastal and marine areas. This gave rise to the problems of overlapping responsibilities as well as gaps and lack of coordination. Thus, the Royal Government of Cambodia has established the National Committee for Management and Development of Cambodian Coastal Areas (NCMD, 2012) as the direct subordinate of the Royal Government in charge of managing and developing coastal areas of the Kingdom of Cambodia in a sustainable and responsible manner. The NCMD is chaired by the Ministry of Land Management, Urban Planning and Construction, with the Ministry

of Environment and Ministry of Tourism as the vice chairs to the national committee. Other line ministries and agencies are members of the NCMD.

The NCMD has the mandate to perform the following functions and duties:

- Prepare policies, strategic plans, master plan, action plans, programmes, and projects related to the management and development of coastal areas;
- Monitor, prevent, and take necessary measures to stem all inactive actions affecting the environment and natural resources in coastal areas;
- Monitor and evaluate all development projects and project implementation in coastal areas to ensure the conformity with Government guidelines for the development of coastal areas;
- Facilitate coastal zone management;
- Protect the environment and natural resources in the coastal zones to improve the living conditions of the coastal population through the sustainable use and development of the coastal zone;
- Coordinate between regional and national institutions and donors on coastal issues;
- Monitor and advise the Royal Government for the purpose of harmonizing national policies, plans, and legal frameworks as well as international conventions and international laws concerning coastal zone management with national development priorities;
- Prepare regular annual reports on NCMD's activities and outcomes, and provide recommendations to the Royal Government;
- Provide advice and guidance on coastal zone management; and
- Coordinate the management and protection of natural and coastal environmental resources to improve the local people's livelihoods through the sustainable uses and development of coastal zones.

Table 14.1: Institutional Arrangements.

Coordinating Body	Main Task/s
National Committee for Management and Development of Cambodian Coastal Area (2012)	Promote sustainable management of coastal areas through integrated planning and monitoring of development activities along the coasts
National Coastal Steering Committee (NCSC)	Coordinating body among 18 line ministries and all four coastal provinces on coastal and marine resource management
National Committee for Disaster Management (NCDM)	Prepare and respond to natural disasters and other natural catastrophes, including a Five-year Strategic National Action Plan for Disaster Risk Reduction (SNAP–DRR)
National Climate Change Committee (2006)	Prepare, coordinate and monitor the implementation of policies, strategies, legal instruments, plans and programmes of the Royal Government to address climate change-related issues
Commission on Monitoring and Assessing for Suppressing Encroachment into Mangrove Land and Coastal Reclamation (2004)	Prohibits the encroachment activities, to force the return of the encroached/reclaimed land, and to order the culprit to replant the mangrove or replace the felled/cleared mangroves

14.3 Partnerships in Ocean Stewardship

In addition to the government ministries and agencies, there are a number of partnerships working for the benefit of marine and coastal management. These partners include Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), Fauna and Flora International (FFI), International Maritime Organization (IMO), UNDP, IUCN, etc. In addition to international partners, there are a number of private investors interested in marine conservation and protection, most of whom are involved in eco-tourism activities.

14.4 Meeting International Commitments

Cambodia has signed, ratified, and accessed a number of international conventions and agreements related to environment and other natural resource management, including marine- and coastal-related issues. Major international conventions and agreements that were accessed include: Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), International Convention for the Prevention of Pollution from Ships (MARPOL), Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, etc.

Conventions and agreements related to environmental management have been taken into consideration by setting up legal frameworks and mechanisms to implement these conventions and agreements. A number of coordinating bodies were established to manage the implementation of such conventions and ensure that the action plans have been developed and implemented to cover the requirements that were set in the conventions (**Table 14.2**).

Table 14.2: International Conventions and Agreements Adopted by Cambodia.

Convention/ Agreements	Action taken
CBD	• Put under the mandate of the Ministry of Environment (MOE) • National coordination body was established • Regulations to implement the CBD were adopted and being implemented
UNFCCC	• Put under the mandate of the MOE • Established the National Climate Change Committee (NCCC) • Strategies and action plans were developed and being implemented • Climate change issues have been mainstreamed into development sectors
Ramsar Convention on Wetlands	• Put under the mandate of the MOE • Ramsar sites were established to protect biodiversity
Basel Convention	• Put under the mandate of the MOE • Regulations and guidelines were developed, particularly related to hazardous waste and E-waste management
CITES	• Put under the mandate of the Ministry of Agriculture, Forestry and Fishery (MAFF) • Quarantine Officers are placed at the border check-points • Concerned with the EIA review process for all development proposals, where MOE is the leading agency in reviewing EIA
SDGs	• Put under the mandate of the Ministry of Planning • Line governmental ministries are requested to provide indicators for each target area and goals • Cambodia requested to add one more target area on de-mining activities (removal of land mines)

Source: MOE 2018, Compilation of Cambodia legal instruments related to those conventions.

Table 14.3: National Laws, Policies and Plans, and International Agreements.

Sustainable Development	Ocean and coastal area management	Coastal and Marine Resources	Climate Change	Natural Hazards and Risks	Pollution	Water resources	Ecosystems and Biodiversity	Fisheries, Food Security	Ports and Shipping	Coastal and Marine Tourism
National laws										
Law on Administrative Management of Capital, Province, Municipalities, Districts and Khans (2008)	Royal Decree no. NS/ RKT/0212/079				Control Regulations of the Environment Protection Law, adopted by Cabinet Decision No. 22	Law on Water Resource Management (2007)	Royal Decree/ Law on Environmental Protection and Natural Resource Management (1996)	Law on Fisheries (2006)		
Law on Land Management, Urban Planning and Construction (1994)							Law on Bio-safety (2008)			
Land Law (2001)										
Law of Investment (1994)										
National policies and plans										
National Strategic Development Plan, 2009-2013, 2014-2018	Cabinet Decision No. 45: Regulations on Creation, Conservation and Supervision of Marine Resources (2013)	Circular No. 1 on the Development of Coastal Area (2012)	Cambodia's Climate Change Strategic Plan, 2014-2023	Cambodia's Shoreline Management Strategy (2006)	Sub-Decree on Water Pollution Control (1999); Sub-Decree on Solid Waste Management (1999)	National Policy for Water Supply and Sanitation (2003)	Sub-Decree on the Establishment of Protected Forests, Natural Resource Conservation, Wild Life Protection Areas, and Protected Forests for Biodiversity Conservation (2002, 2004)	Sub-Decree on Management of Community Fisheries (2005)	Sub-Decree on Ship and Port Security (2006)	Tourism Strategic Plan, 2011-2020
10-Year National Program on Sub-national Democratic Development, 2009-2019		Cambodia's Shoreline Management Strategy (2006)	Cambodia's REDD+ Roadmap (2010)	Five-Year National Action Plan for Disaster Risk Reduction (SNAP-DRR), 2008-2013 National Action Plan on Disaster Risk Reduction, 2014-2018	Sub-Decree on Air and Noise Pollution Control (1999)	National Strategy for Rural Water Supply, Sanitation and Hygiene, 2011-2025	Sub-Decree on Forest Community (2003)	Masterplan on Fishing for the Future, 2010-2019	Port Safety, Health, and Environmental Management System (PSHEMS) in Sihanoukville Autonomous Port, and Phnom Penh Autonomous Port	Ecotourism Policy (draft)

Table 14.3: National Laws, Policies and Plans, and International Agreements. (cont.)

