Report on some aspects of the shipping industry in the Bay of Bengal Large Marine Ecosystem (BOBLME)

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Executive summary

The Bay of Bengal Large Marine Ecosystem (BOBLME) Project is a regional initiative that is pursuing a common strategy to conserve and manage shared marine resources in a sustainable manner. It also focuses on the marine environment, conservation and protection of vulnerable species and habitats as well as on key socio-economic and governance issues. The project involving eight countries is supported by a number of donor countries and the Global Environment Facility (GEF) and is being implemented and executed by the Food and Agricultural Organisation (FAO) of the United Nations who also provides specialist inputs into training and developing capacity promoting an ecosystem approach to fisheries management.

The Bay of Bengal is geographically positioned between the Middle East and Southeast Asia along one of the most important shipping routes in the world. Thousands of oil tankers, bulk carriers and container ships travel through the Bay of Bengal each year around the tip of India and Sri Lanka enroute to and from China, Japan and other Southeast Asian countries via the Straits of Malacca. Busy commercial traffic also occurs in the coastal waters of member states with many vessels carrying their cargoes to and from large ports of the region including Colombo and Hambantota (Sri Lanka), Chennai and Kolkata (India), Chittagong and Mongla (Bangladesh), Yangon (Myanmar) and Penang (Malaysia).

Over 95% of all imports and exports of goods in the BOBLME are transported through the ports of the member countries. In many cases, these ports have become not only regional hubs for shipping activities, but also centres for trade and development as well as tax-free industrial economic zones. The value of the shipping industry related goods and services in the Bay of Bengal region is likely to be very significant, worth hundreds of billions of US dollars and employing tens of millions of people both in full-time and part-time jobs. These activities range from staffing and manning of ships, to operation and management of ports, development of infrastructure, ship building, ship breaking, stevedoring, storage, haulage of raw materials, chandlery, as well as many other supporting businesses and jobs in finance, insurance, logistics, engineering and technology.

This study provides a snapshot of the maritime transport industry of the BOBLME region and focuses on a number of key ports in the member countries. It provides brief summaries of legislation in relation to marine pollution in the various countries and outlines the ports facilities, infrastructure, shipping activities, cargoes and trade as well as plans and strategies for future development.

Information is also given on the likely impacts of shipping on the marine environment including oil spills, the transport of alien invasive species through ballast water, marine litter, waste disposal issues in harbours and potential damage to cetaceans from ships noise and direct striking by vessels. A short summary is provided on the proposed “Sethusamudram” shipping canal project between India and Sri Lanka and land bridge plans in Southeast Asia that will greatly shorten shipping routes and contribute significantly to regional economic development. These include the Dawei and Kyaukphyu Deepsea Port projects and the East-West Economic Corridor (EWEC) project which will link the Bay of Bengal to the South China Sea.

The report serves to increase the knowledge base and highlight the importance of the maritime transport industry to the marine economy of the Bay of Bengal Large Marine Ecosystem (BOBLME) region. It is recommended that more in-depth country studies are undertaken of the shipping industry to gather more up to date information in relation to marine environmental protection in the Bay of Bengal. An integrated analysis of the maritime economies of member states including shipping, fishing, coastal tourism, ICM and climate change and their associated socio-economic and governance issues would also be very useful in terms of regional ocean governance.
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<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>ASCLME</td>
<td>Agulhas and Somali Current Large Marine Ecosystems Project</td>
</tr>
<tr>
<td>ASCOPE</td>
<td>ASEAN Council on Petroleum</td>
</tr>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
</tr>
<tr>
<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
</tr>
<tr>
<td>BICT</td>
<td>Bangladesh International Container Terminal</td>
</tr>
<tr>
<td>BIMSTEC</td>
<td>Bay of Bengal Initiative for Multi Sectoral Technical and Economic Cooperation</td>
</tr>
<tr>
<td>BOBLME</td>
<td>Bay of Bengal Large Marine Ecosystem</td>
</tr>
<tr>
<td>BOBP</td>
<td>Bay of Bengal Programme</td>
</tr>
<tr>
<td>CCCC</td>
<td>China Communications Construction Company Ltd</td>
</tr>
<tr>
<td>CCT</td>
<td>Chennai Container Terminal</td>
</tr>
<tr>
<td>CDL</td>
<td>Colombo Dockyard Ltd</td>
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<tr>
<td>CICT</td>
<td>Colombo International Container Terminal</td>
</tr>
<tr>
<td>CPA</td>
<td>Chittagong Port Authority</td>
</tr>
<tr>
<td>CPCB</td>
<td>Central Pollution Control Board</td>
</tr>
<tr>
<td>DGCMRF</td>
<td>Directorate General for the Control of Marine Resources and Fisheries</td>
</tr>
<tr>
<td>EBM</td>
<td>Ecosystem Based approach to Management</td>
</tr>
<tr>
<td>EEZ</td>
<td>Exclusive Economic Zone</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessments</td>
</tr>
<tr>
<td>EMEP</td>
<td>European Monitoring and Evaluation Programme</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protected Areas</td>
</tr>
<tr>
<td>EPZ</td>
<td>Export Processing Zone</td>
</tr>
<tr>
<td>EWEC</td>
<td>East West Economic Corridor</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
</tr>
<tr>
<td>GCLME</td>
<td>Guinea Current Large Marine Ecosystem</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GEF</td>
<td>Global Environmental Facility</td>
</tr>
<tr>
<td>GMS</td>
<td>Greater Mekong Sub region</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GRT</td>
<td>Gross Registered Tonnage</td>
</tr>
<tr>
<td>HDC</td>
<td>Haldia Dock Complex</td>
</tr>
<tr>
<td>ICES</td>
<td>International Council for the Exploration of the Sea</td>
</tr>
<tr>
<td>ICM</td>
<td>Integrated Coastal Management</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
</tr>
<tr>
<td>ISC</td>
<td>Indian Sub-Continent</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
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<tr>
<td>ISPS</td>
<td>International Ship and Port facility Security</td>
</tr>
<tr>
<td>Acronym</td>
<td>Full Form</td>
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<td>---------</td>
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<tr>
<td>PSA</td>
<td>Productivity Susceptibility Analysis</td>
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<tr>
<td>PSSA</td>
<td>Particularly Sensitive Sea Areas</td>
</tr>
<tr>
<td>PVQ</td>
<td>Prince Vijaya Quay</td>
</tr>
<tr>
<td>RTG</td>
<td>Rubber Tyred Gantry</td>
</tr>
<tr>
<td>SAGT</td>
<td>South Asia Gateway Terminal</td>
</tr>
<tr>
<td>SAP</td>
<td>Strategic Action Programme</td>
</tr>
<tr>
<td>SIDA</td>
<td>Swedish International Development cooperation Agency</td>
</tr>
<tr>
<td>SLPA</td>
<td>Sri Lanka Ports Authority</td>
</tr>
<tr>
<td>SOLAS</td>
<td>Safety Of Life At Sea</td>
</tr>
<tr>
<td>SPCB</td>
<td>State Pollution Control Boards</td>
</tr>
<tr>
<td>SSCP</td>
<td>Sethusamudram Shipping Canal Project</td>
</tr>
<tr>
<td>STS</td>
<td>Ship To Shore</td>
</tr>
<tr>
<td>TBT</td>
<td>Tributyltin</td>
</tr>
<tr>
<td>TDA</td>
<td>Transboundary Diagnostic Analysis</td>
</tr>
<tr>
<td>TEU</td>
<td>Twenty foot Economic Units</td>
</tr>
<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>UCT</td>
<td>Unity Container Terminal</td>
</tr>
<tr>
<td>UNCLOS</td>
<td>United Nations Law of the Sea Convention</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
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1. Introduction

The Bay of Bengal Large Marine Ecosystem (BOBLME) is one of the largest LME in the world covering over 6 million km$^2$ of sea area, 4.3 million km$^2$ of total EEZs and a combined coastline length of 14,000 km. It has an annual fisheries production of 6 million tonnes valued at US$4 billion and provides a livelihood for over 4.5 million people of which 2.2 million are fishermen.

The waters of the Bay of Bengal contain over 8% of the world’s mangroves, 12% of the world’s coral reefs and some of the largest estuaries found anywhere on earth. The coastal areas of the BOBLME member states support a total population of over 450 million people. The eight countries that surround the Bay of Bengal – Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand - have diverse cultural backgrounds, religions, political belief and biological systems.

In 2009, the countries committed themselves through the BOBLME Project to better the lives of their coastal populations through the improved regional management of their marine environment and fisheries.

The BOBLME Project has been strongly supported by the Global Environment Facility (GEF) as well as through assistance from a number of donor partner countries i.e. Norwegian Agency for Development Cooperation (NORAD), the Swedish International Development Cooperation Agency (SIDA) and the National Oceanic and Atmospheric Administration of the USA (NOAA). The project to date has been executed by the Food and Agriculture Organisation of the United Nations (FAO).

The original BOBLME Project (which will be completed in 2015) laid the foundation for sustainable management and conservation of marine resources as well as the protection of the marine environment in the region. It expanded knowledge and strengthened understanding of the ecological, human and governance dimensions of the Bay of Bengal through its research, various working groups and expert workshops. It also increased awareness of regional marine issues by undertaking a Transboundary Diagnostic Analysis (TDA) which was completed in March 2012 and strengthening the capacity of participating countries to develop a Strategic Action Programme (SAP) for the BOBLME region.

The BOBLME Project also provided many new opportunities for scientists from member states to collaborate and interact with policy makers both within and between countries through regional meetings and exchange fora. Collaborations and partnerships have also developed between various international bodies and agencies working in the countries bordering the Bay of Bengal. Awareness of BOBLME issues was also enhanced by building networks, partnerships and communications between stakeholders through the publication and distribution of flyers, newsletters, posters, videos and digital media and websites.

The TDA identifies the major shared issues affecting the Bay of Bengal Large Marine Ecosystem and provides an in depth analysis by experts of the threats and causes of the problems.

Core issues arising from the TDA are summarised as follows:

- **Over-exploitation of marine living resources** - as evident from declining fish availability, changing species composition, high numbers of juvenile fish in catch and changes in biodiversity, including vulnerable and endangered species

- **Degradation of mangroves, coral reefs and seagrass** - as evident from loss and degradation of mangrove habitats, degradation of coral reefs and loss and damage to seagrass

- **Pollution and water quality** - as evident by high levels of sewage-borne pathogens and organic load, dumping and accumulation of solid waste including marine litter and ever increasing nutrient inputs
• **Social and economic considerations** - Relatively low standard of living and working conditions of people involved in fishing including not being able to participate in and benefit from sustainable development practices. High vulnerability of coastal communities to natural hazards, climate variability and change.

The Strategic Action Programme (SAP) addresses and remediates these causes and concerns relating to the major fisheries, environmental and socio-economic issues identified in the TDA thus ensuring the long-term institutional and financial sustainability of the BOBLME Project. The SAP is the product of a rigorous analytical and consultative process involving many stakeholders at national and regional level. The draft document has now been finalised and is currently being considered for endorsement by member states.

One of the fundamental principles and concepts guiding the implementation of the SAP is the ecosystem approach to ocean governance of the BOBLME. Whereas the core issues and threats to the BOBLME have been identified and outlined above, little attention has been focused on the maritime transport industry and associated risks to the marine environment despite the fact that it plays a major role in the marine economy of the region.

The Bay of Bengal also has some of the busiest sea routes and largest ports in the world with an estimated 74,000 vessels passing through the region each year. Significant threats therefore exist to the marine environment, estuaries and beaches from coastal shipping and harbour related activities. These include localised oil spills, the introduction of alien invasive species, marine litter and the disposal of hazardous waste. Furthermore, baseline information on the maritime transport industry in general including harbours, infrastructure and traffic within BOBLME coastal states need to be collected to highlight the importance in relation to the maritime economy and to assess potential impacts and risks posed by these activities on the BOBLME.

Threats from the impacts of shipping activities and possible mitigation measures have not been clearly identified as part of the overall analytical process and should be taken into account as part of any future environmental assessments. In terms of integrated management of the BOBLME, the maritime transport industry should play a key role in future strategic planning because of the high economic importance of this sector not only in relation to trade between BOBLME member states but also to the global economy as a whole.

### 2. Scope of work

This review provides a short compilation of information on the maritime transport industry including descriptions of some of the primary and key secondary ports of BOBLME member countries. The scope of work also summarises information on port infrastructure and management and outlines some of the main environmental threats posed by shipping in the region and how these can impact the marine ecosystems. An outline of some future developments in relation to port development, regional shipping hubs and free trade zones is also given along with some of the main shipping routes that link countries within the BOBLME.

A brief summary of the global shipping industry is also provided which puts this report on the maritime transport industry of the Bay of Bengal Large Marine Ecosystem region into context.

An overview of the controversial Sethusamudram Shipping Canal Project which plans to excavate a channel between the Gulf of Mannar and Palk Bay (between India and Sri Lanka) is presented which highlights the key environmental concerns of stakeholders including impacts on fisheries and ecosystem health. A chronology of project development events and the geopolitical implication of the project for India and the region are also included.

The information collected, synthesised and presented in this report is based entirely on a web-based information search. As such, it is limited with up to date statistical information on the shipping
industry being unavailable for many of the BOBLME member countries. There was also great variation in the quantity and quality of data available as well as considerable knowledge gaps between countries in relation to status of infrastructure and harbour development plans. Because of the broad scope of the maritime transport industry and the limited time allocated to this study, it was only possible to provide a snap shot of the shipping sector in the Bay of Bengal Large Marine Ecosystem. In depth country assessments would be required to collect up to date information on the industry including trade and employment statistics, port development plans and the relative importance to the national marine economies and the BOBLME region as a whole. The status of environmental impacts by the industry would also need to be further evaluated including issues such as marine litter, ship waste disposal, oil spill contingency plans and the challenge of alien invasive species.

3. The global shipping industry – at a glance

In recent years, innovations in the marine sector have helped to fuel the growth of maritime freight traffic. The average size of ships has increased substantially with larger vessels reducing the shipping costs per load. Port authorities have had to respond to increasing vessel size by expanding port infrastructure (wharfage and inland transport links) and improving port access (e.g. deepening navigation channels and harbours).

The average speed of merchant ships is usually about 15 knots (nautical miles per hour) but newer ships with advanced double propeller design can reach speeds of over 25 knots. New ship designs and use of composite construction materials have also dramatically reduced fuel consumption while increasing safety at the same time.

Specialisation and custom design in the shipbuilding industry has brought massive changes to ocean shipping with specific vessel types being built for different types of freight:

- Tankers for crude oil, petroleum products, chemicals, liquid gas and fruit juice concentrates
- Bulk carriers for bulk products e.g. iron ore, coal and grain
- Bulk carriers for large volume loads e.g. motor vehicles
- Refrigerated vessels (reefers)
- General cargo ships
- Container ships - containerised cargoes of all sorts
- Ferries for shipping trucks and roll-on roll-off freight (Ro/Ro).

In many cases, specialisation and the speeding up of cargo handling has been responsible for better utilisation of capacity and achieving economy of scale.

The global maritime transport industry has benefited enormously from various automation technologies that have been introduced to ship building and ships operation in recent years including self-loading/unloading systems, computerised navigation and the global positioning system (GPS). This has reduced the numbers of crew and at the same time substantially improved safety standards.

Maritime freight traffic has been booming for the last few decades with the amount of cargo transported by sea exceeding eight billion tonnes for the first time in 2007. Global shipping has effectively doubled since 1990 with trade volume increasing by an average of 4% per annum. However, the global recession in 2008/2009 triggered a massive slump in world trade leaving 9 % of bulk carriers lying idle in ports around the world. Recovery has only recently started and capacity and trade volume are slowing increasing again.
Ships’ cargo comprise mainly of liquids such as oil and petroleum products and dry cargo made up mostly of iron ore, coal, grain, phosphates and bauxite. Other dry bulk cargoes consist of a variety of goods packed in smaller transportation units, chiefly containers. By far the most significant type of cargo worldwide is crude oil which alone accounts for 25% of all goods transported by sea. In terms of quantity, iron ore and coal make up a large proportion of dry-bulk goods.

Today most other dry cargo including cars is transported in container ships in standardised containers. Other vessels are specialised as car carriers or tankers for carrying fruit juice and chemicals. These units can be moved around and can be unloaded rapidly onto trucks and railway wagons. Since 1985 global container shipping has increased by about 10% annually to 1.3 billion tonnes in 2008. A total of 137 million containers measured in TEU (Twenty-Foot Economic Units) were transported in 2008.

In 2011, the global merchant fleet was dominated by small and medium sized ships up to 25 000 GRT. Small ships also represented 36% by number although only 1% by tonnage. Many of the small ships are not subject to international conventions on safety and pollution prevention because of size or the fact that they do not trade internationally.

General cargo ships made up 21.5% by number, most of which comprised of small and medium sized vessels. In the large to very large categories, oil and chemical tankers and bulk carriers represented over 50% of the fleet by number. In terms of tonnage, the large and very large categories represented 78% of the fleet with oil and chemical tankers and bulk carriers dominating both categories at 66% (large) and 65.5% (very large) respectively.

With regard to the age of the global merchant fleet, over half by number (54.2%) was 15 years and older but this was due largely to dominance of older ships in the small to medium sized categories. The trend was reversed in the large and very large ship categories where 76.2% (large) and 83.9% (very large) were less than 15 years old.

The most modern fleets could be found in the large and very large categories with 84.7% by tonnage of the fleet being below 4 years of age. At the other end of the scale, large and very large ships over 25 year old accounted for just 3.1% by number and 37.8% by tonnage.

In relative terms, ships tend to follow a small number of routes and pass only through a few areas of the ocean. The busiest are the approaches to the ports of Europe and East Asia, particularly Japan but also Shanghai, Singapore, Hong Kong and the United States. The East Coast of the United States in particular is a major sender and receiver of cargo.

Marine traffic is further concentrated along narrow straits and bottlenecks including the Straits of Dover, Gibraltar, Malacca, Lombok and Hormuz and around the Cape of Good Hope, South Africa. As a result of globalisation and outsourcing of production facilities by US and European companies in developing countries particularly China and emerging economies of South East Asia, the shipment of cargo has become much more imbalanced. For example in 2007, over 10 million TEU were transported on the Pacific route between Asia and the Americas and almost 8 million TEU from Asia to Europe. In contrast, cargo shipments between Europe and the United States were much more balanced registering a difference of barely 2 million TEU.

4. Country snapshots of maritime transport sector

4.1. Maldives

The Maldives are a chain of atolls comprising about 1190 islands which are scattered over a distance of more than 800 km situated in the Indian Ocean. It has a population of about 330 000 living on 200 different islands. The Maldives is a tropical country with very flat topography and low elevation. It has a strategic location at the cross roads of world trade and travel for centuries. The economy is based on tourism and fishing.
The Maldives economy is expanding rapidly, driven primarily by a booming tourism industry which makes up over 30% of GDP (Maldives Statistical Yearbook, 2007). The country lacks of any real domestic production and exports consist mainly of fish products. The Maldives must therefore import nearly everything for its growing population and its tourist consumption. With the number of international tourists travelling to the Maldives growing an average of 8.5% per year between 2000 and 2007, shipping cargo traffic supporting tourist consumption has and will continue to grow.

4.1.1. Port of Male

Male Commercial Harbour (MCH) handles all the international sea cargo for the country except petroleum products which are unloaded at an offshore island for reasons of safety and storage. Regular cargo services are provided to and from Europe, the Middle East, Africa and much of Asia and the Far East. Exports are minimal so outbound international traffic via Male consists mostly of empty containers.

The performance of the commercial port of Male is particularly important because it is the sole gateway to the country. Any physical constraints whether external or internal can affect the country’s economic development and influence the supply chain and logistics distribution within the country. The port also plays an important role in management and coordination of materials and information flows and its operation has a major influence on the lead time and stock levels of importers and distributors.

Male is only 2 km² and the land assigned to the national seaport is small. In recent years, frequent bottlenecks and congestion have occurred in the port leading to delays, re-handling cargoes and extra costs for shipping companies and the port terminals. The port handles all types of cargo except dry bulk, liquefied petroleum and gases.