Sustainable Development	Ocean and coastal area management	Coastal and Marine Resources	Climate Change	Natural Hazards and Risks	Pollution	Water resources	Ecosystems and Biodiversity	Fisheries, Food Security	Ports and Shipping	Coastal and Marine Tourism
Socio-economic Development Program, 2001-2005		Regulation 001: Management and Development of Cambodia Coastal Zone	National Adaptation Program of Action 2006		Sub-Decree on Healthcare Waste Management (2008)	Rural Water and Sanitation Sector Investment Plan, 2010-2025	National Forestry Program, 2010-2029	Strategic Planning Framework for Fisheries, 2010-2019		Regulation 001: Management and Development of Cambodia Coastal Zone
National Poverty Reduction Strategy, 2003-2005		ICM program	Cambodia Climate Change Alliance Trust Fund		National Strategic Plan for Land-based Pollution Management, 2006-2010	Strategic Plan on Water Resource Management and Development, 2005-2008	National Environmental Strategic Plan, 2009	Strategic Framework for Food Security and Nutrition in Cambodia, 2008-2012		Regulations and requirements for island development and for investors
		Sihanoukville Coastal Use Zoning (2005)	Coastal Adaptation and Resilience Plan		Key River Basin Pollution Prevention and Mitigation Plan, 2011-2015	Key River Basin Pollution Prevention and Mitigation Plan, 2011-2015	National Action Plan for Land Degradation, 2010-2020	National Nutrition Strategy, 2009-2015		Cambodia Mutual Conservation Fund
					National Environmental Strategic Plan, 2009	National Drinking Water Quality Standards (2003)	National Biodiversity Strategy and Action Plan (2002)			Beach Eco- Label and Beach Competition
					Beach Cleanup		National Self Capacity Assessment Action Plan for CBD, UNFCC, and UNCCD			Beach Management Guidelines
							Proclamation on Koh Rong Marine Fisheries Management Area (MFMA) (2016)			

Table 14.3: National Laws, Policies and Plans, and International Agreements. (cont.)

Sustainable Development	Ocean and coastal area management	Coastal and Marine Resources	Climate Change	Natural Hazards and Risks	Pollution	Water resources	Ecosystems and Biodiversity	Fisheries, Food Security	Ports and Shipping	Coastal and Marine Tourism
Institutional arrangements										
Law on Administrative Management of Capital, Province, Municipalities, Districts and Khans (2008)	Sub-Decree on the Establishment of National Committee for Open Sea Security	Establishment and Function of the National Committee for Management and Development of the Coastal Area (2012)	Cambodia Climate Change Office, under MOE (2003)	Royal Decree No. NS/ RKT/0804/263: Establishing the National Committee for Disaster Management, 2006-2010		Institutional Development Plan for Water and Sanitation, 2003-2012	Commission on Monitoring and Assessing for Suppressing Encroachment into Mangrove Land and Coastal Reclamation (2004)		Sub-Decree on the Establishment of National Committee for Open Sea Security	
		National Coastal Steering Committee (18 line ministries and 4 coastal provinces)	Sub-Decree on Establishment of the National Climate Change Committee (2006)	Sub-Decree No. 61: Establishment of the National Committee for Disaster Management (2006)						
		Commission on Monitoring and Assessing for Suppressing Encroachment into Mangrove Land and Coastal Reclamation (2004)		Provincial Committees for Disaster Management						
International conventions and agreements										
Agenda 2030 and Sustainable Development Goals (SDGs)	UNCLOS 1982 (signature, 1982)	MARPOL 73/78 Annex I/II (1995) Annex III (1994) Annex IV (1994) Annex V (1994)	UNFCC 1992 (accession, 1995)	Hyogo Framework for Action (Acceptance, Succession, 2005)	Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-based Activities 1995	UNCCD 1994 (1997)	Biodiversity (CBD) 1992 (1995)		MARPOL 73/78: Annex I/II (1995) Annex III (1994) Annex IV (1994) Annex V (1994)	World Heritage 1972 (1991)

Table 14.3: National Laws, Policies and Plans, and International Agreements. (cont.)

Sustainable Development	Ocean and coastal area management	Coastal and Marine Resources	Climate Change	Natural Hazards and Risks	Pollution	Water resources	Ecosystems and Biodiversity	Fisheries, Food Security	Ports and Shipping	Coastal and Marine Tourism
			Kyoto Protocol 1997 (2002)		Stockholm Convention on Persistent Organic Pollutants (POPs) 2001 (2006)		Ramsar 1971 (1999)		Basel Convention 1989 (2001)	
			Montreal Protocol 1987 (accession, 2001)		Mercury Convention (signature, 2013)		CITES 1973 ratification, 1997)		International Regulations for Preventing Collisions at Sea 1972 (1994)	
			Vienna Convention for Protection of Ozone Layer 1985 (accession, 2001)				World Heritage 1972 (1991)		CLC: Convention (1995) Protocol (2001) Protocol (2002)	
							Whaling 1946 (2006)		FUND: Protocol (2002)	
							UNCCD 1994 (1997)		SUA: Convention (2006) Protocol (2006)	
							Cartagena Biosafety Protocol 2000 (2003)		SOLAS: Convention (1995) Protocol (1995) Protocol (2001)	
							Treaty on Plant Genetic Resources for Food and Agriculture (Acceptance, 2004)		Load Lines: Protocol (2001)	
							Nagoya Protocol 2010 (signature, 2012; ratification, 2015)			

15 Sustainable Development Strategy and Actions to Ensure Blue Economy

15.1 Integrated Coastal Management (ICM)

Current stresses on the coastal zone of Cambodia are numerous and have been discussed in detail in preceding sections. Perhaps the most pressing issues are the destruction of the protective mangrove forests and haphazard coastal development. An approach being used in many countries to address the various needs and requirements of the different groups of stakeholders in the coastal areas is the Integrated Coastal Management (ICM). The main principle behind ICM is to try and bring together varied interest groups and ensure that they work together, along with the promulgation of complementary policies, towards the sustainable development of coastal zones. In other words, ICM aims to effectively address multiple resource-use conflicts, habitat loss, pollution, and other current coastal issues while at the same time take a strategic approach to deal with long-term issues, such as climate change and sea-level rise. Habitat and biodiversity conservation and fisheries management are being implemented through the establishment of the Marine Fisheries Management Area and the ICM program. Moreover, climate-resilient infrastructure development, reforestation, and mangrove rehabilitation are also being undertaken as part of climate change mitigation and adaptation efforts within the ICM program. Thus, ICM is the pillar supporting blue economy development, especially at the local level.

15.2 Ecosystem, Biodiversity and Fisheries Conservation

15.2.1 Protected areas in coastal provinces

Boundary delineation for protected areas prevented further encroachment in protected areas and allowed recovery of areas from illegal settlers. **Table 15.1** provides specific targets for the rehabilitation, conservation, and protection of key coastal and marine habitats and endangered species.

Table 15.1: Protected Areas in the Coastal Provinces.

Protected Areas	2-Year Targets (by 2011)	5-Year Targets (by 2014)	10-Year Targets (by 2019)
Seagrass	3,000 ha replanted	5,000 ha replanted	7,000 ha replanted
Coral reefs	300 ha rehabilitated	500 ha rehabilitated	840 ha rehabilitated
Mangroves	300 ha replanted	700 ha replanted	1,000 ha replanted
Endangered species	At least 5 endangered species increased in population by 20%	At least 10 endangered species increased in population by 30%; At least 4 endangered species have been removed from the endangered list	At least 15 endangered species have been removed from the endangered list

Source: UNEP. 2009. UNEP/GEF Project: Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand.

Other initiatives that contribute to habitat conservation at the local level:

- Environmental Management in the Coastal Zone of Cambodia (Phase 3, 2002-2007): included environmental protection of coastal resources to improve local livelihood;
- Participatory management of coastal resources in Koh Kong (2005-2007, IDRC project);
- In 2006, three ecotourism destinations have been established and two more were developed to promote habitat protection and provide supplemental income to communities in Peam Krasaop Wildlife Sanctuary, and Botom Sakor National Park;
- Establishment of the Marine Fisheries Management Area (MFMA) around Koh Rong and Koh Rong Sanloem in 2012–2015 by MAFF to create multiple-use management area, with benefits to fisheries, business, and biodiversity;
- Community-based resource management in Stung Hav, Sihanoukville (implemented under SGP and PEMSEA Joint Communiqué): 184,000 mangrove seedlings covering 18 ha were planted in Sangkat Otress and Sangkat Tomnub Rolok, and 50 artificial reefs were put up in the MFMA.; and
- In Kampong Smach, draft coastal use zoning has been prepared as well as a draft MFMA declaration.

15.2.2 Protected areas

The government has designated 23 protected areas (PAs) in 1993. Amongst these 23 PAs, six PAs are located in the coastal area, and three other protected areas are partly located in the coastal area. These protected areas are Kep National Park (Kep Province), Bokor National Park (Kampot), Ream National Park (Preah Sihanouk), Botum Sakor National Park, Peam Krasoab Wildlife Sanctuary, and Dong Peng Multiple Use Area (Koh Kong). The rest of the protected areas are located in the Cardamom Mountains.

There are two Protected Forests, which were created by MAFF: Southern and Central Cardamom Protected Forests, located in Koh Kong Province and partly in Pursat Province covering an area of approximately 383,245 ha.

The creation of Southern Cardamom Protected Forest in year 2004 has increased the total protected forest areas, reflecting that more forest areas were put under conservation and protection. This effort is to ensure the sustainable development and biodiversity richness of the country. Protected forests contribute to watershed management and protection of downstream, coastal areas.

Moreover, in 2016, the Government of Cambodia has announced the establishment of the Koh Rong National Marine Park (NMP), covering over 52,000 ha located along the coast of Preah Sihanouk and Koh Kong. The NMP is critical to safeguarding coastal habitats, such as coral reefs, seagrass beds and mangrove forests. The park is also home to flagship species, such as Irrawaddy dolphins, dugongs and sea turtles.

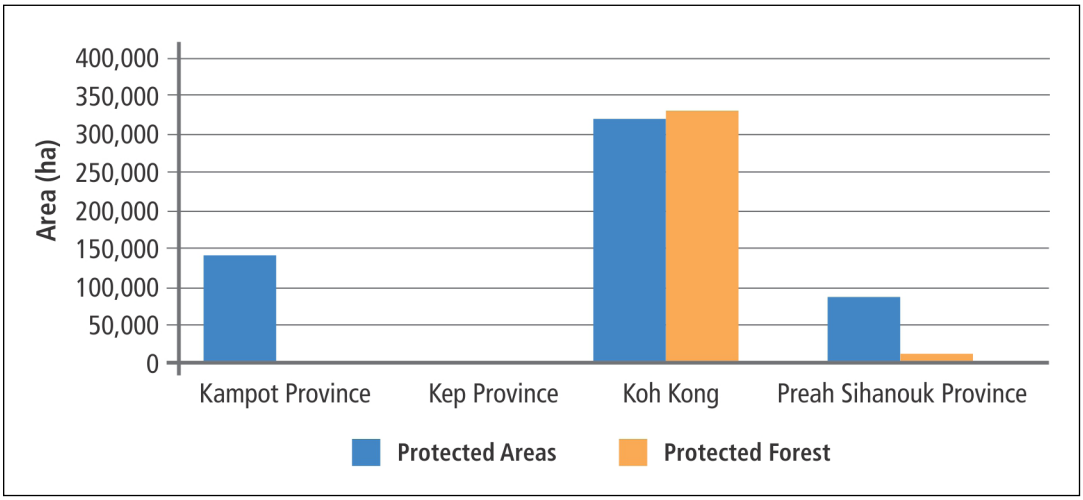
The protected areas and protected forests in the coastal provinces are shown in **Table 15.2** and **Figure 15.1**.

Table 15.2: Protected Areas and Protected Forests in the Cambodia's Coastal Areas (ha).

Province	Protected Areas	Protected Forest Areas
Kampot Province	118,600.29	
Kep Province	2,793.64	
Koh Kong Province	371,636.26	376,779.26
Preah Sihanouk Province	86,100.88	6,355.56

Source: MAFF.

Figure 15.1: Protected Areas and Protected Forests in Cambodia's Coastal Areas.



Source: Ministry of Land Management, Urban Planning and Construction.

15.2.3 Marine Protected Area and Marine Fisheries Management Area

The Provincial Environment Department has been destroying kilns that used mangroves as fuelwood. Some mangrove re-growth and planting have been noted through collaborative efforts by the government, nongovernment organizations (NGOs), and local communities.

On 8 February 2018, the Government of Cambodia announced the establishment of the Koh Rong National Marine Park (NMP), covering over 52,000 ha located along the coast of Preah Sihanouk and Koh Kong. The NMP is critical to safeguarding coastal habitats, such as coral reefs, seagrass beds, and mangrove forests. The park is also home to flagship species, such as Irrawaddy dolphins, dugongs, and sea turtles.

The establishment Koh Rong's NMP is also a step towards fulfilling Cambodia's international obligations. As a signatory to the Convention on Biological Diversity, Cambodia is committed to achieving the Aichi Biodiversity Targets by 2020. Target 11 requires that at least 17% of each signatory's terrestrial and inland water area and 10% of its coastal and marine area be designated and managed as protected. Cambodia already has 53 terrestrial protected areas covering more than 7.5 million ha – almost 41% of the country – and now has one NMP covering more than 52,000 ha of its sea, islands, and coast. However, this is less than 5% of the territorial waters.