![Aerial view of Port of Male showing some vessel berths and container yard, Maldives](image)

**Figure 1.** Aerial view of Port of Male showing some vessel berths and container yard, Maldives

**Berths**

There are six available berths at the main commercial port with quays ranging in length from 53 m to 101 m and drafts varying from 3.5 m to 10.5 m. The size of vessels catered for at these quays range from 60 m to 150 m in length with the longest and with deepest berth being that of “Alongside”.

The dimensions of the main berths, drafts and the size of the vessels catered for at the Commercial Harbour at Male are given in Table 1
Table 1. Berthing facilities and vessel capacity at the Port of Male

<table>
<thead>
<tr>
<th>Available berths</th>
<th>LOA</th>
<th>Draft at quay</th>
<th>Max. size of vessel</th>
<th>Available draft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alongside</td>
<td>101 m</td>
<td>10.5 m</td>
<td>15 000 tonnes 150 m LOA</td>
<td>9 m</td>
</tr>
<tr>
<td>Eastern Quay-1 (East)</td>
<td>92 m</td>
<td>3.5 m</td>
<td>60 m</td>
<td></td>
</tr>
<tr>
<td>Eastern Quay-2 (South)</td>
<td>53 m</td>
<td>3.5 m</td>
<td>60 m</td>
<td>3.5 m</td>
</tr>
<tr>
<td>Western Quay-1(East)</td>
<td>121 m</td>
<td>3.5 m</td>
<td>60 m</td>
<td>3.5 m</td>
</tr>
<tr>
<td>Western Quay-2 (South)</td>
<td>78 m</td>
<td>3.5 m</td>
<td>60 m</td>
<td>3.5 m</td>
</tr>
<tr>
<td>Western Quay-3 (West)</td>
<td>79 m</td>
<td>3.5 m</td>
<td>60 m</td>
<td>3.5 m</td>
</tr>
</tbody>
</table>

Port services
The Maldives Port Authorities operate offshore port services that are located 3-13 nautical miles offshore from the islands harbours. This allows for ships and large yachts to anchor outside port limits for transfer of goods, to undergo repairs, maintenance, and exchange of crew, surveyors and seamen.

Offshore port service designated areas are located between 3 and 12 nautical miles off the country’s ports e.g. off Haa Alif Uligamu and Haa Dhaalu Kulhudhulfushi in the North of the country, off the main commercial port at the capital Kaafu Male in the Central area and off Seenu Gan in the South of the Maldives.

Maldives Commercial Harbour has one large mobile crane with 150 tonnes capacity which is used to load and unload containers from lighters as well as break-bulk cargo from smaller vessels. It also has several smaller mobile cranes of 25 to 60 tonnes capacity. It has one Rubber Tyred Gantry crane for stacking containers, two terminal trailers, three reach-stackers and several forklifts ranging from 2 to 25 tonnes.

Three tugs are available at the harbours to tow vessels. These are the VX BP (4 tonnes), the Veeru (8 tonnes) and the Veeru 2 BP (12 tonnes) type tugs. There are also a number of hatch back and flat back barges ranging in size from 150-200 tonnes.

Shipping industry
The Maldives Islands have a mixed economy based principally on tourism, fishing and shipping. Tourism is the largest industry contribution to 28% of GDP and more than 60% of Maldives foreign receipts. Over 90% of government taxes flow from import duties and tourism related taxes. Fishing is the second major industrial sector contributing to 10% of the GDP and consists mainly of Skipjack and Yellowfin tuna. Agriculture plays a minimal role in the economy with garment production, boat building and handicrafts making up about 18% of GDP.

International shipping to and from the Maldives is mainly carried out by the private sector with only a small fraction of the cargoes being carried by the vessels of the national carrier Maldives Shipping Management Ltd.

The Asian Development Bank (ADB) has helped upgrade the port infrastructure at Male which has boosted throughput from 273 000 tonnes in 1991 to over a million tonnes in 2011. Prior to that much of the freight was transferred to smaller vessels and then brought ashore which was both costly and inefficient.

The Kuwait Fund has also supported the development of port infrastructure in the Maldives to increase transport efficiency and meet the demands of maritime safety, lower shipping costs and reduce pollution around port areas.

Containers are now unloaded at the port and turnaround for ships greatly reduced from 8 to approximately 2 days. There are new plans to develop a specific container port at Thilafushe.
The leading shipping line and national carrier of the Maldives is the Maldives National Shipping Ltd. This active merchant fleet was founded in 1948 and operated mainly in South and Far East Asia with a long standing reputation for quality shipping and logistics service in the marine transport industry. It is the principal carrier of containerised freight. The company has ten cargo ships, one container vessel and one oil tanker.

The pattern of shipping lines services to and from the Maldives can be classified into three categories:-

- A dedicated shuttle service from Colombo operated with smaller ships on fast rotation
- An inter-Asian service originating in Singapore and stopping at various ports with Male as the end of the line
- An Asia-East Africa route which is calling at the Maldives along the way

There are four shipping companies operating container shipping services to and from the Maldives.

• **Lily Shipping**

This is a privately owned Maldivian company specialising in shipping to and from the Maldives. The company owns three vessels, two of which operate between Singapore, Port Klang and Male. The third vessel operates on a feeder service between Colombo and Male. Vessels from the company call at Male from Southeast Asia once every three weeks and from Colombo once a week.

Lily Shipping is the largest Maldivian shipping line with agencies in Malaysia, Singapore and Colombo. It is also a major forwarding and receiving agency in the Maldives. Lily averages about 301 TEU of cargo discharges per trip in Male in 2008 which reflects the small size of their container ships. Its cumulative discharge of cargo for 2009 was 3,724 TEU accounting for roughly 42% of all goods imported into Male.

• **Maldives National Shipping Limited (MNSL)**

The Maldives National Shipping Limited (MNSL) was established in 1957 under the name of Maldivian National Trading Corporation (Ceylon) Limited. The company's routes are concentrated around the triangle formed by Sri Lanka, Maldives and the Southeast Asian ports. It specialises in shipping to the Maldives and operates a shuttle service through Singapore, Port Kelang, Colombo and Male using small container vessels under 500 TEU. MNSL operates a service from Singapore through Port Kelang and Male for containers and then returns through Colombo, Kelang and Singapore with break-bulk using multipurpose vessels and calling at Northport in Port Kelang and Pasir Pajang in Singapore. The break-bulk cargo carried to Male is primarily timber from East Malaysia which is moved conventionally up to Port Kelang and then picked up as break-bulk cargo.

The MNSL also operates a dedicated container service between Colombo and Male on a weekly basis which continues to the Northern regional port or Southern regional port on alternating basis using multipurpose vessels equipped with hydraulic cranes to handle containers. Their nominal container handling capacity is 350 TEU.

• **Delmas**

Delmas is a premier French shipping company engaged in North-South trades. It has 76 regular lines spanning Europe, Asia, Africa and South America and traverses the Atlantic Ocean, Indian Ocean and several smaller waterways (Delmas: Asia-East Africa Line, 2008). Delmas calls at 350 ports in over 150 countries and has a container fleet of 242 vessels with a total capacity of 886,000 TEU. The shipping company calls at Male on their way back to East Africa from the Far East bringing shipments from Colombo and Singapore. There are currently five 700 TEU class container vessels servicing this route making up to ten calls per voyage and about fifty two voyages per year. Their average load discharges in Male is around 100 TEUs.
Maersk

Maersk is one of the leading container ship operators in the world. The company, based in Copenhagen, Denmark, owns and charters over 500 container carriers and number of containers corresponding to more than 1.9 million TEU. Maersk is a relatively small player on the Maldivian market and does not have its own ships calling at the Maldives. Instead it transships to MNSL and Lilly Shipping vessels in Colombo which provide regular trips each month.

**Port administration and management**

The port administration structure in the Maldives comprises of a variety of public and private parties engaged in terminal management. These include the following:-

- Transport Authority (Ministry of Housing, Transport and Environment): deals with land and maritime transport
- Ministry of Economic Development: deals with foreign investment
- Ministry of Tourism, Arts and Culture: deals with resort development
- Maldives Port Limited: manages and operates the international harbour at Male as well as the two regional ports in Hithadhoo (South) and Kulhudhuffushi (North).
- Public Works Division: deals with port management
- Ministry of Home Affairs: deals with harbours and landing places on smaller islands
- Private operators: supply private terminal operator services for ports

**Maldives Ports Limited**

The Maldives Ports Limited is owned by the Government of the Republic of Maldives under the Ministry of Transport and Communication. The company is administered and managed by a Board whose members are appointed by the President. Its mission is to provide efficient port and port related services to facilitate trade and commerce in the region by adhering to international best practices.

The Maldives Ports Limited provides port information and statistics in relation to ships handled, and cargo throughput including containers handled. Vessel movements can also be tracked through the port website. It also oversees training, customs and immigration, port security, medical regulations and pollution in relation to port operations.

**Shipping and the marine environment**

The main marine environmental concerns in the Maldives resulting from shipping and harbour operations are from dredging, oil pollution, marine litter and waste disposal. These activities can pose a threat to coral reefs, the pristine beaches and open ocean waters particularly close to population centres.

In the case of dredging associated with harbour deepening, the physical disturbance of the seabed and removal of bottom substrates directly impacts benthic habitats, increases suspension of sediments and reduces light penetration, which over time can damage the local coral reef communities. The disposal and dumping of untreated waste also results in marine pollution problems along with waste oil and bilge water. Reception facilities at Male Port for oil and solid waste disposal are currently inadequate. The disposal of untreated sewage from ships into the marine environment while at anchor or in port can also contribute to nutrient enrichment, algal blooms, deoxygenation and human health problems.

**Shipping agents**

There are over 40 shipping agents listed operating in the Maldives according to the custom services information. Some of these provide logistic marine services for general and bulk cargo vessels, container ships, tankers and large and small yachts. Others offer services to cruise liners and provide
warehousing, transhipment cargo handling, and stevedoring. Some of the principal shipping agents listed by the Maldives Port Authority are given below:

- Alliance Management Services Co. Pvt Ltd
- Alpha Maldives Pvt Ltd
- Alpha Mike Services Pvt Ltd
- Antrac Maldives Pvt Ltd
- Island Sailors Pvt Ltd
- Mald Links Management Pvt Ltd
- Maldives National Shipping Ltd
- Real Seahawks Maldives Pvt Ltd
- Seline Pvt Ltd.
- Sunrise Maldives Private Ltd
- The Silver Company Pvt Ltd

Vessel traffic and cargo

During the period between 2011 and 2013, cargo ships comprised the greatest number of marine vessels entering and leaving the Maldives. This was followed by luxury yachts, oil and gas carriers, tugs and barges.

In 2013, over 690 marine vessels were registered entering and leaving Maldives ports. There was a noticeable increase in containerised cargos and imports. This amounted to 822 000 tonnes of cargo and 16 169 TEU.

The latest figures from the customs statistics indicate that 224 marine vessels have arrived in the Maldives during the first quarter of 2014.

The bulk of the cargo imported by ships visiting the Maldives consist of fuel oil (30%), food stuffs (20%), machinery and electronics (14%), chemicals (5%) and base metals (4%) with remaining 19% being made up of a variety of other products.

In 2013, the total goods imported into the Maldives were worth US$1.7 billion. Over 53% of products imported into the Maldives by ships came from the United Arab Emirates (29%), Singapore (16%) and India (9%).

In contrast, exports from the Maldives comprised only US$170 million made up mainly of frozen skipjack tuna, chilled yellowtail and big-eye tuna and other fish species. Much of the exports were shipped to Thailand (31%), France (12%) and the UK (8%).

4.2. Sri Lanka

Sri Lanka is an island nation in the Indian Ocean close to India and centrally located with respect to Asia, the Far East, the Middle East, Africa and Australia. The country contributes significantly to global cost effective maritime transport with the Port of Colombo as a transhipment base. It is also situated along the key shipping route between the Malacca Straits and the Suez Canal which is traversed by thousands of ships annually.

Sri Lanka has a number of commercial ports and a national merchant shipping fleet that provides services to the national maritime transport industry. Ancillary services include ship repair, ship building, bunkering services, salvage and towage, ship chandelling, offshore supplies, cruise shipping and marinas as well as ship management services. Multi-country consolidation, entrepot trade and bulk shipping are also services provided by Sri Lanka.

The Sri Lanka Ports Authority (SLPA) was created in 1980 when the port underwent a major transformation to handle containerised cargo with two harbours being built at the end of the 1980s
and three more in the early 1990s. Due to its rapid expansion and its strategic location in South Asian trade routes, Colombo became one of the most attractive port destinations for main line shipping in the region.

The key functions of SLPA is the formulation, implementation and monitoring of policies on the ports sectors, coordination and supervision of port development and improving the development of shipping services.

4.2.1. Port of Colombo

The Port of Colombo is the largest and busiest port in Sri Lanka. It is located on the Southwestern shores on the Kelani River and serves as the premier terminal in South Asia due to its strategic location in the Indian Ocean. It has a land area of 4.8 km² and 27 quays with available berths for 51 ships.

During the 1980s, the port underwent rapid modernization with the installation of cranes, gantries and other modern-day terminal requirements. The port has a dredged depth of over 15 m and ranks among the top 35 ports internationally.

In the late 1990s, with the introduction of private sector operators, Colombo port became a major regional hub for transhipment of container cargo which reached one million TEUs in 1996. A new container terminal and yard was added in 1999 along with the building and opening of the Oluvil Maritime Training Centre. The South Asia Gateway Terminal also began operation and a new berth was constructed for vessels up to 50 000 dwt.

In 2000, a third berth at Galle Regional Port was constructed along with the Peliyagoda Freight Station. The second phase of the North Pier development also commenced and in 2002, the multi-purpose Ashraff Quay was inaugurated and the new Customer Service Centre for LCL and breakbulk cargoes was also opened. In 2002, the Unity Container Terminal was commissioned which increased the containerised cargo to 2.45 million TEUs by 2005. At present, the port handles over 15% of transhipment cargo in South Asia.

In 2008, the port commenced a large-scale expansion project which dramatically increased the port’s capacity and capabilities. The project which costs US$1.2 billion was headed by the Sri Lanka Ports Authority and built by the Hyundai Engineering and Construction Company and was completed in mid-2012. The new development consists of four additional terminals over 1 200 m in length which can accommodate three berths with alongside depths of 18 m. The channel was widened and dredged to a depth of 20 m allowing a turning circle of 600 m. The expanded port development has increased the annual container handling capacity from 4 million TEUs to approximately 12 million TEUs while at the same time being able to accommodate larger container vessels carrying around 12 000 TEUs.

The contract for the first new terminal was awarded to China Merchants Holdings (International) and Aitken Spence Consortium and became operational in 2013. This joint venture port development with SLPA makes Colombo Port complex one of the largest in the world. As part of the port expansion, a new breakwater of 6 830 m in length with berth water depths of 18 m was constructed making a crucial difference to accommodate larger cargo vessels with deeper docking berths. This breakwater was funded through a loan of US$400 million by the Asian Development Bank.

**Port facilities and infrastructure**

The Port of Colombo has three container terminals which operate 24 hours a day:

1) Jaya Container Terminal (JCT)
2) South Asia Gateway Terminal (SAGT)
3) Unity Container Terminal (UCT)
The terminals have an impressive array of port infrastructure, equipment and facilities which include:

- 4 Feeder vessel berths
- 7 Container vessel berths
- 14 Quay cranes
- 12 Super-post-panamax cranes
- 1 Twin lift super-post-panamax crane
- 4 Wall-mounted gantries
- 78 Rubber-Tyred Gantries
- 285 Terminal tractors and trailers

Following the expansion of the Colombo South Harbour Project, the International Container Terminal (CICT) was established and 12 further quay cranes were added. This project was funded by China Merchant Holdings and the Sri Lanka Port Authority and increased the infrastructure development and handling capacity by a further 2.5 million TEU.

The infrastructure includes a quay length of 1 200 m, 3-4 berths and a water depth of 18 m. Equipment for each terminal includes 12 super post-panamax quayside cranes and 40 Rubber Tyred Gantry cranes.

Additional facilities also include the Bandaranaike Quay (BQ) and Prince Vijaya Quay (PVQ) with four rail mounted quay cranes and up to 6 245 m² of bonded warehouses.

The Port of Colombo has two container terminals, the Jaye Container Terminal (JCT) with four berths for mainline vessels and two berths for feeder vessels. The South Asia Gateway Terminal (SAGT) has three berths.

The terminal dimensions and infrastructure include quay of between 290 to 340 m in length, water depths ranging from 13 to 15 m and storage yard areas varying from 9 to 20 hectares. The feeder berths at JCT are 170 and 180 m long with a depth of 9 m along the quays.
Container handling facilities include several post-panamax and super-post-panamax quay cranes, 28 transfer cranes and up to 160 Terminal tractors and trailers. The JCT terminal has a handling capacity for up to 1.5 million TEU and SAGT up to 1.0 million TEU.

The Port of Colombo can now accommodate vessels with 18 000 container capacity and in future will be able to handle the next generation of container vessels of 22 000 TEU capacity. In terms of on-land storage, the Port of Colombo offers a total of 6 245 m² of bonded warehouses including 125 m² of cool room storage. All types of goods are accepted with the exception of dangerous or perishable goods.

**Port capacity and cargo handling**

Information on the capacity and cargo handled by the port of Colombo for the year 2010 is given below:

- Ship arrivals.......................3 910
- Cargo loaded .................12 382 000 (tonnes)
- Cargo discharged ............21 390 000 (tonnes)
- Total cargo handled........33 774 000 (tonnes)

Of the total cargo handled, liquid bulk comprised 4 158 000 tonnes, break-bulk 627 000 tonnes, dry-bulk tonnes and containers 26 434 000 tonnes. The total number of containers handled was 4 137 441 TEU. Of these, 461 648 TEU were imported, 470 596 TEU exported and 3 095 589 TEU were transshipped.

In 2011, the number of vessels arriving at Colombo Port increased by 215 or approximately 5.5% whereas the total cargo handling and the numbers of containers handled increased by 6.2% and 3.0%, respectively.

Ship repair and building activities at Colombo Port are conducted by Colombo Dockyard Ltd (CDL) who operates four dry docks which can accommodate vessels up to 100 000 dwt.

**Colombo Port City project**

The Colombo Port City project is a joint venture between Sri Lanka Ports Authority and China Communications Construction Company Ltd (CCCC).

This project commenced in September 2013 and will be built on an area of reclaimed land adjacent to the historic Galle Face green, in Colombo. The total land area earmarked for this development will be 230 hectares (568 acres). The project is expected to be completed in 2017 at a cost of US$15 billion.

The new Port City will comprise of a marina and yacht club, a formula one race track, a central boulevard, a central railway station, sea-view luxury apartments and five star hotels, a luxury shopping and entertainment centre and theatre, a sea front promenade and many other modern city facilities.

**4.2.2. Port of Hambantota**

Colombo up to recently has been the only major port catering for container handling but has been unable to provide sufficient facilities for dedicated port related industries and services.

Hambantota is the main town in Hambantota District in the Southern Province in Sri Lanka and was badly hit by the 2004 Indian Ocean Tsunami. The region has since undergone a number of flagship development projects including the construction of a major seaport and international airport. A new port is currently being built at the city of Hambantota which has a natural harbour and is located off the Southern tip of Sri Lanka. The development will relieve congestion at Colombo Port and allow ships to receive better services and a more rapid turnaround in terms of refuelling, maintenance, logistics and buying provisions.
The Port of Hambantota will be built in three phases and was started in 2011 with an investment of US$360 million. Part of the port includes a tax-free zone with companies from India, China, Russia, and Dubai expressing interest in establishing shipbuilding, ship repair and warehousing facilities. The completed port will be able to berth 33 vessels making it the biggest port in South Asia.

Figure 3. Schematic image of the new Port of Hambantota south of Colombo, Sri Lanka

The Port of Hambantota is operated by the Sri Lanka Port Authority and serves ships travelling along “the East - West shipping route” (Malacca Strait to Suez Canal) which passes within 6-10 nautical miles off the coast South of Hambantota.

The first phase of the port of Hambantota included the construction of two 600 m general purpose berths, a 310 m bunkering berth and a 120 m small craft berth. It also contains a bunkering facility and tank farm which includes 8 tanks for marine fuels, 3 tanks containing aviation fuel and 3 for Liquid Petroleum Gas (LPG). It will provide bunkering, ship repair, some ship building and crew changes. The larger berths will cater for vessels up to 100 000 dwt.