The Ministry of Agriculture, Forestry and Fisheries has approved the country's first ever marine protected area (MPA) in the waters of the Koh Rong Archipelago (KRA), covering an area of 405 km^2. The KRA is situated approximately 20 km off the coast of Sihanoukville and is home to coral

reefs, seagrass, and mangrove habitats as well as Community Fisheries located across the villages of Daem Thkov, Prek Svay, Koh Touch, and M'Pai Bai.

The Marine Fisheries Management Area (MFMA) was established around the islands of Koh Rong and Koh Rong Sanloem. This MFMA/MPA will protect key species, such as sea turtles and seahorses, and vulnerable habitats, including nursery and breeding sites, while still allowing human activities like fishing, research, and tourism to take place.

The Fisheries Administration (FiA) and conservation organisations have been working tirelessly for more than five years within the archipelago to consult with local stakeholders and communities, and gather baseline data about the area's biodiversity to support the designation of the site. The Fauna & Flora International (FFI) and other organisations, including Song Saa Foundation and Save Cambodian Marine Life, have also played an important part in protecting the site and supporting the designation of the MFMA.

The main purpose of the establishment of this MFMA is to protect biodiversity of key marine fauna and habitats in the archipelago, as well as the communities that rely upon them for their well-being.

The FFI is the key partner of FiA, and has been collaborating with the FiA since 2012 to provide support to those promoting marine conservation in the archipelago. Beside FFI, the Song Saa Foundation also plays an important role in monitoring the health of coral reefs, mangroves and seagrass and providing diving opportunities to tourists who want to see the coral reefs and marine life. **Table 15.3** shows the major organizations and partners collaborating to support the management of the MPA/MFMA.

Table 15.3: Key Players and Their Roles.

Key players	Roles
Fisheries Administration (FiA)	Oversight, management, staff
Fauna and Flora International (FFI)	Conservation management: Research coordination Capacity building: Research scholarships
Royal University of Phnom Penh	Masters Research students
Coral Cay Conservation	Coral reef baseline surveys MSc student support
Song Saa Foundation	Coral reef monitoring surveys; permanent transects
Other collaborators	Ongoing support for implementation; coral propagation

Key steps taken

1. Establish the area as a marine protected area, complete with legal basis, implementing arrangements, and management plan.
   - Designated as the 1st large-scale Marine Fisheries Management Area through MAFF Proclamation No. 364 in June 2016 covering a sea area of 405 km^2.
   - Established six zones in the area: conservation, protected fisheries, community fisheries, fisheries refugia, recreational research, and multiple-use areas.
   - Developed and adopted a Management Plan for the Koh Rong Archipelago 2016-2020.
   - Established as Cambodia's 1st Marine National Park in February 2018 through a sub-decree issued by the Prime Minister covering an area of 52,000 ha (520 km^2). MOE with support from IUCN-Mangroves for the Future (MFF), and FFI will develop the Management Plan and zoning scheme for the marine national park.
2. Involve and empower the fishery communities to conduct patrolling and enforcement.
   - Three fishery communities (CFi) were established in KRA in 2005 for protection of resources to promote tourism and livelihood. They work with the Fishery Administration, local police, and commune leaders for patrolling.
   - Each CFi has a designated area for patrolling.
   - Patrolling is conducted at least 7–20 times/month depending on reports of illegal activities.
   - Illegal activities include encroaching of fishermen from other areas and illegal cutting of trees.
3. Conduct public awareness to promote change in behaviour of communities on environmental protection.
   - Engaging local communities and tourists in environment protection activities (clean-ups, sea turtle conservation, coral reef nursery and rehabilitation).
   - Organizing community consultations and workshop.
   - Developing various information campaigns (billboards, leaflets).
4. Develop partnerships for the implementation of programs and achievement of goals and targets.

Results

- Enhanced protection of resources: establishment of KRA as 1st large-scale MFMA and Marine National Park; METT[28] rating (2014) – 42%; METT rating (2015) – 54%.
- Increased resilience of fish species: parrotfish has stabilized and grouper biomass has increased since 2012 according to reef data (FFI, 2017).
- Controlled illegal activities both at sea (illegal fishing) and upland (illegal cutting of trees).
- Increased awareness and changes in behaviour of communities (e.g., zoning scheme and regulation, disposal of garbage, value of protecting marine resources).

[28] Management Effectiveness Tracking Tool (METT).

- Increased knowledge and capacity of local government and Community Fisheries on habitat protection and enforcement (patrolling and surveillance).
- Increased benefits from tourism – more tourists visiting the island because of protected resources (more attractive sites for diving and other recreational activities).
  - o Increased income of community from the tourism sector. As a result, major shifts in income sources – from fishing to tourism-related livelihood were reported in Koh Touch and Koh Rong Sanloem village. About 90% from 139 families in Koh Rong Sanloem were fishermen in 2005; now, only five families are involved in fishing, but not as the main livelihood (MTR Review, 2017).
  - o According to the Livelihood Assessment Report (2017), a family could earn around US$1,380–US$1,980 annually from tourism-related jobs, while the tourism service provider could earn from US$6,000–US$12,000 annually. Income from fishing ranged from US$1,690–US$3,825 annually.

Opportunities for improved management

a. Implementation of Koh Rong Marine National Park
   - Zoning and management planning will include both inland and marine waters.
b. Potential for sustainable financing
   - Ongoing discussions with Blue Finance for possible partnership to enhance MPA management, including better tourism and environmental infrastructure.
   - Implementation of Environmental Users Fee (EUF) to finance environmental protection and conservation.
c. Partnerships between national and local governments, NGOs, international partners, and private sector in continuing the promotion of sustainable tourism.
d. The short and long-term benefits of increasing tourism potential as a result of improved protection of resources as well as impacts of tourism (e.g., pollution, freshwater supply, etc.) should be carefully evaluated both from the socioeconomic and ecological perspective.

15.3 Pollution Reduction

15.3.1 Wastewater treatment and reuse

The coastal urban and/or towns are considering the installation of household-size septic tanks to reduce wastewater discharged directly to seawater. Such household septic tanks play an important role in the primary treatment of wastewater from major restaurants, hotels, guesthouses, and other large buildings for board and lodging, before sending this wastewater to the treatment facilities. Currently, Krong Preah Sihanoukville is the main coastal town with installed septic tanks for households.

Krong Preah Sihanouk also has a wastewater treatment facility using waste stabilization ponds, with a capacity of about 6,900 m^3/day, and designed for an organic loading (BOD) of 1,380 kg/day. The treatment plant can be expanded in the future by duplicating stage 1, and by adding an airing equipment if organic loading exceeds design assumptions. The system consists of two parallel hydraulic lines. Each line consists of three types of ponds arranged in a series: two anaerobic ponds (AP) in parallel, a facultative pond, and a maturation pond. The series of ponds is duplicated in a parallel line. The ponds are cost effective, require little maintenance, and generally perform well for BOD and solids removal. They can also reduce fecal coliform levels to acceptable levels.

The APs are deep (4 m) to promote sedimentation of wastewater solids and anaerobic decomposition to methane. Pond volume is 5,520 m^3 with a hydraulic retention time of 1 day. Effluent from the AP flows by gravity to the facultative pond (FP). The FP is a shallow pond (1.75 m) where wind action and sunlight combine to promote aerobic decomposition of remaining dissolved organic matter from the wastewater. Algal photosynthesis produces the oxygen required to support aerobic decomposition. Algal growth also raises pH, which enhances inactivation of fecal coliform. The FP has a surface area of 7841 m^2 and a hydraulic retention time of 3.7 days. Effluent from the FP flows by gravity to the maturation pond.

The maturation pond (MP) is a shallow pond (1.5 m) with longer residence time of 5 days that promotes further solar-ultraviolet (UV) disinfection and polishing of the wastewater. It enables effluent storage before discharge or subsequent reuse.

The ICM program in Sihanoukville is coordinating with the Department of Public Works in encouraging households and businesses to connect to this wastewater treatment plant. By 2015, 50 households in Village 1 and 2, 152 businesses, and 10 restaurants in Serendipity Beach in Sangkat 4 were connected.

Other programs

Under the ICM Program in Preah Sihanouk, a revolving fund was set up by the community in Sangkat 4 to support families in putting up toilets in their homes and connecting to the wastewater treatment plant.

An onsite wastewater treatment facility was put up in Occeauteal Beach. Stall owners were connected to this facility to prevent wastewater discharge to the beach.

In Stung Hav, a project covering 987 households in three villages in Tomnop Rolok Commune implemented community preparation and training activities for wastewater management, and established a revolving fund for sanitation.

A wastewater storage facility was also set up in Kep town, which serves hotels and restaurants near the coastal areas of Kep.

15.3.2 Integrated solid waste management and recycling

Since 2015, the solid waste management was handed over to the local governments, i.e., town and districts levels, where they have the right to collect fees from households for waste collection, transportation, and disposal at dumpsites. In the coastal provinces, local authorities are finding lands for the establishment of dumpsites, where all coastal towns and districts have their own lands to receive the household wastes.

Kampot town has established and practised the Integrated Resources Recovery Center (IRRC) for their integrated solid waste management and recycling, wherein household wastes have been segregated by individual households, and collected separately for recycling, composting and dumping. Nevertheless, such practice is conducted in just small areas and not the entire town.

Solid waste collection, transportation and disposal remain a challenge for other coastal towns and districts due to insufficient collection services. For instance, in Sihanoukville, solid waste collection service has been provided only in the central town by a private company. Preah Sihanouk Province entered into a business agreement for garbage collection service. Under the contract, the company provides collection services using their own equipment, collection containers and garbage collection trucks. In turn, the company is allowed to collect a service fee by type of waste generators based on the list of garbage collection fees. They are also allowed to dump collected waste at a dumping site in exchange for a rental fee.

Under the ICM Program in Preah Sihanouk, community-based solid waste management (SWM) activities have been implemented in Sangkat 4. The SWM project covers 1,011 households in five villages. It involved the establishment of a primary waste collection system where households will bring their solid waste to designated transfer points, and a secondary collection system where CINTRI, the private sector company, will collect the wastes from the transfer points, and then transport them to the dumpsite. A bin for recyclable waste is provided for every 10 households, and a community worker is employed to ensure regular waste segregation and disposal among the households. A socialized user fee system was also established. Households will pay KHR 3,000 per month on average for the waste collection system. The collected fees are used to support the community worker and maintenance of equipment and containers.

15.4 Climate Change Adaptation

15.4.1 Climate-resilient infrastructure

The major coastal climate change impacts are sea level rise, shortage of freshwater, and bank erosion, with seawater intrusion into inland areas as the main concern. Hence, the VAAP project has been providing funds for infrastructure rehabilitation to restore existing dykes and polder dykes to prevent seawater intrusion. The VAAP project, located mainly in Preah Sihanouk Province rehabilitates the 7500-m polder and outer polder dyke at Prey Nob District. It also takes care of the 60,000 seedlings of Teaptoas trees planted to protect 2,000 ha of polder.

Due to poor maintenance and erosion, some dyke sections had deteriorated and been toppled by sea water during high tide, damaging several hundred hectares of paddy fields inside the polder system. The VAAP endorsed the proposal for the reconstruction of 7 km of dykes, which was requested and implemented by the Prey Nob Polder User Committee to help protect over 10,000 ha of rice cultivated fields. It is very important to note that its effectiveness appears to have been tested in the following months after construction when it was reported that high tide levels were prevented from overtopping into the cultivated areas on two separate occasions since its construction. (On June 2016, a section of the dyke was temporarily overtopped.)

Therefore, the Prey Nob District dyke rehabilitation demonstration project has benefitted local communities. Nevertheless, in the future, it is proposed to improve dissemination of knowledge on how local communities can maintain and repair the dykes. With this, the long-term financial sustainability of similar interventions can be better realized.

15.4.2 Food security through climate change adaptation and sustainable coastal fisheries management*

Project location

- **Commune:** Trapeang Sangkae, Koun Stav, and Preaek Tnoat communes in Tuek Chhou district
- **Population:** 23, 478
- **Livelihood activities:** Fishing, farming (rice and other crops), animal husbandry, non-timber forest products, conservation, and ecotourism activities

Vulnerability Profile

- **Climate hazards:** Increased water temperature and more frequent storms, heavy rainfall, sea-level rise
- **Impact:** Degradation of fishery resources, marine habitats, and rice fields; saltwater intrusion into rice fields; food insecurity; increased incidence of animal diseases.

- **Key issues:** Increased storms and unsustainable fishing activities, destroying fishery resources and fish shelter, such as sea grass; limited knowledge of sustainable fisheries, climate change adaptation (CCA), and disaster risk reduction (DRR); limited law enforcement to protect marine waters.
- **Traditional coping strategies:** Migration; fishing at night, when fish hiding from the daytime heat in the roots of mangroves come out; community fisheries and patrols to stop illegal mangrove cutting; mangrove restoration and seagrass conservation (with support from previous projects).
- **Targeted stakeholders:** Smallholder farmers, artisan fisherfolk, women and children.

Expected Outcome

Sustainable management of coastal fishery resources and increased awareness of climate change adaptation for food security in coastal communes of Kampot province.