The second phase of the port development is expected to increase capacity up to 20 million TEU per year and when completed will be one of the biggest ports ever constructed on a land site. Port infrastructure currently includes 2 new ZPMC ship to shore (STS) gantry cranes, and nine Rubber Tyred Gantry (RTG) cranes for handling the importing and exporting of containers. Much of the funding (85%) to develop the port was provided by the Exim Bank of China.

The mouth of the natural harbour at Hambantota has a depth of 22 m and includes an extensive 1.5 km breakwater with a minimum basin depth of 17 m. This compares well with the 15.5 m depth at the Port of Colombo.

A tax-free port zone has been set up outside the port at a cost of US$550 million with local and international companies expressing interest in setting up shipbuilding, ship repair and warehousing facilities in the zone. The final project when completed is expected to provide indirect employment for 50 000 people.

When Hambantota Harbour is finally completed in 2014, it will cover 4 000 acres of land and will be able to berth 33 vessels at any given time making it the biggest harbour in South Asia.

Hambantota Port is a deep water protected harbour located near the East-West trunk routes between the Asia-Pacific, Europe and the United States East coast regions. It is therefore the closest transhipment port to the huge rapidly expanding markets of the Indian Sub-Continent (ISC). For Europe bound cargo for the East and Southern parts of the ISC, using Hambantota Port as a hub is
more advantageous than using South East Asian ports because of the shorter distance to Hambantota. The major international shipping routes off Hambantota are used by about 36 000 ships including 4 500 oil tankers each year. Being a transhipment hub, it will reduce shipping costs for Sri Lanka’s own exports and imports and make the country a more competitive location for investment.

**Shipping agents and services**

There are many shipping agents who offer services and handle all types of port calls, vessels and cargoes. Extensive portfolio includes loading and discharging of dry and wet bulk cargoes and containers, dry docking, supply of bunker fuels, crew changes, spare parts delivery, launch service and lay-ups. Companies cover all ports, terminals, anchorages, holding areas and repair yards throughout the country.

**International shipping line operators**

Vessels of many key international shipping lines use Sri Lankan ports and work closely with local ship agents and with the Sri Lanka Port Authority. These include:

- China Ocean Shipping
- Delmas
- Evergreen Marine Corporation
- Hanjin Line
- Hapag Lloyd
- Hyundai
- K Line
- Hatsu Marine
- Yang Ming Line
- Maersk Sealand
- Mediterranean Shipping Co.
- OOCL
- Mitsu Osaka Line
- Pacific International Lines
- Advanced Container Line
- Safmarine
- Shipping Corporation of India United Arab Shipping Co
- Lloyd Triestino

The Port of Colombo serves as part of an important feeder network of vessels that provides services to and from several ports on the West and East coast of India, Bangladesh, Pakistan and the UAE. These include the ports of East India bordering the Bay of Bengal such as Tuticorin, Chennai, Kolkata, and the port of Chittagong. The main feeder shipping companies and operators using Colombo as a hub include Bengal Tiger Lines, Ceylon Shipping Corporation, Lily Shipping Line, Maldives National Shipping, Orient Express Line, Pakistan National Shipping Corporation and X-Press Container Lines.
4.3. India

The ports and shipping industry play a pivotal role in sustaining growth in trade and commerce and in the overall development of the Indian economy. India has one of the largest merchant shipping fleets among developing countries and currently ranks 16th in the world in terms of gross tonnage under its flag. However, its share of overseas seaborne trade has shrunk from about 32% at the turn of the century to about 11% during the last decade. The growth of India’s shipping fleet has been slow with gross tonnage only increasing from 6 million tonnes in 1980 to 10.4 million tonnes in 2012. Approximately 95% of the country’s total trade volume and 70% by value is done using ships.

A recent study by the Association of the Chambers of Commerce and Industry of India (Assocham) indicates that much of the vessels that make up India’s shipping industry are clearly over-aged with more that 41% of the fleet (466 vessels) above 20 years. Over 23% of India’s total fleet (264 vessels) fall into the age group of 5 years or less. Of the remaining vessels about 141 fall into the age group of 16-20 years, 135 vessels in the age group 11-15 years and about 116 vessels in the age 6-10 years.

In contrast, the age profile of the global maritime fleet reveals that 40% of the ships are less than 9 years old which puts Indian ships at a clear disadvantage in relation to foreign competition. In general, maritime traders in the international markets prefer to charter vessels less that 15 years old. Ships past the age of 25 years are considered high risk and require frequent and expensive repairs and maintenance. Much of the repair costs are associated with corrosion and biofouling as well as inefficient older engines and high fuel consumption.

It has been estimated that the replacement of India’s aged merchant fleet will require about 33 new ships which will involve huge investments as well as great opportunities for local shipbuilders. The average costs of new tanker and cargo vessels is about US$100 million each which would mean India would need to spend about US$3.3 billion to upgrade the country’s fleet.

India has a long coastline of about 7 500 km with 13 major ports and about 200 smaller ports currently operating on the Western and Eastern coast of the country. These ports serve as the gateways to India’s international commerce by sea, contributing to over 90% of all foreign trade.

During the period April to December 2013, Indian major ports handled 413 million tonnes of cargo, an increase of about 2% on the previous period in 2012. The sector received Foreign Direct Investment (FDI) of about US$1.6 billion between 2000 and 2014 with the government providing an increasingly favourable investment climate which is attracting investments from private players into the industry. This includes a 10 year tax exemption to enterprises engaged in the business of developing, maintaining and operating coastal and inland ports and waterways.

The Ministry of Shipping, through its Maritime Agenda (2010-2020) has set a target cargo capacity of over 3 130 million tonnes for Indian ports by 2020 largely as a result of private sector participation. Demand for ship repair is also expected to go up with a resulting increase in the number of dry docks required and ancillary repair services. In its recent strategic plan, the Planning Commission of India expects a total investment of US$30 billion to be made in the maritime transport and port sector over the next five years.

4.3.1. Port of Kolkata

The Port of Kolkata is a located on a riverine system in the city of Kolkata, about 200 km from the sea. It is the oldest port operating in India and was constructed by the British East India Company. The city and port are a major centre for finance, commerce and business with over 5 million people living in the Port of Kolkata and more that 14 million living in the urban area. The Port is the home to many skilled and semi-skilled workers and there is a large influx of industries producing a wide range of products to support a growing economy.

The Port has two distinct dock systems - Kolkata Docks at Kolkata and a deep water dock Haldia Dock Complex at Haldia. It has a vast hinterland comprising the entire Eastern part of India including West
Bengal, Bihar, Jharkhand, Uttar Pradesh, Madhya Pradesh, Assam, North East Hill States as well as two landlocked neighbouring countries, namely Nepal and Bhutan.

The Port is owned and operated by the Kolkata Port Trust (KoPT), Ministry of Shipping, Government of India. It has a Board of Trustees which includes stakeholders from the government, trade bodies, port users, labour unions and various nominated individuals.

Figure 4. Vessels docking at one of the cargo terminal, Port of Kolkata, India

Over the period 2012-2013, the Port had an annual cargo throughput of approximately 40 million tonnes of cargo and had a container volume of over 600,000 TEUs. The main commodities being shipped through the Port of Kolkata are automobiles, general industrial cargo including iron ore, granite, coal, fertilizer, petroleum products and containers. Exports are predominantly iron ore, leather and cotton textiles with major imports comprising wheat, raw cotton, machinery, iron and steel.

The Kolkata Dock System (KDS)

The Kolkata Dock System (KDS) is located on the left bank of the Hoochly River about 200 km upstream from the sea. The pilotage station is at Gasper/Saugor roads to the South of KDS around 58 km from the sea.

There are a wide range of berths and facilities at Kolkata Docks as follows:
- Kidderpore Docks: 18 berths, 6 buoys/moorings and 3 dry docks
- Netaji Subhas Docks: 10 berths, 2 buoys/moorings and 2 dry docks
- Budge Budge river moorings and 6 petroleum wharves
- Vessel anchorages at Diamond Harbour, Saugor Road and Sandheads

There are also around 80 major jetties along the river and a large number of ship breaking berths.

The Haldia Dock Complex (HDC)

The HDC Complex is located about 60 km from the Pilotage Station and has the following facilities:
- An impounded dock system with 12 vessel berths
- Three oil jetties (in river)
- Three barge jetties for handling oil barges (in river)
- Vessel anchorage
The docks are located in enclosed systems which have access via locks from the river.

**Dry docks**
The Kolkata Port Trust (KoPT) has the largest dry dock facility in India which can cater for diverse repair and maintenance needs of vessels calling on the Eastern ports of India as well as shipbuilding. There are 5 dry dock facilities at the Kolkata Dock System, 3 are located at Kiderpore and 2 at Netaji Subhas. The dry dock systems range from 102 m long x 14.6 m wide to 172 m long x 23.0 m wide. The Kolkata Dry Dock facilities have a fully range of workshops and servicing facilities and have received the ISO 9001:2000 certification for excellence and quality.

![Figure 5. Bulk carrier being unloaded at Haldia Dock System, Port of Kolkata, India](image)

**Pilotage**
Vessels above 200 GRT are required to be accompanied by a pilot vessel to navigate the river to reach Kolkata Port. The total distance to the Kolkata Dock System is 221 km of which 148 km is in the river and 75 km in the sea. The distance to the Haldia Dock System is 121 km of which about 46 km is in the river and 75 km in the sea.

**Port operations**
The Kolkata Port Trust is responsible for the management of the vessels and shipping system based in the Port of Kolkata, including port infrastructure and facilities and is one of the best port operations in India today. During the financial year 2001-2012, Kolkata Port handled 43 million tonnes of cargo with 3183 vessels calling at the port. This was the highest number for all of India’s major ports during this period. The average turn around time from docking to unloading and setting sail again is about 4.5 days for the Kolkata Dock System and about 4 days for the Haldia Dock Complex.
Imports through the Kolkata Port System (2011-2013) comprised of 20.4 million tonnes of various miscellaneous cargoes, as well as coking coal (5.5 million tonnes), general cargo (2.8 million tonnes), pulses/peas (1.4 million tonnes), liquid cargoes (1.8 million tonnes) vegetable oil (1.0 million tonnes) and non-coking coal (1 million tonnes). Other imported cargoes included timber, LPG, limestone, iron and steel, machinery, metals, manganese ore and paper.

Exports through the Port of Kolkata were approximately 18.4 million tonnes which were dominated by iron ore (10.3 million tonnes), thermal coal (1.8 million tonnes), general cargo (1.6 million tonnes), other cargoes (1.3 million tonnes) and iron/steel (1.0 million tonnes). The Port also handled other export commodities which included fly ash, jute, metals, liquid cargoes, tea and various other products. A summary of the cargo handled at Kolkata Port System from 2011-2013 is given in Table 2.

**Table 2. Cargo handled at Kolkata Port system (KoPT) 2011-2013**

<table>
<thead>
<tr>
<th>Category</th>
<th>2011-2012</th>
<th>2012-2013</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containers</td>
<td>552 241</td>
<td>600 426</td>
<td>TEUs</td>
</tr>
<tr>
<td>Imported cargo</td>
<td>27 001 000</td>
<td>27 960 000</td>
<td>tonnes</td>
</tr>
<tr>
<td>Exported cargo</td>
<td>15 280 000</td>
<td>12 900 000</td>
<td>tonnes</td>
</tr>
<tr>
<td>Passengers</td>
<td>53 239</td>
<td>40 349</td>
<td></td>
</tr>
</tbody>
</table>

Container facilities

The Port of Kolkata has a modern container facility at the Haldia Dock Complex which handles almost two-thirds of all container traffic through the Port of Kolkata, the major portion being handled by the Kolkata Dock System. Storage facilities include a 9 000 m$^2$ container freight station and an 11 hectare site for stacking containers.

The Port of Kolkata’s Netaji Subhas Docks have four container-handling berths with a total quay length of 600 m and an alongside depth of 6.5-8.0 m. These berths can accommodate vessels of up to 172 m in length and 24.5 m in breadth.

The Port of Kolkata has recently built four new container handling jetties at Diamond Harbour some 50 km downstream from Netaji Subhas Dock where natural depths range from 9.0-9.5 m. These new jetties are capable of handling some 1.6 million TEUs of containers.

Some of the container berths at the Haldia Dock Complex can also handle break bulk and dry bulk cargoes (excluding coal).

Cargo facilities

The Haldia Dock Complex contains 17 cargo handling berths, 14 of which are inside the impounded dock system. They can accommodate vessels of up to 90 000 dwt and between 183 and 239 m in length. The various berths can handle between 1.2 and 3.2 million tonnes of break bulk, dry bulk and liquid bulk cargo per year, much of which consists of iron ore, coal, fertiliser and petroleum products.

Oil jetties

The oil jetties are located on the banks of the Hoogly River at the Port of Kolkata’s Haldia Docks Complex. The three jetties have a capacity for handling about 17.7 million tonnes of crude oil per year. In addition, there are two riverine barge jetties that have a capacity for 500 000 tonnes of petroleum, oil and lubricants. each year. The oil jetties can cater for vessels of 150 000 dwt and up to 277 m in length.
4.3.2. Port of Chennai
The Port of Chennai is one of the oldest and biggest commercial ports in India and is a vital part of Tamil Nadu’s growing economy, particularly in relation to South India’s booming manufacturing sector. Its major industries include factories that produce vehicles, rubber, and fertilisers as well as electrical engineering plants and an oil refinery. Exports leaving the Port of Chennai comprise mainly of iron ore, leather and cotton textiles, whereas import predominantly consist of wheat, raw cotton, machinery, iron and steel.

Located strategically on India’s Southeastern coast, the Port of Chennai is conveniently located near some of the world’s important shipping lanes and a major hub port for the country.

The Port of Chennai began operation in 1881 with the building of an artificial harbour. In the first two years of service, it handled about 300 000 tonnes of cargo carried aboard 600 ships. By the 1940’s, the port expanded and contained the West, East and South Quays as well as warehouses, transit sheds and marshalling yards. In 1964, the Jawahar Dock was added with the berths for six vessels to handle bulk cargos. In 1972, the Bharathi Dock was added to handle petroleum and a facility for mechanically handling of iron ore was added in 1974.

The port is owned and operated by the Chennai Port Trust, Ministry of Shipping, Government of India. It has three docks with 24 berths with alongside depths ranging from 12 to 16 m. The port’s activities focus primarily on containers, cars, cruise ship and clean cargo. Future plans include the extension of the breakwater to develop a deep oil berth for the largest crude carriers.

Cargo handling and management
In 2010-2011, the Port of Chennai handled almost 62 million tonnes of cargo which include 20 million tonnes of coal and 12 million tonnes of iron ore. During the same period, the port’s first container terminal handled over 1.5 million TEUs and the second container terminal handled more than 300 000 TEUs. The port also had a throughput of 235 000 units of car exports. The number of vessels according to category of cargo being handled by the Port of Chennai for period 2008-2010 is given in Table 3.

In the 2011-2012 shipping season, the port served over 2 000 vessels of which 789 were container vessels, 524 were carried bulk cargos, 507 carried liquid bulk and 223 vessels were dry bulk vessels.

The Port of Chennai operates 24 hours a day and has a high efficiency and turnaround rate for vessels i.e. about 2 days. The port has a marine pollution strategy and action plan to protect the marine environment and has an on-going harbour dredging programme that will create additional land area.
The Port of Chennai’s first dedicated container terminal opened in 1983. Growth in container traffic was dramatic, and in subsequent years a second terminal was constructed which brought capacity of an additional 1.5 million TEU to the port. The latest container terminal was opened in 2013 which adds 5 million TEUs capacity to the Port of Chennai current capacity of 3 million TEUs.

**Port infrastructure**

The Port of Chennai covers a total of 238 hectares of land area and almost 170 hectares of water area. The entrance channel is about 7 km long with a depth of 19.2 m at the outer channel and 18.6 m at the inner channel. The channel width is approximately 300 m. The Inner Harbour contains the 1 325 m Eastern Breakwater and the 575 m Northern Breakwater. The Outer Harbour contains a 590 m Eastern Breakwater, a 460 m Northern Breakwater, a 1000 m Outer Arm and a 950 m Upper Pitch Revetment. The port has three docks with 24 berths with depths along the quays ranging from 12 to 16.5 m.

The Port of Chennai contains 7 transit sheds covering a total area of 3.1 hectares, 5 warehouses covering 3 hectares and 3 container freight stations covering 4.1 hectares. There is also 38.5 hectares of open space and a 25 hectare parking yard for container units.

The Port of Chennai has ample cargo handling equipment including a 150 tonnes capacity floating crane and three 10 tonnes capacity mobile cranes. It has ten Diesel forklift trucks and an additional ten high capacity forklift trucks (three 10 tonnes, five 15 tonnes and two 25 tonnes). The port also operates two 3 tonnes pay-loaders, 14 Diesel locomotives and a mechanised coal conveyor system with capacity of 15 million tonnes per year.

**Container terminals**

The first container terminal - Chennai Container Terminal (CCT) - was opened in 1983. It was privatised in 2001 and is now operated by DP World. It can handle fifth generation container vessels carrying up to 6 400 TEUs. The container terminal has direct services to China, Europe, West Africa and the United States linking international trade to the South India hinterland.

The CCT wharf is 885 m long and contains four berths with alongside depth of 13.4 m. The terminal includes a Container Freight Station with 1.6 acres of covered area and has state of the art
infrastructure including an electronic management system with online services that save time and money for customers.

The total area of CCT is 21.1 hectares and the terminal has a stacking area of 17 hectares and an on-site rail service. The Port of Chennai’s CCT has a total capacity of 12 600 TEUs and is equipped with one post-panamax and seven super-post-panamax quayside cranes. Yard-side equipment also includes several 20-30 tonnes capacity Rubber Tyred Gantry cranes, one reach stacker and two 5 tonnes forklifts.

Chennai Port has also a new International Container Terminal serving the automobile, textile, pharmaceuticals, leather, light engineering and chemical manufacturing industries. This container terminal can accommodate the new generation of deep-draft container vessels and is connected by rail to the inland container depot and South India’s hinterland.

The International Terminal was built at a cost of US$100 million and is a joint venture between PSA International and Chennai based Sical Logistics Ltd. It covers an area of 35 hectares and contains three berths with a total length of 832 m and an alongside depth of 15.5 m. The terminal has a capacity for 1.5 million TEUs and is equipped with four post-panamax cranes, seven Twin-lift rail mounted quay cranes and 18 Rubber Tyred Gantry cranes (RTGs) and six reach-stackers.

**Bulk and break-bulk terminals**

The General Cargo Terminal in the Port of Chennai has eleven berths with four at the West Quay, two at the South Quay and three at the Jewahar Dock. The Iron ore terminal has capacity for eighty million tonnes per year and can load up to 6000 tonnes per hour. The terminal can accommodate vessels to 280 m in length with a maximum of 145 000 dwt. The mechanised ore handling plant is located at Bharathi Dock II.

The facilities at the Port of Chennai Bulk and break-bulk terminal include two rotary wagon tipplers, ten lines of conveyors, two rail mounted stackers, two rail mounted bucket-wheel reclaimers and two rail mounted shiploaders. The facility is equipped with an automatic belt weigher, sampling facilities, a service station and a container maintenance workshop. The ore stock yard has a capacity for 640 000 tonnes and the terminal is serviced by rail.

**Oil and liquid terminals**

The Oil and liquid Terminals are located at Bharathi Dock. The first oil berth (BD-1) can accommodate tankers up to 100 000 dwt and the second berth (BD-111) can handle tankers of 140 000 dwt. Both berths can accommodate tankers of up to 289 m in length. The oil docks have a capacity of 13 million tonnes per year. The BD-1 berth has 5 marine loading arms and the BD-111 six marine loading arms equipped with separate pipe lines to convey crude oil, white oil products and furnace oil. The facilities have the capacity to pump 3 000 tonnes of crude oil and 1 000 tonnes of petroleum products per hour.

**Ro/Ro terminals**

The Port of Chennai is India’s premier export car terminal and serves many international car makers including Ford Motors, Nissan, Hyundai, Renault, BMW and Daimler.