Outputs

- CCA and DRR integrated into commune investment and development plans
- Climate change campaign waged to raise awareness on the effects of climate change on vulnerable ecosystems and food security
- Food security and livelihood of small-scale fishermen improved

Adaptation Activities

- Develop a suitable CCA strategy for the targeted communes, covering the needs and plans of vulnerable communities, to be integrated into the development and investment plans of the communes.
- Develop a guidebook for mainstreaming CCA and DRR practices in coastal areas to improve governance and the adaptive capacity of institutions to respond to climate change.
- Develop awareness-raising materials and disseminate them to the communities, and organize fishermen's workshops to share information about climate change risks and food security threats.
- Build a community learning center to give the public access to information and learning related to climate change and its effects on ecosystems.
- Plant mangrove trees in the targeted communes and support mangrove conservation activities to increase fish stock and reduce the impact of climate change
- Introduce salinity-resistant crops through demonstration farms and training to cope with saltwater intrusion from sea-level rise
- Develop a case study to share lessons learned and best practices

Resilience Instruments to be Developed and Tested

- Salinity-resistant crops
- Ecosystem conservation and restoration
- Complementary livelihood strengthening (ecotourism)

* *Source: ADB. 2017. Cambodia: Pilot Program for Climate Resilience. Project Brief no. 7.*

15.4.3 Climate change adaptation in Koh Rong Archipelago**

Project location

- **Commune:** Koh Rong commune in Preah Sihanouk district
- **Population:** 2,016
- **Livelihood activities:** Fishing, farming, small-scale home agriculture and aquaculture, tourism

Vulnerability Profile

- **Climate hazards:** Drought, increased rainfall, rising sea levels, more frequent and intense storms
- **Impact:** Decline in crop yield, less water supply for fisheries, loss of fish habitat, coral bleaching, seawater intrusion, poor water quality for human and animal consumption, increase in waterborne diseases.
- **Key issues:** Poor condition of coral reefs, limited water and sanitation facilities; limited understanding of climate change adapatation (CCA) and disaster risk reduction (DRR) among local authorities and communities.
- **Traditional coping strategies:** Fishing and small-scale home gardening in pots or planters; rainwater harvesting and wells; patrols against illegal fishing to conserve fish stocks.
- **Targeted stakeholders:** Vulnerable communities in coastal areas and fisherfold, including women and childrens.

Expected Outcome

Enhanced adaptive capacity of communities and local authorities through improved access to potable water, increased protection of natural systems, and improved knowledge and understanding of climate change.

Outputs

- Access to clean potable water during drought improved
- Natural systems, such as coral reefs and mangrove that contribute to climate change and disaster resilience of coastal communities, protected.
- Understanding and capacity of local communities and local and regional authorities to respond to climate change improved.

Adaptation Activities

- Establish water harvesting, storage, and distribution network infrastructure and systems at community tap stations to help communities cope with drought.
- Introduce potable water filters to the most vulnerable communities, and train them to use the devices.
- Restore coral reefs and mangrove forests to increase local communities' resilience and adaptive capacity in the face of rising sea levels and saltwater intrusion.• Restore coral reefs and mangrove forests to increase local communities' resilience and adaptive capacity in the face of rising sea levels and saltwater intrusion.
- Conduct village-based outreach events to promote CCA and DRR in the communities.
- Provide training in mainstreaming CCA and DRR into commune investment and development plans to increase the adapative capacity of institutions.
- Develop a photo book and other media on the impact of climate change and local adaptive coping strategies being understaken by the communities, to empower local communities, including women and children, to tell the story of how climate change is affecting them and how they have chosen to respond to it.

Resilience Instruments to be Developed and Tested

- Rainwater harvesting infrastructure
- Climate-smart coastal resource management

** *Source: ADB. 2017. Cambodia: Pilot Program for Climate Resilience. Project Brief no. 16.*

PART 6

CONCLUSION AND RECOMMENDATIONS

16 Conclusion and Recommendations

16.1 Where We Are Now

16.1.1 Ocean economy and ecosystem services

The ocean industry, comprising of fisheries, ports and shipping, and coastal and marine tourism sectors, contributes an estimated US$2.4 billion in value added or around 16% of the country's GDP. This could be underestimated due to lack of disaggregated data for other ocean-related industries. Moreover, the non-market values and the regulating, supporting and cultural services generated by ecosystems are usually not accounted for in the GDP. The estimated total economic value of the coastal and marine ecosystems (mangroves, seagrass, and coral reefs) ranges from US$200.42 million to US$583.42 million per year. The ocean accounts of Cambodia need to be further developed to show the benefits in monetary terms of the oceans, and their contribution to income, livelihood, economic growth, food security, shoreline protection, carbon sequestration, etc. The ocean accounts would also help in assessing opportunities and gains from blue economy development.

16.1.2 Status of Cambodia's coastal and marine environment and ecosystems

Cambodia has a 435-km coastline with 55,600-km^2 EEZ, and shares marine borders with Thailand and Vietnam in the Gulf of Thailand.

The coastal population is about 1,094,072 residents, which accounts for 7.1% of the total population, according to the Cambodia Socio-Economic Survey 2015.

The blue economy relies on healthy oceans. The Cambodia has a rich biodiversity and coastal and marine ecosystems consisting of mangroves, coral reefs, seagrass, estuaries, and mudflats.

There are 74 mangrove species and relatively pristine mangrove forests growing in four major species zones from the shoreline to the landward edge. In 2002, the mangrove area was 56,241 ha (JICA, 1997 and MOE, 2002), but it was reduced to 50,860 ha in 2011 (MOE, 2013).

For coral reefs, there are around 70 coral species found in Cambodian waters, with 33 genera and 11 families recorded at Koh Tang, in Sihanoukville (Nelson, 1999). SOER 2005 shows that there

were about 2,805.5 ha, of which Preah Sihanouk province has 1198 ha, Kampot province with 953 ha, Koh Kong province with 602 ha, and Kep province with 52.5 ha. Most of the Cambodian islands are reported to be abundant in coral reefs. Some coral reefs are in poor condition because of sedimentation, particularly around Polowii Island (Koh Wai). Coral reefs in Cambodia are in fair to good condition, with coral cover ranging from 23.1% in the Sdach Island group of Koh Kong Province to 58.1 % at Takiev Island group of Sihanoukville (UNEP/GEF, 2007; Vo et al., 2013).

Cambodia's seagrass can be divided into two types; extensive seagrass meadows along the mainland, and paths of seagrass interlinked with coral reefs around islands. The distribution of seagrass in the Cambodian coastal waters is about 32,494 ha, of which Kampot province has about 25,241 ha, Koh Kong province about 3,993 ha, Kep province about 3,096 ha, and Preah Sihanouk province about 164 ha (Department of Fisheries).

Most of Cambodia's marine estuaries are located in protected areas, namely Botum Sakor National park, Ream National Park, Dong Peng Multiple Wildlife Use Area, Peam Krasoab Sanctuary, and Koh Kapik Ramsar Site. These areas are influenced by inter-tidal levels and water flow from highland areas.

There is a need to monitor and evaluate the condition of these ecosystems, considering that t he available data are old and the country has experienced rapid development in the past decade.