Hyundai Motor India has established a dedicated automobile terminal at the Port of Chennai that exports about 300 000 units each year making the port an important export base for the company. This terminal covers one hectares of land area and includes a 300 m long berth, 30 m wide with an alongside depth of 12 m and a parking facility for 6 000 cars.
Cruise terminals
The Port of Chennai is one of India’s five major cruise destinations with services and passenger connections to Singapore, Myanmar, Malaysia, the Philippines (Manila), Suez, Sri Lanka (Colombo) and the UK (London).
A dedicated passenger cruise terminal is located on the West quay which handles about ten international cruise vessels per year. During the 2009-2010 season, the cruise terminal served 3 400 passengers and in 2011, India’s first cruise ship “AMET Majesty” set sail from the Port of Chennai.

Connectivity to Hinterland
The Port of Chennai contains over 27 km of roads and is served by Chennai Beach Railway Station. It has a terminal rail yard at the port and its own railway operations. Two broad gauge rail lines in the port handle a quarter of the total cargo volume. There is a four-way elevated road expressway that links the port to the Maduravoyal interchange and the country’s vast road network.

Table 3. Number of vessels according to commodities handled by the Port of Chennai (2008-2011)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid bulk</td>
<td>441</td>
<td>494</td>
<td>502</td>
</tr>
<tr>
<td>Dry bulk</td>
<td>441</td>
<td>446</td>
<td>308</td>
</tr>
<tr>
<td>Break bulk</td>
<td>486</td>
<td>489</td>
<td>559</td>
</tr>
<tr>
<td>Containers</td>
<td>710</td>
<td>703</td>
<td>812</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2 078</strong></td>
<td><strong>2 132</strong></td>
<td><strong>2 181</strong></td>
</tr>
</tbody>
</table>

Future port development plans
The Port of Chennai plans to construct a new mega container terminal, the single largest terminal ever to be built in India. Construction will take seven years to complete and the deep water facility will have a capacity of 4 million TEUs. The investment will cost US$800 million and will be offered as a “build, operate and transfer project” over a 30 year concession.

The mega terminal will be developed north of Bharathi Dock with two new breakwaters (4.23 km in length), a continuous quay length of 2 km with a depth of 22 m alongside and a basin area of 300 hectares. The project also involves converting waterfront properties into 225 acres of land.

The development project will be the first deep-water terminal of its kind in India and will be able to handle ultra-large container ships of capacity over 15 000 TEUs and lengths of 400 m. The project is expected to be completed in 2018 when the port will be able to handle over 5 million TEUs.

Chennai Port Trust also has plans to build a marina along a 200 m stretch in the West quay together with facilities to provide berths and facilities for yachts.
4.4. **Bangladesh**

Bangladesh is situated on the world’s largest delta and as a result more that 90% of its trade is transported by sea and rivers. Shipping and training of seafarers have always been considered to be one of the most important factors for developing the national economy.

Bangladesh has approximately 40 ocean going vessels including tankers. These vessels are both publically and privately owned and total over 400 000 dwt. About 90% of overseas trade is routed through the ports of Chittagong and Mongla with the country earning about 70-80% of its national revenue through the port of Chittagong alone.

The Government has been promoting a policy of encouraging the private sector to grow side by side with the public sector and to share in its responsibilities towards the national shipping trade.

Bangladesh’s ship scrapping industry is one of the largest in the world, second only to India. It gives employment to over 100 000 people (mostly unskilled workers) and involves over 100 companies who support and compete for business. Production contributes to more than 50% of the country’s steel industry and 25% of the national steel consumption. This amounts to over 1.5 million tonnes of steel per year being supplied by the nation’s ship scrapping industry. Latest figures indicate that Bangladesh scraps about 110 large vessels a year (most above 60 000 dwt) amounting to approximately 7 000 000 dwt.

In 2010, due to hazardous work conditions, damage to health and loss of life, the Government placed restrictions on the industry which resulted in higher employment safety standards and an improved regulatory environment.

4.4.1. **Port of Chittagong**

The Port of Chittagong is the principal seaport of Bangladesh handling about 92% of import-export trade of the country. It is situated on the right bank of the River Karnafuli at a distance of 12 km from the Bay of Bengal.

The Chittagong Port Authority (CPA) operates and manages the port and is the basic service provider. Its mission is to provide the necessary services and facilities to the port users efficiently and at a competitive price as well as to manage, maintain, improve and develop the port. The Authority is administered by a Board comprising of a Chairman and four members representing engineering, harbour and marine finance, administration and planning. The Chairman and members are appointed by the Government of Bangladesh.

The port has a number of key terminals including the New Mooring Container Terminal (NCT), the Chittagong Container Terminal (CCT), the Pangoan Container Terminal (PCT) and the Dhaka Inland Container Depot.

In 2012, The Port of Chittagong handled over US$60 billion worth of foreign trade, of which US$19 billion comprised of readymade clothes for export to Europe and the USA.
Figure 7. Vessels docked at container terminal, Port of Chittagong, Bangladesh

**Jetties and moorings**

The Chittagong Port Authority owns and operates 10 general cargo berths, 6 container berths and several specialised berths for handling bulk cargoes in relation to ocean going vessels. The latter includes jetties for handling oil, grain, cement, clinker and chemicals/fertilizers (ammonia and urea).

For inland coasters and smaller vessels, a number of jetties and pontoons are offered as berths for handling dry bulk as well as single point moorings.

**Chittagong Container Terminal (CCT)**

This terminal has a quay length of 450 m, a holding capacity of 8 376 TEUs and a storage yard of 150 000 m². It is serviced by a 550 m long railway siding and can accommodate three large container vessels at a time.

**Equipment and cargo handling**

The terminal has a wide selection of container handling equipment including:

- 4 Quay side cranes (40 tonnes)
- 11 Tyred gantry cranes (40 tonnes)
- 19 Straddle carriers (40 tonnes)
- 12 Reach stackers (45 tonnes)
- 7 Fork lift trucks (25-42 tonnes)
- 28 Fork lift trucks (7-16 tonnes)
- 9 Reach stackers (7 tonnes)
- 3 Container movers (50 tonnes)
- 45 Terminal tractors (50 tonnes)
- 57 Terminal trailers (50 tonnes)

The Port of Chittagong has a large amount of different cargo storage spaces throughout the port including nine transit sheds (52 069 m²), seven warehouses (26 746 m²), six warehouses (32 500 m²), two vehicle storage sheds (5 082 m²) and over 200 000 m² of open storage areas.

Various companies importing and exporting dry and liquid bulk cargoes (grain, cement and oil products) have their own open and covered storage facilities adjacent to their berths.
According to the Chittagong Port Authority, equipment for the handling of dry and break-bulk cargo at vessel berths is as follows:

- 32 Mobile cranes (10-50 tonnes)
- 72 Forklift trucks (2.5-5 tonnes)
- 16 Tractors (25 tonnes)
- 30+ Trailers (6-25 tonnes)

**Other services and facilities**

The Port Authority of Chittagong provides additional services such as a harbour dredging, tugs and towage and a fully fledged fire fighting unit.

A new comprehensive security regime for international shipping is in place with an effective risk assessment and risk management tools to determine appropriate security measures. The Chittagong Port Authority has adopted the International Ship and Port Facility Security (ISPS) code and maintains strict security according to a Port facility security plan.

The implementation of the security plan is overseen by a Port Security Committee which comprises members of the Navy, Coastguard, Police, Intelligence, Mercantile Marine Departments, Customs, Workers Unions as well as key companies and port users.

**Port cargo and trade**

The main imports entering through the Port of Chittagong are food grain, cement clinker, sugar, salt, fertiliser, iron, chemicals, coal and edible oils. Exports comprise of garments, knitwear, fertiliser, jute, leather, tea, molasses, naphtha and frozen foodstuffs.

The total volume of cargo exported by the port increased from about 31 million tonnes in 2006 to 48.7 million tonnes in 2011. Over the same period, imports of goods rose from 24 to 38 million tonnes. In relation to containers handled at Chittagong Port, the amount increased from 876 186 TEUs in 2006 to 1 393,104 TEUs in 2011.

The number of vessels handled at Chittagong Port has steadily increased from 1957 vessels in 2006 to 2 240 vessels in 2011 with an average turnaround time in port of 2.5 days.

**Table 4** provides a summary of ports statistics in relation to imports and exports of general cargo and containers from 2006 to 2011.

<table>
<thead>
<tr>
<th>Year</th>
<th>Imported cargo (tonnes)</th>
<th>Exported cargo (tonnes)</th>
<th>Containers (TEUs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>23 936 103</td>
<td>30 895 500</td>
<td>876 186</td>
</tr>
<tr>
<td>2008</td>
<td>24 236 261</td>
<td>37 042 862</td>
<td>1 069 999</td>
</tr>
<tr>
<td>2011</td>
<td>38 266 480</td>
<td>48 735 620</td>
<td>1 393 104</td>
</tr>
</tbody>
</table>

**Future development plans**

The Chittagong Port Authority plans to develop a new container terminal that can handle up to 12 container vessels at a time and is looking towards promoting Chittagong Port as a regional commercial hub serving India, Bangladesh and Myanmar.

At present, Chittagong Port is limited to handling vessels of less than 188 m in length because of restricted draft and the river environment around which the port is built. The Government of Bangladesh is also looking at developing a new deep sea port on Sonadia Island located to the South of Chittagong in the Bay of Bengal with the assistance of a multi-billion US dollar investment from China.
4.4.2. Port of Mongla
Mongla is the main seaport in the Bagerhat District of South western Bangladesh. The Port is under the administration of the Ministry of Shipping. The Mongla Port Authority (MPA) formulates policies concerning operation, administration, finance and development of the port. There are three divisions within the port authority structure: Finance, Operations and Engineering. There is also a “Restricted area” and a security policy is in operation for all of the port area.

Mongla Port is situated on the East Bank of the Pusser River near the confluence with the Mongla Nulla River. It lies about 100 km north of the Bay of Bengal and is connected to the major inland river ports and to the rail terminal at Khulna city, 45 km to the South. It is well protected and very near the Sundarbans. Kolkata and Haldia in India and Mongla and Chittagong in Bangladesh are the principal seaports of the large Ganges delta. Mongla Port has trade links with other ports throughout the region and also other parts of the world. Vessels arriving at Mongla Port are mainly from Asia, the Middle East, Australia and Europe.

The port is open 24 hours a day and caters for vessels up to 225 m long with port quays and facilities able to handle up to 33 ships at a time. A large channel provides secure anchorage.

The main exports from the port are jute, leather, tobacco, frozen fish and shrimp. Imports are predominantly grain, cement, fertiliser, machinery, vehicles, coal and wood pulp.

Shipping agents
The Mongla Port Authority lists 99 registered shipping agents on its website and provides company addresses including contact details and e-mails of key personnel. Among some of the key shipping agents are:

- Atlas Shipping Lines
- Maersk Bangladesh Ltd
- Bengal Shipping Lines Ltd
- Bangladesh Shipping Lines Ltd
- Container and Terminal Services Ltd
- MH-Global Logistics Ltd
- Unicorn Marine Ltd
- K-Lines Bangladesh Ltd
Mongla Port Authority operates 5 general cargo and container berths with 5 jetties approximately 183 m long. It also has 7 river mooring berths and 14 vessel anchorage berths.

There are 4 transit sheds each with an area of 4 907 m$^2$. Other storage facilities include 2 warehouses of 9 815 m$^2$ each and 3 container yards with 35 752 TEU capacity (single stacking).

There are 3 tugs, 2 pilot launches and several other service vessels available to ensure smooth functioning of port. The maximum drafts for vessels at the various locations are 9 m, 8 m and 7 m at anchorage, mooring buoys and jetties, respectively.

**Port handling**

At present, the port handles about 1.6 million tonnes of cargo per year and 20 500 TEU container volume but has a capacity to handle up to 6.5 million tonnes per year. There is also an Export Processing Zone (EPZ) located close by the port area. The present capacity of the port is not fully utilised. Plans are being developed to build a bridge at Padma to shorten the land distance between Mongla and Dhaka-Chittagong which would increase competitiveness and use of the port. There are about 2 800 government appointed officers and staff working for the Mongla Port Authority.

The Mongla Port provides other facilities and services to international shipping lines including dredging services to maintain adequate water depths in the channel. The Port has several mobile cranes (25-100 tonnes lift) as well a number of smaller cranes. It has several fixed dockside cranes, 20 forklifts (2-5 tonnes), 4 heavy duty forklifts (15-35 tonnes) and 10 trailers (20-40 long).

**New port development strategy**

The Government of Bangladesh has recently developed a national strategy to ensure the vibrant operation of multiple ports to meet the nations increasing imports and exports requirement. In 2013, it has taken active steps to revitalise Mongla Port to handle an increased volume of cargo. Between 2009 and 2012, the volume of traffic has doubled which has led to a public private partnership initiative to build 2 new jetties at a cost of US$50 million.
4.5. Myanmar

Myanmar is strategically located between China and India along the East-West trade routes. It has a population of 63 million, a coastline of over 2,228 km long and its land borders China, Laos, Thailand, Bangladesh and India.

After years of isolation under military rule, Myanmar is now reforming its political agenda, improving its structures and legislation and adopting international standards and best practices. At the same time, it faces challenges in terms of lack of funds, inexperience, low levels of technology and poor cooperation between government sectors.

In terms of its maritime transport industry, the country participates in regional ASEAN meetings and has ambitious plans for the development of new ports and infrastructure. It is also encouraging privatisation, engaging with stakeholders and drafting a new national shipping policy.

Myanmar five star lines is the national flag carrier and has 26 vessels (total 161,344 dwt) which are involved in coastal and foreign trade. Most of these are multi-purpose and conventional vessels with some short sea trade cargo and coastal passenger ships.

Myanmar is planning to develop a number of new deep sea ports to take economic advantage of its position along one of the key world shipping trade routes. These ports and infrastructure (Sitwe, Kyaukpyu, Dawei and Kalagauk) are to be financed by Japan, China and Thailand and will greatly benefit economic development in the Southeast Asian region. There is also a proposal to build a land bridge linking the Port of Kalagauk to Thailand which would cut the transport distance by two-thirds from the usual shipping route around the Straits of Malacca.

4.5.1. Port of Yangon

The Port of Yangon is the principal port of Myanmar and handles about 90% of the country’s exports and imports. It is situated on the East of the Yangon River about 32 km inland from Elephants Point on the Gulf of Martaban, Bay of Bengal.

All vessels entering the port require pilotage if they are over 200 GRT. The pilotage station is located a further 32 km seawards from Elephant Point and access to the port is timed at flood tide to cross the Outer Bar at the mouth of the river and the Inner Bar at Monkey Point.

Yangon Port is accessible to vessels of 167 m in length, up to 9 m draft and 150,000 dwt. The port is operated and managed by the Myanmar Port Authority (Ministry of Transport) and implements effective port security measures in line with the International Ship and Port Facility Security code.

The Port of Yangon supports Myanmar’s biggest city and its commercial and industrial centre. It is also home to several light industries, over 2,500 factories that account for much of the employment in the region.
Report on some aspects of the shipping industry in the Bay of Bengal Large Marine Ecosystem

Figure 9. Bulk carriers and container vessels berthed at terminal at Port of Yangon, Myanmar

Port services
The port services offered include:
- Container and general cargo handling and storage
- Tug services
- Shipping agency service
- Bunkering
- Port security and fire-fighting
- Ship’s repair
- Diving service

Port facilities
Yangon Port has several wharves with a number of berths dedicated to general cargo, containers, cargo/passengers, rice and rice products, and liquid bulk including oil. These are summarised in the following Table 5:

Table 5. Main facilities (wharves and berths) available at Yangon Port

<table>
<thead>
<tr>
<th>Wharves and berths</th>
<th>Vessel length (m)</th>
<th>Vessel width (m)</th>
<th>Storage (Yard+Shed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hteedan (2) GC</td>
<td>139-180</td>
<td>12.5-21.0</td>
<td>21 738 m² 6 688 m²</td>
</tr>
<tr>
<td>Ah lone (3) container + GC</td>
<td>198-260</td>
<td>19.5-30.5</td>
<td>157 426 m² 12 605 m²</td>
</tr>
<tr>
<td>Sule Pagoda (7) GC</td>
<td>137-160</td>
<td>12.2-15.2</td>
<td>36 806 m² 71 882 m²</td>
</tr>
<tr>
<td>Bo Aung (3) container + GC</td>
<td>137-182</td>
<td>15.2-30.0</td>
<td>480 000 m² 400 m²</td>
</tr>
<tr>
<td>Thaketa (2) GC /Passenger</td>
<td>106-200</td>
<td>17.0-19.5</td>
<td>16 294 m² 4 462 m²</td>
</tr>
<tr>
<td>MIPL (1) GC, Liquid bulk</td>
<td>200</td>
<td>17.0</td>
<td>20 000 m² 3 000 m²</td>
</tr>
<tr>
<td>MITT container + GC</td>
<td>1000</td>
<td>30.0</td>
<td>500 000 m² 20 000 m²</td>
</tr>
</tbody>
</table>

(GC=General Cargo)
Port equipment

The Port of Yangon is well equipped to handle the multiple cargoes that enter and leave the port. The Myanmar Port Authority have at their disposal a 30.5 tonne Quayside container crane, 4 Electric cranes (6-40 tonnes), 6 Yard gantry crane (35-40 tonnes), 9 Mobile cranes (6-40 tonnes), 4 Reach stackers (42-45 tonnes), 2 Container forklifts (36 tonnes), 9 Empty container forklifts (15 tonnes), 3 Forklifts (8 tonnes), 88 Forklifts (2.5-4.0 tonnes), 8 Towing tractors (5-8 tonnes) and 42 Container tractors with trailers.

The Asia World Port Terminal has 2 Mobile harbour cranes (104 tonnes), 6 Reach stackers, 10 Container tractors and trailers and 2 Empty container forklifts.

The Myanmar Industrial Port has 2 Rough terrine cranes (30-60 tonnes), 2 Reach stackers, 4 Empty container forklifts, 15 terminal tractors and trailers and 8 Forklifts (3-6 tonnes).

Myanmar International Terminals Thilawa (MITT)

Myanmar International Terminals Thilawa (MITT) is a multi-purpose container terminal located at Thilawa near the mouth of the Yangon River. The terminal offers a comprehensive range of safe, efficient and productive services for the shipping industry 24 hours a day all year round. The terminal also has a Special economic zone nearby. MITT can handle a wide variety of cargo and can cater for large vessels with deep drafts. It is also becoming an important stop-over for visiting cruise ships and is only a one hour journey by road to Yangon.

The Myanmar International Terminal (MITT) has 2 Container quay cranes (40 tonnes), 3 yard Gantry cranes (40 tonnes), 2 Reach stackers and 7 Container tractors and trailers.

Japan is providing significant investment in financing and development of the MITT and has pledged a further US$615 million to the port and industrial zone including the development of an environmentally friendly “Smart city” supported by cutting edge technology. This project is expected to have a very positive impact on economic development and improve employment opportunities and connectivity across the region. It is expected to be completed by 2015.

Port trade statistics

Data available by the Ministry of Transport from the period 1996 to 2006 indicate that there was a steady increase in the import and export of containerised cargo from 85 445 TEU in 1996 to 189 690 TEU in 2006 and a corresponding expansion in the number of port calls from 192 to 313 vessels.

Non containerised cargo also increased over the same period from 7.4 million tonnes in 1996 to 9.0 million tonnes in 2006 with the number of vessels calling at Yangon Port doubling from 492 in 1996 to 997 in 2006. These data and statistics are summarised in the Table 6.

4.5.2. Port of Sitwe

A deep water port at Sitwe, the capital of Rakhine State in Myanmar on the Bay of Bengal is currently being developed by India at a cost of US$500 million. The port is situated at the mouth of the Kaladan River and will provide an alternative route to connect India’s North East States with Southeast Asia without having to transit Bangladesh via the Siliguri Corridor, a narrow strip of land (Indian territory) that is wedged between Bhutan and Bangladesh.
Table 6. Ship traffic and volumes of imports and exports at Yangon Port over the periods 1996 to 2000 and 2001 to 2006

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Container cargo</strong></td>
<td>1146</td>
<td>1737</td>
</tr>
<tr>
<td>Ships</td>
<td>286 529 (TEU)</td>
<td>529 490 (TEU)</td>
</tr>
<tr>
<td>Imports</td>
<td>286 110 (TEU)</td>
<td>527 704 (TEU)</td>
</tr>
<tr>
<td>Exports</td>
<td>572 639 (TEU)</td>
<td>1 057 194 (TEU)</td>
</tr>
<tr>
<td><strong>Non container cargo</strong></td>
<td>3 072</td>
<td>5 036</td>
</tr>
<tr>
<td>1996-2000</td>
<td>23.9 (MT)</td>
<td>29.2 (MT)</td>
</tr>
<tr>
<td>2001-2006</td>
<td>12.7 (MT)</td>
<td>21.1 (MT)</td>
</tr>
<tr>
<td><strong>Total cargo</strong></td>
<td>36.6 (MT)</td>
<td>50.3 (MT)</td>
</tr>
<tr>
<td>1996-2000</td>
<td>27.6 (MT)</td>
<td>36.0 (MT)</td>
</tr>
<tr>
<td>2001-2006</td>
<td>16.8 (MT)</td>
<td>33.0 (MT)</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>44.4 (MT)</td>
<td>69.0 (MT)</td>
</tr>
</tbody>
</table>

The project, known as the Kaladan Multi-modal Transit Transport Project” aims to build trade links, infrastructure and transport networks in this underdeveloped part of NE India and SW Myanmar. The project will have significant economic and social implications for the region and will become a nodal centre for the transportation of goods to and from the interior of the Rakhine State to NE India along the banks of the River Kaladan.

Part of the project involves the dredging of 158 km of the River Kaladan and the construction of six cargo vessels by Indian contractors.

**4.6. Indonesia**

Indonesia comprises the largest archipelago in the world consisting of more than 17 000 islands. It is located at the crossroads between Asia and Australia and between the Pacific and Indian Ocean along the busiest East-West shipping lanes. It has a well-developed marine transport system with a network of ports, a shipping fleet, shipyards and waterways.

Indonesia has five major ports located in various regions of the country i.e. Belawan in Medan, Tanjung Priok in Jakarta, Tanjung Perak in Surabaya, Balikpapan in East Borneo and Makassar in South Sulawesi.

In 2011, the Indonesian registered shipping fleet was made up of 9 884 vessels many under 1 000 GRT. There were 63 active shipyards in the country which delivered 189 vessels which consisted mainly of a range of specialised tugs, but also included cement carriers, general cargo ships and production tankers. The international merchant fleet comprised 1 340 vessels made up of the following ship types: Bulk carriers (105), Cargo vessels (618), Chemical tankers (69), Container ships (120), LNG (28), Passenger (49), Passenger/Cargo (77), Petroleum tankers (244), Refrigerated cargo (6), Roll-on/roll off (12), Specialised tanker (1) and Vehicle carrier (11).

Approximately 5% of the Indonesian Merchant Fleet is foreign owned, mostly by companies registered in Singapore and Japan. Over 7% of the vessels are registered in other countries mainly in Singapore and Hong Kong.

No details was available on the age of vessels in the merchant fleet from the web search but the age profiles are probably quite similar to Malaysia with 30% expected to be under 9 years old and 45% between 10 and 20 year old and 25% older than 20 year.

Indonesia is heavily dependent on maritime transport and trade both for its international as well as for domestic markets. In terms of extractive commodities, the main exports are coal, LNG and oil with the latter reaching just over one million barrels per day in 2010. The country also produces significant quantities of palm oil, cocoa, tin, nickel and bauxite.
4.6.1. Port of Sabang
The Port of Sabang is located on the island of Pulau Weh (Aceh Province) at the Northern end of the Indonesian Archipelago inside a deep protected bay (up to 53 m deep) near the entrance to the Straits of Malacca. The port facilities are excellent and the local authorities are developing the eco-tourism potential of the area which has excellent beaches, diving spots and marine reserves with significant biodiversity including coral reefs, whale sharks and manta rays.

The port caters for several visiting cruise ships each year and the city of Banda Aceh is only 45 km away with a ferry service carrying up to 250 passengers operated between Sabang and Banda Aceh.

Vessel berths and facilities
There are two berths for vessels in Sabang Port. The first is the CT2 berth which is 180 m long and can accommodate vessels of up to 205 m in length. There is an alongside depth of 7-9 m at low tide. The berth is equipped with vertical rubber fenders and is in good condition.

The second berth (CT3) is 423 m long with an alongside depth of 7-9 m. This berth was completed in 2013 and is intended mainly for container use. It is also being used as a cruise ship berth and can take vessels of over 230 m in length. Cruise ships that called at Sabang Port in 2013 include the following: Albatross, Amadea, Columbus, Europa, Seabourne Legend and Seabourne Pride.

Sabang Port has a medium sized dry dock, can undertake some limited ship repairs and can handle vessels up to 170 m in length. It is classified as a duty-free zone. There is no pilot or towage service at the port, but bunkers and freshwater are available.

Port development plans
The control and management of Sabang Port has recently been contracted out to the Dublin Port Company, Ireland who plan to improve the port’s operations, upgrade its facilities including the container yard, warehouses and cargo terminal. There are also plans to extend the piers to 2 617 m in length which would enable the port to cater for and possibly become a hub for large tankers and cargo ships that cannot pass through the Straits of Malacca.

Figure 10. Docking jetty for passenger ferry at Port of Sabang, Pulah Weh Island, Indonesia
4.6.2. Port of Belawan

Medan is the capital of North Sumatra and is located on the Deli River about 15 km from its mouth where the city’s port Belawan is situated. Medan is the marketing, commercial and transport centre of a rich agricultural area based on tobacco, rubber and palm oil estates.

Belawan Port has been re-developed over the last decade and has extensive cargo berths almost exclusively for dry bulk and loading of palm oil. It has a well-equipped international container terminal (BICT) and a ferry passenger terminal. Crude palm oil has become the main export commodity of the port, although large volumes of rubber, tea and coffee are also exported through the port. There is a regular ferry service from the Port of Belawan across the Straits of Malacca to Penang in Malaysia.

In 2006, the port handled 6.7 million tonnes of cargo including 4.5 million tonnes of exports and 2.2 million tonnes of imports. The leading exports included petroleum (3.1 million tonnes), palm oil (500 000 tonnes), vegetable oil (338 000 tonnes), fertiliser (560, 000 tonnes) and iron (9 120 000 tonnes).

In 2013, Belawan Port handled over 1.2 million TEUs of containers and is currently expanding its capacity to 2 million TEUs following a significant investment of US$90 million.

The Port of Belawan is managed by the Port of Indonesia Corporation (PELINDO).

Figure 11. Unloading containers from vessel at Port of Belawan, Northern Sumatra, Indonesia

Facilities and storage

The largest vessel that can be accommodated at the Port of Belawan is 220 m in length, with a draft of 7.5 m and gross registered tonnage of 22 560 GRT.

The Port of Belawan includes four major wharves: Belawan Lama (688 m), Ujung Baru (1 555 m), the Ferry Wharf (115 m), the Citra Wharf (635 m) and the IKD Wharf (150 m).

Belawan Lama has six warehouses and contains storage and handling facilities for 5 000 m² of covered space and 23 300 m² of open yards. Ujung Baru has ten warehouses and contains 38 500 m² of covered space and 19 hectares of open container yards. The Citra Wharf has three warehouses with 16 800 m² of covered space and 25 500 m² of open yards. The IKD wharf has 9 400 m² of open yard. There are also a number of other covered and open yard storage spaces available.
The Ferry Terminal has a covered area of 539 m² and a capacity for about 720 persons for outgoing passengers. Incoming ferry traffic has additional terminal capacity with cover of 2 300 m² and can cater for 2 200 passengers.

The main container line carriers calling at the Port of Belawan are: APL, Evergreen Marine Corporation, Mediterranean Shipping Company (MSC), Pacific International Lines (PIL), Regional Container Lines and Yang Ming.

**Equipment**

The equipment at the Port of Belawan includes a 40 tonnes Floating crane, 11 Mobile container cranes (35-40 tonnes), 22 Rubber Tyred Gantry cranes (35-40 tonnes), 8 Reach stackers (40 tonnes), 42 Head trucks (40 tonnes), 52 Chassis combo (40 tonnes), 3 Side loaders (7-9 tonnes) and several forklifts.

The international container terminal has a yard capacity for 15 000 TEUs.

Bulk liquid cargoes can be loaded at 220 tonnes per hours and dry cargo can be transhipped using three conveyors which have a capacity of 50-60 tonnes per hour.

Ship repairs and stevedoring is also available at the port and there is a railway connection at the port to the city of Medan about 26 km away.

**Cargo volume**

Data on the volumes of vessel traffic and imports and exports passing through the International Container Terminal at the Port of Belawan during 2013 is given in **Table 7** below. It shows that 546 vessels visited the terminal and that a total throughput of 457 986 container units (TEUs) was handled.

The quarterly traffic of vessel and volumes of container traffic for 2013 is also given in **Table 7** below.

**Table 7. Quarterly traffic of vessels and volumes of containers for 2013**

<table>
<thead>
<tr>
<th>Months</th>
<th>Vessel Nos.</th>
<th>Imports (Box)</th>
<th>Exports (Box)</th>
<th>Totals (Box)</th>
<th>Throughput TEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan - Mar</td>
<td>137</td>
<td>40 417</td>
<td>46 467</td>
<td>86 884</td>
<td>111 962</td>
</tr>
<tr>
<td>Apr - Jun</td>
<td>139</td>
<td>42 890</td>
<td>48 918</td>
<td>91 808</td>
<td>119 977</td>
</tr>
<tr>
<td>Jul - Sept</td>
<td>133</td>
<td>39 500</td>
<td>46 561</td>
<td>86 061</td>
<td>111 007</td>
</tr>
<tr>
<td>Oct - Dec</td>
<td>137</td>
<td>44 488</td>
<td>47 901</td>
<td>92 389</td>
<td>114 980</td>
</tr>
<tr>
<td>Jan - Dec</td>
<td>546</td>
<td>167 303</td>
<td>189 847</td>
<td>357 150</td>
<td>457 986</td>
</tr>
</tbody>
</table>

**4.7. Malaysia**

Malaysia has a relatively large sea area which is four times the size of its land mass, has a vibrant offshore oil and gas sector and a well-developed maritime transport industry that carries 95% of the country’s imports and exports. Strategically, it has developed into a key maritime hub being positioned along the main shipping lanes connecting East-West trade. It has set up its own shipping line, the Malaysian International Shipping Corporation Berhad (MISC) in the late 1960s to serve exports and address the problem of balance of payments as a result of the absence of a national carrier. With the government taking significant equity participation, it marked a milestone in the development of modern commercial shipping in Malaysia.

In 1997, the purchase of a 29% stake in MISC by Petronas transformed the company into a leading liner. The company’s growth was further enhanced by the acquisition of Konsortium Parkapalan and PNSL in 1998. Today, MISC has grown into one of the world’s largest shipping operators with over 100 vessels including a modern and well-diversified relatively young fleet of 27 LNG tankers. A
significant number of Malaysian vessels are greater than 20 000 GRT, 35.4% of which are under 9 years old, 33.2% between 10 and 19 years old, 18.5% between 20 and 29 years old and the remaining 13% more than 30 years old.

Besides MISC, other major commercial shipping companies such as Malaysian Merchant Marine, Halim Mazim, Nepline, Gagasan Carriers, Global Carriers, Malaysia Bulk Carriers and Wawasan Shipping also have modern fleets of vessels plying the world's oceans carrying all types of cargoes and loads.

Malaysia ranks 19th in terms of fleet size globally. In 2012, the country had 526 vessels with a combined tonnage of 14.1 million GRT of which 33% were registered under foreign flags. Over half of the ships comprise of oil and LNG tankers with the rest made up of container vessels, bulk carriers and general cargo. The country is also the 13th largest producer of natural gas and the 24th largest in crude oil production.

The country's ports are critical gateways and facilitators of trade as well as catalysts for economic growth. Container volume handled by national ports reached an all-time high of 21 million TEUs in 2012. The Port of Klang is one of the world's largest container ports and Bintulu Port has the largest LNG export terminal in Asia. Other ports include Penang and the Port of Lumut in the Northwest of the country and border the Bay of Bengal.

Malaysia also has a well-established ship building and repair sector which built 252 new vessels in 2012 creating over 30 000 jobs. The biggest shipyard, Malaysian Marine and Heavy Engineering, became a subsidiary of MISC in 2004 further strengthening the country's maritime transport sector.

Future expansion of the maritime transport sector looks promising. Assuming continued growth in the global economy, Malaysian ports are projected to handle 36 million TEUs and 545 million tonnes of cargo by 2020.

4.7.1. Port of Penang

Penang Port is located in the State of Penang, in Northwest Malaysia and is the oldest and longest established port in the country. The port serves as the main gateway for shippers in the Northern states of Malaysia and also the Southern provinces of Thailand.

The port is strategically located along the Straits of Malacca, one of the busiest shipping routes in the world. Penang Port is fully equipped to handle all types of cargo such as containers, liquid bulk, dry bulk, break bulk and others and provides a multitude of services to cater for safe and efficient transit via the port's various terminals and facilities. The port operates throughout the year and is open 24 hrs a day. It has recently been privatised to improve operational efficiency and enhance the services offered.

According to its mission statement, its aim is to be the premier port and logistic chain integrator in the region and to provide maximum value to the customer through superior quality service. The port is committed to effectively implementing and maintaining a quality management system that complies with the requirements of the ISO 9001:2008 standards.
Figure 12. Vessels unloading containers at terminal, Port of Penang, Malaysia

Port services
Penang Port is serviced by up to 30 shipping lines and agents which provide connectivity to the world and can be regarded as a gateway port for North Malaysia and Southern Thailand. It operates 24 hours a day all the year round and this coupled with a state of the art container terminal management system with web access, provides flexibility, efficiency and sustainability to ensure continued growth. The port has well established rail links to the hinterland and containers can be shipped directly to all major seaports in the Far East.

Container services and facilities
Penang Port provides a modern dedicated terminal to cater for the ever growing volume of container trade in the region. In 2013, the port achieved a throughput of 1.2 million TEUs.

Container operations are the core business for Penang Port with much of the activities centred at the North Butterworth Container Terminal (NBCT).

It is equipped with six berths, varying in length from 200-300 m with an alongside depth of 11 m. These berths can cater for vessels of between 70 000 and 135 000 dwt and have a capacity for 2 million TEUs per annum.

The berths are well equipped with 13 Quay gantry cranes, 7 of which are post-panamax. The terminal has 8 Rail mounted gantry cranes and 32 Rubber Tyred Gantry cranes (RTG). It also has 60 Prime movers and 124 Trailers and well as several Reach stackers.

Cargo services
Penang Port offers a complete array of facilities to handle nearly all types of non-containerised cargo e.g. break-bulk, dry bulk and liquid bulk. The port provides dedicated facilities located at Butterworth Wharves, Perai Bulk Cargo Terminal and Perai Wharf to handle these cargos which amounted to 30 million tonnes in 2013.
Break-bulk

In 2013, Penang Port handled nearly 1.26 million tonnes of break-bulk cargo mainly at Butterworth Wharves where there are 6 berths with a total length of 1 km dedicated to this type of cargo. Vessels of up to 40 000 dwt can be accommodated. Commodities in 2013 comprised mostly of iron and steel, machinery, asbestos, wood and rice.

Butterworth Wharves have over 60 hectares that house transit and storage warehouses as well as open spaces. The combined warehouse space is 38 000 m² which is capable of holding up to 50 000 m² of cargo at any one time. The wharves are well equipped with handling equipment such as forklifts, prime movers and trailers and there is good connectivity to the national highways and national rail network.

Dry-bulk

Much of the dry-bulk cargo (67%) is handled at the Perai Bulk Cargo Terminal (PBCT) which has 5 berths with alongside depths of about 11 m. The quay is 632 m long and is capable of handling 3.9 million tonnes of dry-bulk per annum. Part of the berth space is used for handling dangerous liquid or gaseous goods. Dry-bulk is also handled by other terminals such as Butterworth Wharves and Perai Wharf which made up about 33% of this cargo e.g. 1.8 million tonnes in 2013.

Vessels with a maximum of between 25 000 and 50 000 dwt can be accommodated at the berths. The maximum arrival displacement weight tonnage of vessels is between 33 000 and 66 000 tonnes.

The biggest contributors to the dry-bulk volume are coal, steel, scrap metal and fertilisers.

PBCT is about 34 hectares in size and offers nearly 111 000 m² of covered warehouse space and about 4.6 hectares of open stockpile area. It is equipped with 1 Gantry and 2 Mobile cranes at the wharf side for discharging and loading of cargo.

Liquid bulk

Penang Port has dedicated terminals to handle liquid bulk which comprise mostly of vegetable oil, petro-chemicals, fuels and gaseous compounds. All liquid cargo are discharged by pipes and manifold arms and are directly piped to nearby storage facilities most of which are privately owned.

Nearly 5 million tonnes of liquid bulk were handled at Penang Port in 2013 of which 44% were handled by Penang Port, much of which was edible oils including crude and refined palm oil. The remainder (about 2.7 million tonnes) were handled by private operators such as Chevron, Esso and Shell.

Passenger cruise liner terminal

Passenger and tourist traffic is handled at the Swettenham Pier Cruise Terminal on the island of Penang. Its main berth is 400 m long and has a water depth of 12 m capable of handling the largest cruise vessels in the world.

It has two smaller cruise liner berths (North and South inner berths) which have quay lengths of between 219 and 248 m with waters depths of 5.5-6.5 m.

The Swettenham Cruise Terminal has handled over 1.3 million passengers in 2013.

Penang port service

The Port of Penang operates a fleet of four ferries which transport passengers between the port and Georgetown and Butterworth on the mainland.

Penang Port provides 24-hour surveillance at all entry and exit points of the various port facilities. This includes waterborne police, restricted and controlled access to the terminals and an emergency response team. The port is ISPS code compliant with both national and international legislation.
The port provides a specialised department of fire and rescue which is responsible for providing firefighting services, structural and ship fire response, emergency medical and hazardous materials response as well as fire prevention programmes and courses.

The Port of Penang offers a range of other services including pilotage, towage and ferry repairs. It operates a fleet of four tug vessels with bollard pull capacities ranging from 20 to 40 tonnes.

4.7.2. **Port of Lumut**

Lumut Port is located on the West coast of the Malaysian Peninsula in the State of Perak directly off the Straits of Malacca. It is strategically located for transhipment of liquid bulk and dry bulk cargoes to serve international trade within Southeast Asia and between the Indian Subcontinent, the Middle East, Atlantic Basin, China and the Australia-Pacific regions. Lumut Port has two terminals, the Lumut Maritime Terminal and the Lekir Bulk Terminal.

- **Lumut Maritime Terminal**

  The Lumut Maritime Terminal is located along the banks of the Dindings River. It is a commonly used port facility encompassing 33 hectares of land area with extensive covered and open storage facilities. It has 480 m of multipurpose berths, 10 m depth alongside and can accommodate vessels of up to 35,000 dwt. It can also handle two 7,000 dwt barges end to end along a 54 m berth. The terminal provides an integrated port service and facilities covering marine, stevedoring, cargo handling and warehousing. It can cater for all requirements including break-bulk, project cargo, dry-bulk, liquid bulk and containerised cargo. Equipment includes conveyors, crane grabs and hoppers cargo facilities. It has also pipeline gantries available to export and import various liquid bulk cargoes.

  The terminal is operated on a 24 hours day with a year round service and is International Ship and Port Security code compliant.

- **Lekir Bulk Terminal**

  The Lekir Bulk Terminal is located about 78 km further South and is designed to handle ships of Capmax size in excess of 180,000 dwt. It has natural deep water with depths of up to 20 m alongside. It is currently Southeast Asia’s largest dry-bulk unloading facility.

  The terminal is designed to handle dry-bulk cargoes which include large volumes of coal for local power stations. It is equipped with 2 units of grab ship un-loaders and has transfer stations for onward movement of cargoes from jetty to storage areas. The Lekir Bulk Terminal has a storage area with a capacity for up to 2 million tonnes of cargo. Quay cranes are designed to do ship to ship transhipment of cargoes and there is mechanised bulk unloading capacity with a rate of 45 tonnes per day depending on the type of cargo. There is open storage for bulk cargo of over 25 hectares.