16.1.3 Risks and threats to blue economy

The major threats to Cambodia's marine and coastal environment are caused by human activities and natural hazards. The major continuing threats to the ecosystems are over-fishing, use of dynamite and other illegal fishing practices, harvesting of of live specimens and corals for trade, and degradation of water quality. Sedimentation and pollution greatly impact seagrass and coral reefs.

Pollution control, with proper sanitation and wastewater treatment facilities, should be made a priority. According to the report on Economic Impact of Sanitation in Cambodia (World Bank 2008), poor sanitation and lack of wastewater management lead to economic losses of US$448 million per year, equivalent to 7.2% of Cambodia's GDP in 2005. This amount is roughly equivalent to the contribution of the fishery sector to the GDP, or twice the forestry's contribution. While these economic costs are not all tangible, the immediate money 'in the hand' losses (financial losses) amount to about US$160 million per year, which is roughly 2.5% of the GDP.

In the economic cost estimate, it is found that health impact is the largest contributor of quantified costs, accounting for 42% of the total economic costs. The next main contributor of the quantified economic costs is the water costs attributed to the cost of accessing cleaner drinking water, the

cost of accessing other domestic water uses, and the loss in fish production due to polluted water, which is roughly 33% of the total economic losses. Moreover, the tourism sector, which may also be affected by poor sanitation and hygiene practice in the country, accounts for 16% of the total costs. The last economic loss caused by the loss of time due to unimproved sanitation is 9% of the total economic costs.

In addition to pollution and habitat loss, natural hazards and climate change pose major risks to the marine and coastal environment and will impact coastal communities, infrastructure, and agriculture. Such natural hazards are mostly related to sea level rise, ocean acidification, sea water temperature increase, droughts, and flooding.

16.1.4 Cambodia's response to ensure ocean health and blue economy

Many regulations, strategies, and projects have been developed and implemented to protect marine and coastal environment as well as support sustainable development in the coastal area and enhance people's income and livelihood. Major Royal decrees, laws, sub-decrees and other regulatory instruments have been issued. Some are still being developed, such as the Law on Environmental Protection and Natural Resources Management, Land Law, Royal decree on the Creation and Designation of Protected Areas, Sub-Decree on Environmental Impact Assessment, Water Pollution Control, Fisheries and Forestry laws, and Law on Land Management Urbanization and construction, etc.

There are a number of institutions with statutory power in implementing these policies and laws in the coastal and marine areas. This has led to problems of overlapping responsibilities and lack of coordination. Thus, the Royal Government of Cambodia has established the National Committee for Management and Development of Cambodian Coastal Areas (NCMD, 2012), which is directly subordinate to the Royal Government and is in charge of managing and developing the coastal areas of the Kingdom of Cambodia in a sustainable and responsible manner. The NCMD is chaired by the Ministry of Land Management, Urban Planning and Construction, with the Ministry of Environment, and Ministry of Tourism as the vice chairs. Other line ministries and agencies are members of the NCMD.

For marine water quality control, Cambodia has a sub-decree on water pollution control, issued in April 1999, which provides the standards for public water quality for supporting aquatic lives. It covers some parameters, such as pH (7.0-8.3), COD (2-8mg/l), TSS (1-15 mg/l), DO (7.5-2.0mg/l), Coliform (<1000 MPN/100ml), Oil content (0mg/l), Total Nitrogen (0.2-1.0 mg/l), and Total phosphorus (0.02-0.09 mg/l).

It is hard to get information on the nutrients from watershed and coastal areas being discharged into Cambodia's coastal waters. There was one incident of algal bloom, which occurred in 2015

in Kep Province. It cannot be determined if such algal blooms resulted from nutrient runoff from Cambodia's watershed or from neighbouring countries.

The UNEP/GEF Transboundary Water Assessment Programme, 2015 for LME 35-Gulf of Thailand indicated that the Nitrogen Load risk level for contemporary (2000) conditions was low (level 2 of the five risk categories, where 1 = very low risk; 2 = low risk; 3 = moderate risk; 4 = high risk; 5 = very high risk). Based on a "current trends" scenario (Global Orchestration), this will remain low in 2030 and increased to moderate by 2050. For the nutrient ratio, the risk level for contemporary (2000) conditions was very low. According to the Global Orchestration scenario, this will increase to low in 2030 and increased further to moderate in 2050.

In response to the long-term coastal and marine environmental management, the government is currently drafting the one umbrella environmental law, called the "Environment and Natural Resources Code of Cambodia". This Code will address the mandate of governmental institutions responsible for environmentally-sound management of waste as well as requiring treatment of wastes before releasing into the environment.

The Ministry of Environment also delegated power and resources to the local government for sound waste management. For wastewater, the initiative to build wastewater treatment facilities is being studied in major cities and municipalities. At the initial stage, Krong Preah Sihanouk is increasing the connection to the city sewerage system and wastewater treatment facility and working with communities in installing septic tanks for households that are inaccessible to the sewerage system. There is also a collection, transfer, and disposal system for solid waste in some areas of Sihanoukville. A community-based solid waste collection system, and partnership with private sector for the transfer and disposal of the collected waste was established in some areas of the province as pilot site, but this system needs to be further improved, and replicated in other areas. A sanitary landfill is also essential.

The major ports in Cambodia – Sihanoukville Autonomous Port, the main seaport, and Phnom Penh Autonomous Port (PAPP), the main river port – are implementing the Port, Safety, Health and Environmental Management System (PSHEMS). Both ports have completed the Stage 1 Audit, and are expected to be awarded their PSHEMS certification in 2019. The national oil spill contingency plan is still up for adaptation

There are protected areas and natural parks in the four coastal provinces for biodiversity and habitat conservation. The government had designated the country's first large marine protected area (known in Cambodia as a Marine Fisheries Management Area) in Koh Rong archipelago in 2016 to ensure that fishery resources are managed sustainably while also encouraging tourism, reducing poverty, and maintaining biodiversity. The Koh Rong islands, located about 20 km off

Sihanoukville in the Gulf of Thailand, have mangroves, seagrass, coral reefs, beach areas as well as hills, creeks and estuaries. In 2018, the Koh Rong archipelago was declared a marine national park.

In order to protect coastal and marine environment for sustainable use and development, and address risks and pressures, Cambodia is implementing the integrated coastal management (ICM) program in all of Cambodia's coastal provinces. Preah Sihanouk Province started to apply ICM with support from PEMSEA in 1999. In 2016, with support from the GEF/UNDP/PEMSEA SDS-SEA Scaling Up Project, the three other coastal provinces (Kampot, Kep and Koh Koh Kong) initiated the implementation of their ICM programs. The country boasts of its 100% coastline coverage of ICM program implementation. The main principle behind ICM is to try and bring together varied interest groups and ensure that they work together to adopt and implement policies and action plans on habitat conservation, pollution reduction, fisheries and alternative livelihood, water use and supply management, natural and man-made risk reduction and management, and climate resiliency for the sustainable development of coastal and marine areas. To support the ICM concept, the government issued a circular on the development of Cambodia's coastal area, including the definition of coastline and delineation of coastal zones (**Figure 14.1**). Coastal use plans and zoning schemes are also being applied along rivers and streams, and for sustainable island development.