  The Lekir Bulk Terminal also operates 24 hour a day throughout the year and is International Ship and Port Security code compliant.
Lumut Port Industrial Park

The Lumut Port Industrial Park is located close to the Port Maritime Terminal and has an area of 1000 acres of which 885 acres is suitable for various industrial projects. The business park has a range of activities including mineral processing, chemicals, metal work and fabrication, import and re-export of grain, vegetable oil processing, ship building and biodiesel.

4.8. Thailand

Thailand has a long history of international trade with the export market playing an important part in economic growth, with commodities such as rice, sugar and rubber being exported across the whole South and Southeast Asia region. More recently, Thailand has emerged as one of the leading international exporters of automobiles and automotive parts.

Maritime transportation has always played a leading role in the Thai economy. This has resulted in the considerable growth and development of Thailand’s ports and transport infrastructure, particularly over the last decade. The government has also been actively promoting the Thai merchant fleet through the establishment of the office of the Mercantile Marine Promotion Commission (MMPC).

In 2011, Thailand’s merchant fleet comprised of 363 vessels which were made up of the following ship types: Bulk carriers (31), Cargo (99), Chemical tankers (28), Container vessels (18), Liquid gas (36), Passenger (1), Passenger/cargo (10), Petroleum tankers (114), Refrigerated cargo (24), Roll-on/roll-off (1) and Vehicle carrier (1). Of these, 13 vessels were foreign owned (UK, Singapore, Malaysia, Hong Kong and China) with 46 vessels registered in other countries mainly Singapore. The Thai merchant fleet totals about 1 700 000 GRT, much of which is involved in international trade. A smaller proportion of the fleet transports cargoes between local and neighbouring ports. Information on the average age of the merchant fleet could not be obtained from web searches carried out during this survey. However, it is assumed that most of the vessels comprising the international component of the fleet are between 10 and 20 years old.

Thailand’s largest ports are Bangkok and Laem Chabang located in the Gulf of Thailand. There are also other ports which play a key role in the economy of the North on the Mekong River such as
Chieng Saen and Chiang Kong. The Thai ports of Phuket and Ranong located along the Eastern part of the Bay of Bengal are the most important in that area.

The Port Authority of Thailand (PAT) is responsible for the development of ports and infrastructure and encourages private operators to build terminals that will further increase the port’s size and capacity. Significant expansion of ports across the country is also driven by the emergence of Myanmar as a growing trade partner and the increasing role of China in regional infrastructure development and investments.

4.8.1. Port of Ranong
Ranong Port is a relatively small facility situated on the Eastern bank of the Kraburi River in the Muang District, Ranong Province. It is operated by the Port Authority of Thailand and is the main port for marine cargo transport in the Andaman coast, linking trade routes with countries in South Asia, the Middle East, Europe and Africa.

Ranong is one end of the Land Bridge connecting the Andaman Sea with the Gulf of Thailand. The Land Bridge gives importers and exporters a cheaper alternative by by-passing Singapore and the piracy of the Malacca Straits.

The port provides a full range of cargo services including discharging, loading, transferring, storage and delivery. The Port Authority operates a computerised container data centre, import/export cargo lists, and provides bunker, energy and communication services.

![Figure 14. Offshore supply and survey vessels docked at Port of Ranong, Thailand](image)

**Berths**

The port has a 30 x 150 m pier capable of handling vessels of up to 12 000 dwt including small container vessels. Ranong Port is frequently used as a base for offshore supply vessels servicing the oil industry in the waters off Myanmar in the Andaman Sea.

**Equipment and facilities**

The Port of Ranong has adequate facilities and equipment to service vessels including a mobile crane (50 tonne capacity), three forklift trucks (2.5-10.0 tonnes) and six trucks and trailers.
The port has a warehouse of 1,500 m\(^2\) in area, a 7,200 m\(^2\) general cargo yard and an 8,000 m\(^2\) empty container yard. It also has an 11,125 m\(^2\) yard for the storage of up to 405 TEUs containers (outbound) and 285 TEUs (inbound) and 590 TEUs empty containers.

**Port cargo volumes**

During the period 2005 to 2009, the port had an average of 15-20 vessels calling per month with the busiest period being over December to April during the Northeast monsoon season when up to 40 vessels docked at the port each month. The monthly cargo throughput ranges from 1,500 to 3,500 tonnes per month.

Information for the period 2005 to 2009 (Table 8) showed a steady increase in exports and imports of cargo through the Port of Ranong. There is little recent data on container volumes. However, in the past these values ranged from 30 TEUs in 2005 to 664 TEUs in 2009.

<table>
<thead>
<tr>
<th>Year</th>
<th>Nos. of vessels</th>
<th>Import cargo (tonnes)</th>
<th>Export cargo (tonnes)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>287</td>
<td>1,885</td>
<td>2,372</td>
<td>4,257</td>
</tr>
<tr>
<td>2006</td>
<td>180</td>
<td>1,766</td>
<td>7,224</td>
<td>8,990</td>
</tr>
<tr>
<td>2007</td>
<td>234</td>
<td>3,271</td>
<td>21,994</td>
<td>25,265</td>
</tr>
<tr>
<td>2008</td>
<td>385</td>
<td>12,183</td>
<td>15,803</td>
<td>27,986</td>
</tr>
<tr>
<td>2009</td>
<td>321</td>
<td>9,970</td>
<td>17,420</td>
<td>27,390</td>
</tr>
</tbody>
</table>

**New port development plans**

Recent meetings have been held between delegations from the Port of Ranong and Chittagong Port officials to strengthen ties and launch a direct shipping service between the ports of the two countries. After dredging in 2013, Ranong Port can now facilitate shipping to other BIMSTEC countries without having to pass through the Malay Peninsula. BIMSTEC or the “Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation” comprises seven member countries which also include Bangladesh, India, Myanmar, Sri Lanka, Nepal and Bhutan.

The on-going development of Ranong Port has now opened up a gateway for shipping more Thai products to foreign countries. Further developments are in the pipeline involving improved logistics and infrastructure and the establishment of a special economic zone and a border market and duty-free shops.

**4.8.2. Port of Phuket**

The Port of Phuket is a relatively small port located on the Western seaboard of Thailand on the Andaman Sea. It is situated at Makham Bay on the Eastern coast of Phuket Island.

Access for vessels entering and leaving the port is via a 1.5 km long and 120 m wide channel which is dredged to a depth of 9 m. There is a 360 m turning point to the North of the quay. The port is designed to service both cargo vessels and cruise liners.
Figure 15. Cruise liner docked at quay, Port of Phuket, Thailand

**Berths and storage**

The Port of Phuket has two berths with a total length of 360 m, a 30 m wide apron and an alongside depth of 10 m. It also has four barge berths. The quays can accommodate vessels with a maximum of 180 m total length and a draft of up to 9.4 m.

The Port has a total area of about 26 hectares, a transit shed of 3,600 m² and an open lay down yard of 15,700 m² for break-bulk cargo and containers.

**Equipment**

Port equipment comprises of eight forklifts (3-3.5 tonnes), seven tow tractors (5-40 tonnes) and thirteen drawbar trailers (5-40 tonnes). There is a harbour tug, pilot boat and various launches to service vessels.

**Port cargo volume**

The most recent data on annual cargo throughput is 32,000 TEUs of container volume per year and 420,000 tonnes of conventional cargo.

**Cruise liners**

The Port is a popular stop for cruise liners with many tourists and passengers disembarking to visit the Island of Phuket and for short holidays and day-trips. Up to 15 cruise liners were scheduled to dock at Phuket Port during the main holiday season in 2014.
5. Shipping and the marine environment

Some of the busiest sea lanes in the world pass through the Bay of Bengal Large Marine Ecosystem maritime area and the transport of goods and passengers is a constantly growing activity. Although a comparatively environmentally friendly means of transport, shipping does have a clear impact on the marine environment. These can be of a wide range such as noise, oil pollution, atmospheric emissions, marine litter or impacts of shipping related activities such as dredging of navigational channels, dumping of dredged materials and the development of ports and harbour facilities.

As part of an ecosystem approach to ocean governance, the impacts of shipping on marine ecosystems as part of environmental assessment processes have been receiving more attention in recent years by the International Maritime Organisation (IMO) and the European Community through work by the European Monitoring and Evaluation Programme (EMEP) and the International Council for the Exploration of the Sea (ICES). In Northeast Atlantic waters, the issues have been clearly spelt out in OSPAR quality status reports which address the environmental concerns from shipping as well as the relevant international regulatory frameworks and their effectiveness.

Although oil pollution from ships has been identified as a possible threat to the BOBLME in its Transboundary Diagnostic Analysis (TDA), the environmental impacts of shipping have not been assessed in terms of risk to the ecosystem as a whole. Although the current signatory status to international IMO regulations and conventions by BOBLME member states can easily be assessed, the degree of compliance in terms of enforcement and the mitigation actions is not clear.

This section of the report highlights some of the pressures that can arise from the shipping industry on the marine environment, what can be done to reduce such impacts and how this can be applied by BOBLME countries.

5.1. Impacts on marine ecosystems

Some of the main impacts of shipping on the marine environment are likely to be as a result of the following:

- Pollution by oil and hazardous or toxic substances from incidental, operational and illegal discharges
- Air pollution through emissions and particulate matter from engine exhaust gases and cargo tanks which may be carried over long distances
- Discharge of operational waste from ships, including discharge of raw sewage and garbage (litter)
- Release of toxic chemicals used in anti-fouling paints and leaching of heavy metals from anodes
- Introduction of non-indigenous organisms through ship ballast water and associated sediments and fouling of ships’ hulls
- Pollution and physical impact through loss of ships and cargo
- Physical and other impacts including noise and collision with marine mammals or damage to coral reef habitats

These pressures will not be evenly distributed throughout the Bay of Bengal but are likely to be concentrated in busy shipping lanes and around ports and harbours. Coastal shipping traffic could also directly impact ecologically sensitive areas in inshore waters with resulting damage to biodiversity, mariculture and coastal tourism and leisure activities.

Maritime transport is a growing sector worldwide and is increasing as a result of market developments, global trade and policies to take more transport goods off the roads. The sizes of vessels have also been growing with larger tankers and container ships being built to cater for
greater volumes of oil and cargoes. In tonnage terms, the amount of oil being transported by sea worldwide has increased from 1.600 million tonnes in 1992 to over 2.400 tonnes in 2008. Container vessels have also dramatically increased in size with some ships able to handle up to 20,000 TEUs in unit volumes.

5.2. Protecting the marine environment

The International Maritime Organisation (IMO) is the competent international body for the regulation of international shipping. Through international agreements and conventions, it implements various regulations and measures to protect the marine environment from shipping at a global level. For example, contracting parties have committed themselves to phase out the use of organotin compounds in antifouling systems on ships in a concerted effort to combat pollution of the marine environment especially with Tributyltin (TBT). The IMO has also brought into force the Ballast Water Management Convention for the shipping industry to reduce risks associated with exchange of ballast water and the introduction of alien invasive species. IMO guidelines and protocols also include actions directed at shipping safety, waste reception facilities in ports and harbours and fuel quality.

A number of other priorities have also been addressed through the development of legislation at an international level with the IMO. This is in addition to the recent convention on ballast water management and the ban on the use of TBT based paints on ships hulls. One of the key regulatory frameworks for preventing pollution from shipping is the MARPOL Convention (Appendix II) on oil, noxious liquid substances, packaged dangerous goods, sewage, garbage and air pollution.

In addition, the International Maritime Organisation, through the SOLAS Convention on the Safety of Life at Sea, helps reduce the risk of ship accidents and associated oil pollution incidences through setting technical minimum standards.

The IMO has also recognised the important contributions by European countries to protect sensitive ecosystems of the Northeast Atlantic which now require stricter pollution regulations in relation to shipping and the management of shipping routes. This includes designation of special areas under MARPOL and the designation of Particularly Sensitive Sea Areas (PSSAs).

World shipping is responsible for about 3% of all global Carbon dioxide (CO$_2$) emissions through the discharging of ozone-depleting gases (e.g. from incinerators and cooling installations) and greenhouse gases from engine exhausts. The IMO estimated that shipping emitted over 1.046 million tonnes of CO$_2$ worldwide in 2007. In recent years, the IMO has been working towards measures to reduce greenhouse gas emissions from shipping and encouraging ship owners to replace old inefficient installations and equipment with clean green technology that will meet new emission standards.

Reducing air pollution from ships is now seen as a priority by IMO which recommends ratification, implementation and enforcement of existing instruments and international conventions in order to apply the “Clean ship approach”. In 2006, a Ministerial meeting on the environmental impacts of shipping and fisheries adopted the Gothenburg Declaration which committed European maritime nations to adopt a “Clean ship approach” whereby future vessels are designed, constructed and operated in a way that eliminates harmful discharges and emissions during their working life. Many of the leading international shipping companies are now adopting this approach and building new fuel efficient ships with clean green technology.

Approximately 90% of all commercial ships use bunker fuel for their engines. This is a cheap crude oil distillate that is notorious for its high 3.5% Sulphur dioxide (SO$_2$) content and dangerous vapours. The IMO has issued stringent regulations to stem SO$_2$ emissions from bunker fuel consumption with the latest cap due to be implemented in January 2015 (see MARPOL, Annex IV). It ultimately aims to cut SO$_2$ emissions from ships from 4.6% today to 0.5% by 2020. Environmental solutions include
“Scrubbers” which are air pollution reduction systems retrofitted onto ships’ engines to stem $SO_x$ emissions.

MARPOL Annex VI, first adopted in 1997, limits the main air pollutants contained in ships exhaust gas, including $SO_x$ and nitrous oxides ($NO_x$) and prohibits deliberate emissions of ozone depleting substances. It also regulates shipboard incineration and the emissions of volatile organic compounds from tankers. The MARPOL Annex IV was amended in 2005 with the aim of significantly strengthening the emission limits in the light of technological improvements and implementation experience.

### 5.3. International measures and priorities for action

Significant progress has been made in the international and regional arena over the last decade to reduce the impacts of shipping on the marine environment through improved regulations, more effective monitoring and the application of better practices within the industry. A detailed assessment of the impacts of shipping on the marine environment made by OSPAR in 2000 identified the issues and the measures being applied to reduce the risk of accidental spills and to ensure that ships are operated to the highest standards.

The assessment addressed impacts such as oil pollution and noxious substances, loss of ships and cargoes, litter, air pollution, non-indigenous species and Tributyltin. The measures taken to address these issues, including priorities for action, are summarised in Appendix III and can also be applied in relation to the Bay of Bengal Large Marine Ecosystem.

Besides the chemical, pollution and cargo loss issues, other physical impacts by shipping on the marine environment were also identified that required attention. These included the effect of low frequency noise (from ship’s propeller cavitation) on marine mammals in busy shipping lanes. Concerns about the risk of ship strikes with cetaceans have also been raised at international fora as collision with ships are known to kill whales especially those ones that inhabit or migrate through waters with high levels of ship traffic. Indeed, recent studies on cetaceans near shipping routes in Sri Lanka have confirmed several deaths of blue and pigmy whales as a result of direct ship strikes. More data needs to be collected on such incidence and further research needs to be expanded with long term monitoring.

In order to address these concerns, the IMO Marine Environmental Protection Committee recently agreed to produce guidance documents to minimise the introduction of noise from commercial shipping operations into the marine environment and the risk of ship strikes on cetaceans.

Although much progress has been made by the IMO to develop measures to tackle the various threats from shipping to the marine environment, many of the measures have been introduced only recently and there is at present limited information available on the effectiveness of enforcement and compliance in terms of implementing regulations.

### 5.4. Pollution and the marine environment in the BOBLME

Protection of the marine environment, estuaries and ports from the threats posed by shipping such as oil spills, alien invasive species from ballast water, sewage and garbage disposal has been identified as a source of concern by BOBLME countries during the preparation of the Transboundary Diagnostic Analysis (TDA) and national study reports. Some of these issues have also been outlined in FAO’s (BOBP) published “Manual on the Prevention of Pollution” in the BOBLME region. This provides useful information on the international conventions in place to mitigate marine pollution including a list of acts and decrees of relevance in the case of each country and an overview of the duties and responsibilities of harbour management in relation to pollution incidences.

The following summarises some of the main national environmental legislation governing pollution of the marine environment in BOBLME member states and also lists some key IMO International Conventions that address pollution of the marine environment in relation to shipping.
Maldives

A report on coastal pollution and water quality criteria in the Maldives published in 2010 identified oil pollution and ballast water as the most important marine-based sources of pollution. Although oil pollution is not the most significant threat, it still poses risks to coastal waters because of its close proximity to the major tanker route between the Maldives and Sri Lanka where over 80% of oil from the Middle East is transported to East Asia.

In terms of the maritime transport industry, the main concerns to the Maldives are from the dumping of bilge oil and the disposal of oily waste water, sewage and garbage. Studies have shown that with regard to shipping, there have been no cases of oil spills in the last fifteen years. However, significant threats have been identified from the dumping of waste oil and oily water by local boats and vessels that operate in Maldives waters.

The Coast Guard has the mandate for oil pollution response and oil spill contingency planning. However, at present there is no national plan in place or equipment in place that could be effectively put into operation in the event of a major oil spill.

The Maldives Port Authority provides an efficient port service to facilitate trade and commerce much of which depends on maritime transport. It works closely with the Coast Guard in relation to oil spill response and pollution monitoring and implements an effective service of ship solid waste collection.

The Transport Authority under the Ministry of Transport and Communication has a designated marine sector which has responsibility for shipping and maritime safety. Although there are limited regulations in place to address pollution of the marine environment from shipping, the government has enacted some laws that regulate marine pollution and has become a party to and ratified several international conventions to promote and enhance maritime safety and protect the environment.

The Environment Protection and Preservation Act (Law No.4/93) provides the legal basis for environmental protection and conservation in the Maldives. This is supported by the Environmental Impact Assessment Regulations (2007); the Draft Regulations on Environmental Liabilities (2010) and the National Waste Water Quality Guidelines (2007).

Among the international conventions signed up to are MARPOL 1973/78 (which include 3 of the 6 Annexes); The London Convention (1972 and 1996 Protocol); the Basel Convention on the Control and Transboundary Movement of Hazardous Waste (1989) and the International Convention for the Control and Management of Ship’s Ballast Water (2004). In general, the application of IMO International Conventions is difficult to put into practice and enforce at local level because of a lack of clarity and understanding of legal issues as well as uncoordinated national policy.

Sri Lanka

The Government of Sri Lanka regards protection of their marine and coastal environment from pollution as a high priority. Its Marine Environment Protection Authority (MEPA) was established under the Marine Pollution Act (2008) with the sole responsibility to prevent, control and manage pollution of Sri Lanka’s marine environment. Through the work of the MEPA and other national bodies, Sri Lanka is meeting its obligations as a party to various IMO International Conventions, the most important in relation to marine pollution being:

- International Convention for the Prevention of Pollution from Ships (MARPOL Annex I-VI)
- International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC), 1990
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001
- International Convention for the Control of Harmful Anti-Fouling Systems on Ships
The Authority also provides a list of registered service providers for the removal of ship generated waste and issues bunkering permits which allow bunkering operations to be undertaken safely and without spills or leakage. Other important functions of the MEPA include the formulation and implementation of the National Oil Spill Contingency Plan and the coordination of ballast water issues in relation to vessels and ports.

The Sri Lanka Ports Authority (SLPA) has also responsibility for pollution prevention particularly in regulating pollution prevention activities within commercial ports and harbours.

India

Indian coastal waters are located at a vulnerable position to oil pollution, since 45% of the world’s oil transport originates from Middle East countries and passes through India’s Exclusive Economic Zone (EEZ). On average, 40 super tankers pass through Indian coastal waters daily. In addition, Indian ports and harbours handle about 3,810 tankers carrying about 84 million tonnes of oil, petroleum and lubricants every year.

India has regulatory agencies such as the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCB) which address pollution of the marine environment including oil and hazardous chemical spills. These regulations are constituted under the Water (Prevention and Control of Pollution) Act, 1974 and regular surveys in respect of oil pollution and the marine environment are carried out by various agencies coordinated by the CPCB.

India has a large number of laws in relation to coastal and marine environmental protection as well as agreements in place with a number of foreign countries. The country is also a signatory to a number of UN International Conventions. A list of some of the most important regulations in relation to the marine environment and pollution from ships and offshore platforms includes:

- Coastal Regulation Zone Notification, 1991;
- Water (Prevention and Control of Pollution) Act, 1974;
- Hazardous Waste Management Act, 1998;
- Environmental Impact Assessment Notification, 1994;
- Environmental Protection Act, 1986;
- Indian Wildlife (Protection) Act, 1972;
- Indian Fisheries Act, 1987;
- Indian Ports Act, 1908;
- Major Ports Trust Act, 1963;
- Coast Guard Act, 1978; and

These regulations relating to the marine environment fall under the responsibilities of the Ministry of Shipping, the Ministry of Defense and the Ministry of Environment and Forest.

The standards for various discharging effluents are listed in the Environmental Protection Act, 1986. This regulation serves as an umbrella act providing for the protection and improvement of the environment including coastal and marine areas.

The Coast Guard Act, 1978 provides for the levying of heavy penalties for the pollution of port waters. A National Contingency Plan was formulated in 1996 to combat oil spills in the EEZ of India with the Coast Guard (under the Ministry of Defense) acting as the central agency responsible for formulation and implementation.
India is a signatory to the UN Law of the Sea Convention (UNCLOS), MARPOL 73/78 and the Basel Convention, 1992. It also has other guidelines and enacted notifications for shipbreaking such as:

- GMB Regulation, 2000 (Prevention of fire and accidents for the safety of workers and protection of the environment during shipbreaking)
- Guidelines for Shipbreaking Activities (CPCB) to minimise pollution impact of shipbreaking activities.

**Bangladesh**

In Bangladesh, pollution discharges from the ship breaking industry and their impacts as well as oil pollution from coastal shipping in and around ports such as Chittagong and Mongla can pose serious threats to the marine environment. Many areas in the coastal zone of Bangladesh are protected such as the Sundarbans (Ramsar and World Heritage Sites), are rich in biodiversity and form important nursery grounds for fish.

Bangladesh has promulgated a number of regulations to address various aspects of pollution in relation to the marine environment. These include the Marine Fisheries Ordinance (1983); the Environment Conservation Act (1999); The Bangladesh Merchant Shipping Ordinance (1983); the Bangladesh Coastal Policy (2005) and the Territorial Waters and Maritime Zone Act (1974). To combat marine pollution, the country has also ratified the International Convention on Oil Pollution Preparedness, Response and Cooperation (London, 1990); the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal (Basel, 1989); the United Nations Law of the Sea (1982); the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Brussels, 1969) and the International Convention for the Prevention of Pollution of the Sea by Oil, (MARPOL, 1973) as modified by protocol of 1978. The six annexes of MARPOL have been in force in Bangladesh from 2002 covering pollution by oil, chemicals, harmful substances, sewage and garbage in relation to shipping and ports.

The Environmental Conservation Act (ECA, 1995) is the umbrella legislation that provides for overall environmental conservation in Bangladesh. However, older legislation such as the Port Act, was enacted in 1908, to protect the water of port areas from pollution caused by chronic spillage of oil, dumping of ballast and rubbish from ships and discharges of bunker water containing oil from vessels. Laws concerning marine pollution in Bangladesh in some cases are difficult to apply especially in relation to implementing international conventions that have been ratified.

In relation to shipbreaking, the country is a signatory to the Basel Convention, but this does not establish a regulatory system for ship recycling which is dealt with under the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (2009). Although Bangladesh is the 3rd largest ship breaking and recycling country in the world, it has still not ratified the Hong Kong Convention.

A recent study on maritime environmental law in relation to combating marine pollution in Bangladesh concluded that existing legislation hindered the success in preventing and controlling marine pollution and that legal reform was needed to make the International Conventions more effective. There was also little capacity to enforce legislation and better links and communication between maritime and port administrations was required. It recommended further capacity be built in this area and that there should be more coordination between the agencies including the Coast Guard. Further ratification of relevant IMO International Conventions was suggested as well as better compliance, enforcement and dispute resolution.

**Myanmar**

A comprehensive national report on pollution in Myanmar has been produced as an output of the BOBLME Project. It deals mainly with land-based sources such as agrichemicals, phosphates, pesticides, industrial pollution, heavy metals, sewage and waste discharges and their impact on the freshwater and marine environment. There are up to 30 offshore gas platforms operating off the
coast but there are no oil refineries or offshore oil production. No significant oil spills were reported in the marine environment either from coastal shipping or from operations in any of Myanmar’s ports.

Myanmar has many sectoral laws relating to the protection and conservation of its natural resources and the control of pollution both on land and from incidences at sea. Some of the key legislative regulations are as follows: The Factory Act (1951); The Forest Law (1992); The Myanmar Marine Law (1994), The Myanmar Pearl Law (1993); The Water Power Act (1927), The Territorial Sea and Maritime Zone Law (1977); The Law Relating to Aquaculture (1989); The Law Relating to the Fishing Rights of Foreign Fishing Vessels (1989); The Myanmar Marine Fisheries Law (1990) and the Freshwater Law (1991). Many of these regulations are provided for the development, protection and management of fisheries and prohibit fishing without a licence, causing water pollution and the use of destructive fishing practices.

Myanmar has become a party to a number of International Conventions which relate to pollution and the marine environment. These include MARPOL 73/78, the International Convention for Prevention of Pollution from Ships, London (1973) and the Stockholm Convention on Persistent Organic Pollutants (2001). However, Myanmar has not signed up to other International Conventions relevant to shipping such as the ships’ ballast water and anti-fouling paints programmes.

A National Environment Policy was adopted by Myanmar in 1994 with the aim to establish sound environmental policies in the utilisation of water, land, forestry, minerals and marine and natural resources in order to conserve the environment and prevent its degradation. The National Commission for Environmental Affairs (NCEA) serves as a coordinating agency, collaborating closely with government departments in matters relating to the environment including marine pollution. It has four specialised committees which deal with conservation of natural resources, control of pollution, research, education and information and international cooperation. One of its main mandates is to provide guidance and advice to regulatory agencies on such matters as legislation, regulations and environmental standards.

Indonesia

Indonesia is a maritime nation with thousands of islands which derives over 25% of its gross national product from utilisation of its coastal and marine resources. Its fisheries, coastal habitats and coral reefs are very vulnerable and need to be protected, conserved and managed in a sustainable manner. Marine environmental pollution including oil spills from ships remains a serious threat to living marine resources in coastal waters.

Maritime legislation in Indonesia evolved from the old maritime regulations of the earlier Dutch colonial government. These have been replaced over time by new laws to meet changing requirements. To date, Indonesia has several national laws that relate to the management of marine and coastal activities. Those which apply to marine pollution include:

Ocean Jurisdiction Claims - Act No.6 6/1966 concerning Indonesian Waters; Act No.5/1983 concerning Indonesian Exclusive Economic Zone; Act No. 1/1973 concerning Indonesian Continental Shelf; Ocean Activities and Pollution Prevention – Act No. 21/1992 concerning shipping; Act No. 22 of 2011 concerning Oil and Natural Gas; Act No. 5/1990 concerning Conservation of Biological Resources and their Ecosystems and Act No. 23/1997 concerning Environmental Management.

Enforcement of Indonesia’s coastal and marine resources laws and regulations is the joint responsibility of several national government institutions. Two major departments deal primarily with environmental issues e.g. the Ministry of Marine Affairs and Fisheries (MMAF) and the Ministry of Environment and Forestry (MOEF). The Directorate General for the Control of Marine Resources and Fisheries (DGCMRF) of MMAF has the functions of monitoring as well as enforcing the coastal resource management regulations. The Directorate for the Control of Marine Ecosystems together with the Navy and Marine Police conduct monitoring, control and surveillance and enforcement within Indonesia’s territorial seas and offshore waters.

Maritime laws enforcement including protection of the marine environment against marine pollution in Indonesia is confronted by several challenges including the sheer size of its marine territories, the lack of funding, insufficient facilities and trained personnel. There is also a need for increased interagency coordination and greater community involvement in marine environmental monitoring and pollution control.

**Malaysia**

Early environmental laws in Malaysia were established in colonial times to protect forest areas and establish wildlife reserves. Since then, environmental legislation has adapted to changing conditions with far reaching and for the most part effective legislation in place to deal with marine pollution.

The most comprehensive legislation introduced to deal with environmental protection and pollution control including marine pollution has been the Environment Quality Act (1974). There are also a number of other supportive regulations that protect marine ecosystems and vulnerable species. These include Marine Parks (1994), various Fisheries Protected Areas and “No take” zones and the Amendment to the Fisheries Act (1997) which specifically protects dugongs, whale sharks, dolphins and giant clams.

Vessel pollution laws have been in force since the promulgation of the Environmental Quality Act (1974) and the Exclusive Economic Zone Act (1984). There has been more effective enforcement in recent years of environmental laws especially after a spate of pollution incidences in the 1990’s which resulted in heavy fines, imprisonment and temporary detention of vessels. The Merchant Shipping Ordinance (1952) saw a new section inserted in 1991 on “Pollution from ships” to make the legislation more effective and was further amended in 2011 to allow for enforcement beyond Malaysia’s 12 nautical mile territorial seas and out to the 200 nautical mile EEZ limit.

Malaysia has ratified nine International Conventions relating to the environment and has successfully incorporated most into national laws and programmes. Those dealing with pollution of the marine environment include MARPOL (1973 and 1978 modified protocol); UNCLOS (1996) with the enabling legislation including the Exclusive Economic Zone Act (1984) and the Fisheries Act (1985) and the Basel Convention (1993) which is supported by the enabling legislation, the Environment Quality Act (1974, as amended).

Overall, marine environmental laws in Malaysia are comprehensive and effective although enforcement and compliance can be complex and involve many factors. However, for the most part they work well with heavy fines and detention of vessels serving as deterrents in the case of marine pollution from ships.

**Thailand**

The primary framework for environmental law in Thailand is the “Enhancement and Conservation of National Environmental Quality Act” (NEQA) which was enacted in 1975. A National Environmental Board (NEB) for environmental administration was then formed which in 1979 became an agency under the Ministry of Science, Technology and Energy (MOSTE). Further changes in environmental legislation occurred in 1992 when the Act was revised and the NEB was restructured to have a significant role in the formulation of national environmental policy and plans.
NEQA (1992) regulates and calls for the creation of Provincial Environmental Management Plans (PEMP), Environmental Impact Assessments (EIA), Environmental Protected Areas (EPAs) and Pollution Control Zones (PCZs) as well as standard setting and monitoring. Other national legislation which protects and monitors the environment and natural resources are the National Park Act (1961), the Wildlife Conservation and Protection Act (1992) and the Fishery Act, (1957, 1994).

There is no legislation specifically or directly regulating marine pollution in relation to shipping although some laws are obliquely relevant to marine pollution e.g. the Fishery Act, 1957, the Mineral Act, 1967 and the Petroleum Act, 1971.

The Fishery Act it provides that “No one shall release, discharge or dump specified hazardous substances into fishable water or shall do anything harmful to marine animals or shall pollute the water”. The Mineral Act covers both onshore and offshore mining activities but it is quite vague, requiring miners to take environmental impacts into account. It broadly authorises the local authority to temporarily or permanently forbid any mining activity that may be harmful to humans, animals, plants or property. The Petroleum Act only has two provisions relating to marine pollution. One prohibits the concessionaire from carrying out activities that may cause danger to people or property and another which requires warning signs to be put up in an oil exploration or production licence area.

Legal mechanisms in Thailand’s pollution control laws mostly relate to command and control measures which place heavy demands on manpower resources needed to monitor compliance. Although there are many laws and government agencies regulating pollution, enforcement of these laws is for the most part only superficial. In effect, the laws are not strong enough because they rely too much on the established “Control standards” and provide almost no incentive for polluters to pollute less.

With regard to marine pollution, Thailand has signed the IMO International MARPOL 73/78 Convention but has only ratified Annex 1 and II. It is not a party to some of the other international agreements that address pollution from ships such as the London Convention (1972), the Ships Ballast Water and Sediments Convention (2004) or the Anti-fouling Systems on Ships Convention (2001).

**ASEAN and marine pollution**

Oil pollution from shipping and the offshore oil and gas exploration and production sectors are of primary concern for countries of the Association of Southeast Asian Nations (ASEAN), some of which are BOBLME member states. Within the ASEAN group, transboundary impacts can have serious consequences where oil released into the marine environment in one national jurisdiction can pollute the waters of another coastal state. They have established two bodies which share and coordinate information; The ASEAN Council on Petroleum (ASCOPE) deals mainly with the environmental consequences of oil spills and the ASEAN Expert Group on Marine Pollution can provide input into the development of contingency plans for the control and mitigation of marine pollution.

There are also a number of agreements between ASEAN countries to tackle transboundary oil pollution and provide mutual assistance in combating spills. In addition to their own national plans and regulations regarding oil spills, some States have more formal arrangements in place to tackle transboundary oil pollution. For example, Indonesia, Malaysia and Singapore are signatories to a navigation safety agreement for the Straits of Malacca and the Straits of Singapore which includes addressing pollution issues.
5.5. **International conventions and marine pollution**

The IMO has produced a comprehensive body of global conventions and international agreements that govern every facet of the shipping industry. The measures are aimed primarily at preventing accidents, casualties and environmental damage from ships with conventions setting standards for ship design, construction, equipment, operation and manning. Regulatory frameworks also mitigate against accidents and their negative effects including distress, safety communication, search and rescue, oil spill response and clean-up mechanisms. Rules are also in place to address the consequences of shipping accidents which ensure that those who suffer the consequences especially in relation to pollution incidences are adequately compensated.

IMO’s conventions are regularly amended and revised while new instruments and protocols are adopted. Some of the most important ones are listed below:

- **International Convention for the Safety of Life at Sea (SOLAS) 1974 as amended**
- **International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW) as amended, including the 1995 and 2010 Manila Amendments.**

Other conventions relating to maritime safety and security of ships and ports include:

- **Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972**
- **International Convention on Load Lines (LL), 1996**
- **International Convention on Maritime Search and Rescue (SAR), 1979**

There are also a number of other important conventions that specially relate to the prevention of pollution at sea. These are:

- **International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Causalities (INTERVENTION), 1969**
- **International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), 1990**
- **International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001**
- **International Convention for the Control and Management of Ship’s Ballast Water and Sediments, 2004**
- **The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009**

5.6. **Shipping and the Bay of Bengal**

The Bay of Bengal Large Marine Ecosystem is situated in a major trade route between the Far East, South Asia and Europe. As a result, there is likely to be significant ecosystem impacts by shipping especially along the major sea lanes, coastal trading routes and in ports and harbours. Further information on potential impacts of shipping on the BOBLME needs to be gathered and assessed in order to identify threats and develop mitigation responses. Measures should also be implemented in line with IMO guidelines to reduce levels of pollution and to protect the integrity of its marine and coastal habitats and biodiversity.
One of the key objectives of the Bay of Bengal Large Marine Ecosystem Project is to protect and conserve the ecosystem and biological diversity as well as to promote the sustainable management of the region’s fisheries through adopting an Ecosystem Based approach to Management (EBM). This should include the evaluation of the impacts of shipping and an assessment of BOBLME States in terms of their commitment to and ratification of international conventions such as MARPOL to reduce pollution from ships at sea and in ports.

The Bay of Bengal LME Project, through regional fora, working groups and advisory committees, should promote actions by member countries to work more closely with the IMO to:

- Implement MARPOL Annexes I-VI
- Implement the “Clean ship” approach in maritime and environmental policy
- Develop and improve practices and innovative technologies for ships in port and at sea to reduce current and future greenhouse gas emissions
- Provide effective reception facilities for garbage and oily waste
- Implement the Convention on the Control of Harmful anti-fouling Systems on Ships and its global prohibition on the application of organotin compounds as biocides on ships hulls.

Countries should also consider the ratification of the International Ballast Water Convention and work within the forum of IMO to ensure that it is enforced. Risk assessments should also be made at key ports in the region on the introduction of invasive species so that adequate regional prevention measures can be implemented. Engagement should be made with relevant international organisations to assess the effects and impacts of ship noise and ship strikes on marine mammals and to establish plans to work with IMO in developing and implementing mitigation strategies.

Finally, the countries of the BOBLME region should consider the development of means of collecting and collating accurate and standardised data which are comparable between countries of the region so that these can be meaningfully used in a future assessment of the impacts on this Large Marine Ecosystem.

### 6. Shipping routes and land bridges

The Bay of Bengal lies on one of the main global shipping routes linking Europe, the Middle East and Asia. Much of the maritime transport traffic comprises of large oil tankers, bulk carriers and container ships. On their journey from the Suez Canal and the Red Sea to Southeast Asia and China, vessels pass to the South of the Bay of Bengal around the tip of India and Sri Lanka and onwards to the Straits of Malacca and the Singapore Straits. This is one of the world’s great maritime highways.

Vessel traffic has to pass through the narrow Straits of Malacca between Malaysia and Indonesia before sailing onwards to China and Japan. The Straits are 600 miles long and provide the main corridor between the Indian Ocean and the South China Sea in the Pacific Ocean. The waters throughout the narrows which are only a few kilometres wide in places are relatively shallow which restrict ships to about 200 000 dwt. Hundreds of ships carrying various cargoes pass through the Straits of Malacca each day including those carrying about 80% of oil from Gulf states bound for China and Japan. In terms of value, it is estimated that the annual tonnage carried through the narrows reaches over 525 million tonnes, worth about US$390 billion.
Figure 16. The world’s shipping routes: Cargo ships bigger than 10 000 GRT (2007)

There are also smaller but equally busy coastal shipping trade routes between member states of the BOBLME especially linking the ports of Colombo (Sri Lanka), Chennai and Kolkata (India) and Chittagong (Bangladesh) and Yangon (Myanmar). These large ports often serve as regional hubs for imports and exports of commodities such as coal, iron ore, oil and petroleum products, grain and bauxite as well as containerised traffic of automobiles, technological goods, equipment and electronics.

With the growth and expansion of marine trade and maritime transport traffic, there are increasing pressures to find ways to improve efficiencies, apply new technological development, shorten shipping routes and reduce transport costs. This is particularly true in the case of shortening sea routes around South and Southeast Asia where consideration is being given to artificially construct shipping canals i.e. Sethusamudram Shipping Canal Project (between India and Sri Lanka) or building West-East land bridges connecting the Bay of Bengal to the South China Sea i.e. Myanmar to Vietnam.

6.1. Sethusamudram Shipping Canal Project

The Sethusamudram Shipping Canal Project (SSCP) proposes to create a narrow shipping passage linking the East and West coast of India in the 56 km long shallow sea between Palk Bay and the Gulf of Mannar.

Sethu Samudram is the sea that separates India from Sri Lanka. It has a depth of less than 10 m across most of its extent and has not sufficient deep to allow for the movement of ships through the region. This is due to the presence of the shallow region known as Adam’s Bridge, located Southeast of Rameshwaram near Pamban that joins Sri Lanka to the continent of Asia. This prevents the presence of a continuous navigation channel connecting the East and West coasts of India and means that ships currently sailing from the West coast of India and Western countries to ports on the East coast of India and Bangladesh, have to circumnavigate around the island of Sri Lanka.

The completion of the SSCP would allow ships sailing between the West and East coast of India especially those from destinations in the Middle East, Africa and Europe to have a straight passage through India’s territorial waters. In practical terms, the advantages of the canal would be that the distance between Cape Comorin and Chennai could be reduced to 402 nautical miles compared with the existing 755 miles. Furthermore by reducing the distance between the East and the West coasts,
travelling time would be shortened by 36 hours thereby resulting in significant savings by ships in fuel costs.

The successful completion of the Sethusamudram project would give India a firm grip on one of the world's most strategic and busiest sea-lanes and as such has a very important geo-political dimension.

The project started in July 2005 when the initial dredging commenced with costs estimated at US$660 million. This was to be completed over a period of approximately 3.5 years. The Sethusamudram project required the dredging of over 82.5 million m$^3$ of sand and rocks from the sea bed.

In 2007, dredging in the Adam’s Bridge region had to be stopped following a Supreme Court order in response to petitions filed by individuals and groups opposed to it. When the work ceased, only about 33.99 million m$^3$ had been dredged. Experts now consider that this stoppage has undone much of the work already completed. A new alignment avoiding the Adam’s Bridge area is now proposed for the canal which will require further geological, wave and sedimentation studies as well as additional environmental impact assessment work. The project faces a cost escalation of up to US$740 million as a result of delays in order to complete the project.