16.2 Where Are We Heading

Cambodia understands that the coastal and marine resources provide a substantial portion of the county's population with food, livelihoods, and the means of transportation and international trade. The marine and coastal environment also constitutes key resources, which are important to Cambodia's tourism industry – supporting all aspects of the tourism development cycle from infrastructure development to the diverse and expanding domain of nature-based tourism. Cambodian coastal tourism contributes about 13.6% (all coastal provinces) to GDP. The country's commodities trade is heavily dependent on maritime transport. Contributing to the rapid economic development, Cambodia has been fostering infrastructure development, such as airport, seaports, roads, railways, and industrial facilities in the coastal areas.

There are a number of investment opportunities for blue economy in Cambodia's coastal areas, such as (a) sustainable ecotourism and beach management; (b) green port development; (c) climate resilient infrastructure; (d) sustainable and climate-smart fisheries and aquaculture; and (e) sustainable fish and seafood sourcing and processing, etc. With these new developments, the share of ocean economy to GDP is expected to increase further.

In addition, to ensure the transformation to blue economy, it is also critical to have investments in the following areas: (a) waste treatment facilities for solid waste, plastic waste, and toxic and hazardous waste, (b) sanitation and wastewater management system, (c) safe drinking water supply, and (d) habitat conservation and marine protected areas. These are essential to ensure food, water and energy security; improve the quality and condition of the marine waters and ecosystems; and

support the continued growth and sustainability of the ocean economy. Improved governance, including putting in place necessary policies and plans (e.g. ENR code; oil spill contingency plan, environmental monitoring plan), capacity development, and stakeholder involvement are key pillars, which support blue economy.

16.3 Recommendations

In conclusion, the blue economy can optimise the benefits from Cambodia's marine and coastal resources, hence, it is necessary to conserve these resources and sustainably develop the coastal and marine area. Cambodia is using the sea and its resources, yet, they have to be sustainably utilized more as the country further explores the other possible growth areas and opportunities for innovation, incomes, jobs and livelihood. The economy of Cambodia is essentially affected by natural, cultural, and other societal factors. Transitioning from unsustainable growth approaches to sustainable growth path and blue economy development requires supporting policies, enabling conditions and innovative strategies.

Blue economy development can facilitate the implementation of processes that integrate science, economics, environment, public awareness, cultural heritage, and social change in order to achieve sustained growth, and real improvements in environmental and ecological health and social well-being. It is necessary to develop a comprehensive plan, and adopt some key initiatives. The policy-makers should put into action the following strategies that are necessary for overall socio-economic development, and protection of our oceans and coasts.

- At the initial stage: Develop a 3-5 year plan and project for blue economy, including integration of strategies and activities of relevant ministries.
- Introduce a panel of experts from diversified fields, e.g., marine biologists, fisheries and aquaculture specialists, economists (natural resource and environmental economists, macroeconomist), marine trade experts, land management, marine transport, civil engineers, climate experts, etc. to monitor and evaluate the blue economy plan and project. No policy and/or action should be undertaken without the concurrence of the expert panel.
- Set up a database and statistical system for ocean economy, ocean and coastal ecosystems, freshwater and marine water quality, fisheries, and environment accounts, as well as on-going initiatives, investments, plans and projects to monitor trends, changes, and progress in achieving the SDS-SEA, SDGs, and other international commitments, and assess the gaps, benefits, outcomes and impacts.
- Take measures to minimize the pollution of coastal waters and rivers and mitigate environmental degradation. Monitoring of water quality and putting in place wastewater and stormwater management systems are recommended. Sea-based pollution from shipping, offshore oil and gas, and marine construction must also be evaluated, and corresponding risk management measures should be put in place.

- Promote waste management techniques and investments, such as waste recycling, incineration process, gasification, bioreactor landfills, composting, and anaerobic digestion etc. Moreover, plastic waste and marine debris need to be addressed. It is therefore necessary to implement an Integrated Waste Management (IWM) system, including required infrastructure and financing mechanisms. Public awareness and stakeholder participation are essential for successful implementation and sustained support.
- Involve and employ local people in ocean health conservation and consider improving local livelihood. Habitat restoration and protection with co-management and alternative livelihood arrangements should be fostered. The new economic arrangements of blue economy should not take away the benefits being enjoyed by the coastal people as they know the coastal areas and depend on coastal resources much more than any other part of the country.
- Adequate infrastructure development as well as initiatives on ecotourism, water, wastewater and solid waste management, habitat and biodiversity protection, and community livelihood programs are needed to promote sustainable coastal and marine tourism since the tourism industry has become an emerging source of national income.
- Climate change mitigation and adaptation measures should be examined and put in place, together with initiatives on water resource management, habitat restoration, and waste management, considering the vulnerability assessment results, and water, food and energy security needs.
- Incentives and capacity development programs are essential to promote and enhance innovative blue economy initiatives, such as sustainable, safe and climate-smart fisheries and aquaculture, ecotourism, green ports, marine renewable energy, etc.
- Government, business, and community partnerships (public-private partnerships) for blue economy investments should be established through transparent and collaborative mechanisms, business connectivity and integrated infrastructure.

The above recommendations are proposed to be considered for future blue economy development in Cambodia, and in line with achieving a number of the SDG targets.

Table 16.1: State of ocean economy and ocean health.

Indicator	Status / Trend
State of ocean economy	
Ocean economy	↑
Fisheries and aquaculture	↑
Tourism	↑
Ports and shipping	↑
Offshore oil and gas	N/A
Employment in ocean economy	↑
State of ocean health	
Fish stocks	N/A
Catch per unit effort	↑
Mangroves (area)	↑
Coral reefs (area)	N/A
Seagrass beds (area)	N/A
Tidal swamps, mudflats	N/A
Beach (area)	--
Prevention of extinction of known threatened species	N/A
Marine water quality (DO, N, P, TSS, etc.)	N/A
Marine protected areas (% of territorial waters)	↑
Pressures and threats	
Population growth in the coastal areas	↑
IUU fishing	N/A
Coastal erosion and sedimentation	--
Wastewater (untreated) discharge	↑
Solid waste generation	↑
Plastic waste generation and marine debris	↑
Oil spills	N/A
Greenhouse gas emissions	N/A
Response	
Policies on coastal and marine management	↑
Coastal area with integrated coastal management	↑ (100%)
Population with access to sanitation and wastewater management systems	↑
Population covered by solid waste management services	↑
Tourist establishments with habitat, solid waste and wastewater management	↑
Ports with environmental management systems	--
Mainstreaming of valuation of ecosystem services; natural capital accounting	N/A

Notes: N/A - No Data ↑ - Increase ↓ - Decrease -- - remain the same data

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