6.1.1. Impacts on the environment

A few organizations opposed the project on religious, environmental and economical grounds. Concerns were expressed that if the canal was excavated, it would slice through the Gulf of Mannar and the Palk Bay, both of which are semi-enclosed marine ecosystems, causing irreversible damage to the rich biodiversity of marine life that occur there.

The Environmental Impact Assessment (EIA) report of the National Environmental Engineering Research Institute (NEERI) acknowledges that the Gulf of Mannar and the Palk Bay, covering 10,500 km$^2$, are rich in marine species and rated among the most highly productive seas of the world. The Gulf of Mannar has been categorised as a "Biosphere Reserve" and its 21 islands have been declared National marine parks. The region also contains significant numbers of endangered species including whales, sea turtles, dugongs and dolphins.

There is also concern that the churning of the sediment by dredgers will smother hundreds of coral reefs species and generally destroy the fragile marine ecosystem balance of the area. The coral beds, which are sensitive biological systems, contribute to an abundance of biodiversity including fisheries the Gulf of Mannar.

The region provides livelihood to the families of fishers living in 140 coastal villages in Ramanathapuram and Tuticorin districts of Tamil Nadu. Environmentalists fear that if the physical environment of coral beds is significantly disturbed, the entire marine food web could be affected.

There are also fears that threats from oil and marine pollution associated with shipping traffic will aggravate the ecological stress already being caused by the effluents released into the Gulf of Mannar by nearby Tuticorin's chemical industries and the ash of its thermal power plant.

Meteorological researchers also consider the region highly vulnerable, because of unpredictable and intense cyclones that sometimes affect the region.

In recent months, there has been a revitalised initiative by the DMK, a large political party in Tamil Nadu, to withdraw the Supreme Court Order and implement the project again. They point out the high benefits of a shorter route for maritime transport around India and the positive benefits for Tuticorin Port which could develop into a major shipping hub for the East coast of India.

Both Indian and Sri Lankan environmental groups so far have made several appeals to their respective governments and to the United Nations Environment Programme. Although Sri Lanka has an Environmental Impacts Assessment (EIA) procedure under the Coast Conservation Department, the Sethusamudram project does not come within its jurisdictions. However, Sri Lankan environmental concerns are not addressed in the Environmental Impacts Assessment process by
Indian authorities. The EIA study on the project carried out by India rarely refers to Sri Lanka, which is a main stakeholder. On a number of occasions environmental groups urged that a joint Indo-Lanka Environmental and social impacts assessment be undertaken but this was not seriously considered by the Indian authorities.

As late as 2005, the Sri Lankan government has been demanding the establishment of a standing joint mechanism for exchange of information on the project and its development. It wanted to set up a common data base on hydrodynamic modelling, environmental measures and impact on fisheries resources, fisheries dependent communities and measures to cope with navigational emergencies. The discussions, however, have not led to any significant achievement in terms of level of transparency in the implementation of the project and many of these concerns still remain unsettled. These included:

- lack of sediment dynamics studies in the area especially in Palk Bay and Palk Strait
- little information on the role of cyclones on the dispersal of dredged materials
- insufficient information on nature of seabed and safe disposal of dredged materials
- Impacts of altered bottom topography from dredging on currents and sediment transport not known

6.1.2. Geopolitical implication

Within Tamil Nadu, the political factions are divided over the project, and this is linked to whether the Tamil Nadu faction constituting the State Government is in coalition with the political party constituting the Central Government in Delhi. The project if approved for completion is expected to provide a boost to the economic and industrial development of coastal Tamil Nadu. The project will be of particular significance to Tuticorin Harbour, which has the potential to transform itself into a regional shipping hub. Development of the canal and ports are also expected to provide increased maritime security for Tamil Nadu.

The Sethusamudram project has a very important geo-political dimension. All the oil supplies to Southeast and East Asia that originate in the Middle East are shipped from ports in the Red Sea or the Persian Gulf. The sea-lanes from there converge in the Arabian Sea and then pass through the Gulf of Mannar and curve off the Western, Southern and South eastern coast of Sri Lanka. This sea-lane then turns Northeast through the Bay of Bengal towards the Malacca Strait. Eighty percent of Japan's oil supplies and sixty percent of China's oil supplies are shipped on this sea-lane. Almost half of the world's container traffic passes through the choke points of this sea-lane and its branches in the Indian Ocean. The Sethusamudram Shipping Canal Project, assuming that it could handle large vessels with deep drafts, would create an unavoidable by-pass that would inevitably divert this sea traffic through India's own maritime waters. Its strategic importance should also be understood in the light of New Delhi's ambitions for becoming the Indian Ocean's predominant naval power.

6.2. Land bridge projects

Myanmar has recently positioned itself as a land bridge between China and India in the middle of mainland Southeast Asia. Its strategic location, its natural resource wealth and its membership of ASEAN gives it advantages that few of the other neighbouring countries have. It also has strong economic ties to Thailand from whom it receives substantial investments, loans and assistance with capacity development programmes.

6.2.1. Dawei Deep Sea Port project

The Dawei Deep Sea Port project is being designed to lessen the growing problem with shipping traffic jams at the Straits of Malacca through which goods from throughout the whole Southeast Asia region are exported and imported. The Dawei project development will cover a land based area of approximately 250 km² and consists of three major components comprising a Deep Sea Port, an Industrial estate and a Cross border road, Rail and pipe link with connecting electrical transmission
lines extending to the Myanmar - Thailand border. A major concern here is the absence of a true EIA process in Myanmar and insufficient capacity to assess and monitor environmental impacts.

The development will place Dawei Port as a new commercial gateway providing an alternative sea route/land bridge to India, China and the Middle East, Europe and Africa and will lessen the dependence on the congested Straits of Malacca reducing transport time and logistic costs. For example, cargo from Thailand passing through the Straits of Malacca to India usually takes 2-3 weeks but it will be just hours from Bangkok to Dawei Sea Port and less than a week to India. Additionally, it will offer a gateway for land-locked Eastern regions to trade with the West.

6.2.2. Kyaukphyu Deep Sea Port project

Another important development is the Kyaukphyu Deepsea Port which is to link Myanmar’s Bay of Bengal coast with China through the construction of a crude oil pipeline alongside the proposed Kyaukphyu-Kunming highway. The tanker port will be able to accommodate vessels of up to 300 000 dwt and will have quays of over 480 m long. It will provide easier access to the markets of Africa, the Middle East and Europe for Chinese manufacturers through Myanmar.

6.2.3. East-West Economic Corridor (EWEC)

Other promising new transportation land bridge routes are also being explored such as the EastWest Economic Corridor – EWEC linking Myanmar, Thailand, Laos and Vietnam. This development seeks to select potential routes for exporting industrial and agri-industrial products including electronic components and rubber through this land bridge instead of using the Thai ports of Bangkok and Laem Chabang.

The EWEC is one of the top priority economic developments under the economic framework of the Greater Mekong Sub-region (GMS) countries namely Thailand, Myanmar, Laos, Cambodia, Vietnam, China-Yunnan and Guangxi. The project is supported by the Japanese Bank for International Cooperation (JICA) and the Asian Development Bank (ADB). The corridor will connect the Andaman Sea at the West end to the South China Sea at the East end. The road connecting four countries will have a total distance of 1 450 km starting from the port at Mawlamyine in Myanmar, crossing the border to the Thai provinces of Tak to Sukhothai, Phitsanulok, Phetchabun, Khon Kaen, Kalasin and Mukdahan and the Laotian provinces of Savannakhet, Vietnamese provinces of Dongha, Hue, Danang and ending at Danang deep sea port. The EWEC will be the shortest land transportation route linking the Pacific and Indian Ocean.

6.3. Piracy and international shipping

The increased shipping as a result of globalization in recent years has seen pirate attacks on large cargo vessels and tankers becoming common place. Much of the activity occurs around the Horn of Africa, off the coast of Somalia and in the Gulf of Aden through which about 16 000 ships pass each year. Piracy is also a problem in parts of the Western Indian Ocean, in the Straits of Malacca, a narrow channel between Indonesia and Malaysia and in the Guinea current region off West Africa.

Pirate activity especially off East and West Africa is nearly always linked to abject poverty and the weakness or collapse of governance structures in coastal nation states.

Although the risk of a pirate attack on ships is generally quite low, it does pose a threat to the crew of ships and their cargo. Such incidences significantly increase the cost of maritime transport in these regions. Threats of piracy can also raise insurance premiums up to ten-fold and is proving to be an obstacle to the global shipping industry because of the high cost of protection by international naval forces. The “Oceans Beyond Piracy” Report estimated the economic cost of Somali piracy at over US$7 billion in 2011. The study found that over 80% of the costs are borne by the shipping industry while the governments account for 20% of expenditures associated with countering pirate attacks.

In recent years, there has been a drop in the number of piracy incidences mainly as a result of increased patrols by naval vessels along vulnerable coastal shipping routes and greater successes in
arrest and capture of pirate vessels. According to the International Maritime Bureau, some 45 vessels were hijacked and 802 seafarers taken hostage in 2011, down from 53 ships seized and 1 181 people captured in 2010.

The worldwide threat to shipping from attacks by radical groups is also of global concern especially the need to prevent hijackers at sea from acquiring supplies of weapons and materials and also to prevent the ships being used as weapons in themselves. Security for the maritime transport industry has become a huge challenge especially in relation to the container traffic which is a highly complex system involving interactions between diverse stakeholders, industries, regulatory bodies, modes of transport and legal frameworks.

The economic consequences of a major terrorist incident i.e. explosion of a “Dirty bomb” at any of the world’s largest container ports would compromise the security of the entire global shipping logistics chain. This would result in tens of billions of US dollars in damage, and it has been estimated that it would take months to clear the resultant container congestion with disastrous results. The costs involved in providing maritime security for the shipping industry and especially putting in place sophisticated surveillance and monitoring technology at major Western ports to prevent attacks are already contributing to rising costs and lower profit margins at least in the short term.

Maritime security is an integral part of IMO’s responsibility. A comprehensive security regime for international shipping entered into force in July 2004 with further mandatory security measures adopted in December 2012 which includes a number of amendments to the 1974 Safety of Life at Sea Convention (SOLAS), the most far reaching of which enshrines the International Ship and Port facility Security (ISPS) code which contains detailed security-related responsibilities for governments, port authorities and shipping companies.

Large Marine Ecosystems where piracy is already a challenge include the Northern part of the Agulhas Somali Current Large Marine Ecosystem (ASCLME), the East part of the Bay of Bengal Large Marine Ecosystem (BOBLME) and in coastal waters of the Guinea Current Large Marine Ecosystem (GCLME) especially off Nigeria.

International legislation to combat piracy is already in place. In 1982, the United Nations Convention of the Law of the Sea (UNCLOS) provided a framework for the repression of piracy which provides that all states shall cooperate to the fullest possible extent in the elimination of piracy on the high seas or in any other place within the jurisdiction of member states. The United Nations also recognised the crucial role of international cooperation at the global, regional, sub-regional and bilateral levels in combating threats to maritime security including piracy in accordance with international law.

In 2011, the general assembly of the United Nations called upon States to take appropriate actions under their national laws to facilitate the apprehension and prosecution of those who are alleged to have committed acts of piracy. It also continues to urge all States to cooperate with the International Maritime Organisation (IMO) to actively combat piracy and armed robbery at sea by adopting relevant measures in their national legislation. Furthermore, the IMO is routinely engaged in the promotion of cooperation between member States in addressing piracy such as the “Regional Cooperative Agreement on Combating Piracy and Armed Robbery Against Ships in Asia (ReCAAP)”, the “Djibouti Code of Conduct” and the “IMO - Maritime Organisation of West and Central Africa (MOWCA) Memorandum of Understanding (MoU)”.

The IMO regularly publishes lists of incidents of piracy and armed robbery that take place on the high seas and in the coastal waters of various member states.
7. Summary and conclusions

The maritime transport industry plays a key role in the economy of the Bay of Bengal Large Marine Ecosystem which contains one of the busiest East-West sea routes and some of the largest ports in the world. In terms of value, the industry is worth hundreds of billions of US dollars and generates tens of millions of full-time and part-time jobs throughout the region.

The report briefly describes some of the ports of the region including their infrastructure, facilities, water depth and quay space as well as port management, trade, cargo volumes and future development plans. These include the ports of Male (Maldives), Colombo and Hambantota (Sri Lanka), Chennai and Kolkata (India), Chittagong and Mongla (Bangladesh), Yangon (Myanmar), Belawan and Sabang (Indonesia), Penang (Malaysia) and Phuket and Ranong (Thailand).

Some ports have become large regional shipping hubs, especially Colombo, Hambantota, Chennai, and Kolkata. Sri Lanka has emerged as a key shipping nation and has attracted significant funding especially from China to modernise its ports, develop new infrastructure and facilities and establish integrated ports with shopping malls, hotels, businesses and hubs for coastal tourism. In many cases, these new port development projects taking place around the Bay of Bengal are associated with special economic zones which encourage investment in the establishment of service centres and business clusters.

Significant developments in maritime transport infrastructure are also taking place in Myanmar where plans are underway to build new deep sea ports at Dawei and Kyaukphyu which will link the Indian Ocean directly with China via a land bridge. An East-West Economic Corridor is also being established that will connect Myanmar’s deep sea ports on the Bay of Bengal with Vietnam’s Port of Danang on the South China Sea. These projects are being carried out in cooperation with ASEAN and BIMSTEC with much of the investment funding coming from China, Japan, Thailand and the Asian Development Bank.

India is also planning a new start-up phase of its controversial project to complete the Sethusamudram shipping canal which will allow ships to pass through Palk Bay (between India and Sri Lanka), instead of sailing around the island of Sri Lanka. This would cut costs considerably for vessels sailing up the East coast of India.

Given the volume of marine traffic in the Bay of Bengal, the on-going risks from accidental oil spills, spreading of alien invasives through ballast water, pollution from marine litter and oily waste and lack of adequate waste reception facilities at ports, threats to the marine environment remain high. This is especially relevant where coastal shipping lanes pass close to sensitive marine areas and in estuaries and waterways as well as around ports and harbours. Marine mammals, especially whales, also face threats from ships’ noise and mortalities from direct striking that need to be assessed and evaluated.

In applying the ecosystem approach to ocean governance, BOBLME countries also need to have in place national oil spill contingency and emergency response plans. Comprehensive maps of marine protected areas and sensitive parts of the coastline also need to be produced so that impacts and threats from oil pollution from ships can be assessed. Such plans should also be part of ports’ and harbours’ best management practices.

Finally, more comprehensive studies of the maritime transport industry of BOBLME states need to be undertaken that will provide more up to date information on shipping including fleet data, marine environmental regulations, trade and economic development. This is essential for future strategic planning and decision making in the region’s maritime economy. Greater cross-sectoral coordination and integration of the socio-economics and governance issues in relation to shipping, fishing, coastal tourism, spatial planning and climate change within and between countries of the Bay of Bengal region needs to be promoted and developed.
It is also essential that the BOBLME Project is promoted within the broader marine community of member states and that links are developed with other government ministries with responsibilities for the marine sectors i.e. Ministry of Shipping and Ministry of Defence. New ways also need to be examined that can involve the national maritime transport sector within the current BOBLME management structure either through existing project management committee or through inter-ministerial consultative groups or mechanisms at country level. Links between the BOBLME Project and other regional structures such as ASEAN also need to be formalised and developed.

8. Information sources

- **Text**
  - Introduction
  
  http://www.boblme.org
  http://www.boblme.org/project_overview.html

- **Maldives**

  http://planning.gov.mv/YearBook2011/yearbook.html
  http://researcharchive.lincon.ac.nz/bitstream/10182/1587/3/Adam_MappISc.pdf

- **Sri Lanka**

  http://www.lmd.lk/2014/02/01/shipping-industry/
  http://www.fl.lk/2014/03/03/towards-maritime-excellence-in-sri-lanka/
  http://www.development.lk/project_detail-1a--9.html

- **India**

  http://www.chennaiport.gov.in/Abt_PortProfile.html
  http://www.en.wikipedia.org/wiki/Chennai_Port
Report on some aspects of the shipping industry in the Bay of Bengal Large Marine Ecosystem

http://www.en.wikipedia.org/wiki/Port_of_Kolkata
http://www.infdiamaritime.in/brochure2015.pdf
http://www.investingintamilnadu.com/India/Indian_Maritime_Shipping.pdf
http://www.researchandmarkets.com/reports/843007/industry_insight_marine-transport_in_india
http://www.cci.gov.in/images/media/ResearchReports/Akanshaint240611.pdf

- Bangladesh

http://www.mos.gov.bd
http://www.dos.gov.bd
http://www.marinetechbd.com/About-Industry
http://www.en.wikipedia.org/wiki/Port_of_Chittagong
http://www.seaport.homestead.com/files/chittagong.html
http://www.mpa.gov.bd/
http://www.en.wikipedia.org/wiki/Port_of_Mongla
http://www.searates.com/port/mongla_bd.htm

- Myanmar

http://www.seaport.homestead.com/files/myanmar01.pdf
http://www.blog.canpan.info/oprf/img/Myanmar.pdf
http://www.globalsecurity.org/military/world/myanmar/shipbuilding.htm

- Indonesia

http://www.academia.edu/1090625/draft_Marine_Transport_System_Framework_For_Coordinated_Indonesia
http://www.gbgindonesia.com/indonesia_s_shipping_and_shipyard_industry.php
http://www.seatrade-global.com/indonesia-shipping-industry-growth-seen-slowing.html
http://www.marketresearch.com/Indonesia-Shipping-Q2-2=8079376/
http://www.seaport.homestead.com/files/belawan.html
http://www.wikitravel.org/en/Sabang_(Indonesia)
Report on some aspects of the shipping industry in the Bay of Bengal Large Marine Ecosystem


- Malaysia

http://www.mima.gov.my/Support%20services%20_Dec7__pdf
http://www.mima.gov.my/mima/research/
http://www.penangport.com/my/
http://www.portsworld.com/ports/penangport.htm
http://www.portsworld.com/ports/lumutport.htm
http://www/lumutport.my/

- Thailand

http://www.wto.org/english/tratop_e/serv_e/w62.doc
http://www.en.wikipedia.org/wiki/Transport_in_Thailand
http://www.thailand-shipping-maritime-lawfirm.com
http://www.store.businessmonitor.com/thailand-shipping-report.html
http://www.shipping.einnews.com/country/thailand
http://www.rnp.port.co.th/eng/dataset1/data1.html
http://www.whatsinport.com/Phuket.htm

- Shipping and the marine environment

http://www.qsr2010.orpar.org
http://www.imo.org/ourwork/environment
http://www.qsr2010.ospar.org/media/assessment/p00440_Shipping_Assessment
http://www.niot.res.in/m5/mbic/me/data/me.pdf
http://www.fao.org/docrep/X5623E/x5623eOr.htm
http://www.mepa.gov.lk/web/
http://www.elaw.org/node/3478
http://www.niot.res.in/m5/mbic/me/data/me.pdf
http://www.icmam.gov/teri-wr/projects/tbtpresentations/sreviewmarine.org
http://www.shipbreakingbd/info/Environment.html
http://www.ucd.ie/dipcon/docs/theme14/theme14_21.PDF
http://www.academia.edu.pollution_in_the_marine_coastal_environment_of_the_ASEAN-countries
http://www.academia.edu/GREEN_SHIPPING_FLEET_FOR_NEW_INDONESIA

• **Shipping routes and land bridges**

  http://www.en.wikipedia.org/wiki/Sethusamudram_Shipping_Canal_Project
  http://www.indiaenvironmentportal.org.in/sethusamudram_ship_canal_project
  http://en.wikipedia.org/wiki/Kyaukpyu
  http://www.scmp.com/business/strife-hangs-over-china-billions-myanmar
  http://www.bangkokpost.com/print/350963/
## Appendix I  Key contact details for some port authorities in countries of the Bay of Bengal Large Marine Ecosystem region

<table>
<thead>
<tr>
<th>Port of Belawan</th>
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<tbody>
<tr>
<td>Port of Indonesia Corporate</td>
<td>PT (Persero) Pelabuhan Indonesia 1</td>
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<tr>
<td>Jalan Sumatera Utara 20411</td>
<td>Port of Sabang</td>
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<tr>
<td>Belawan Sumatera Utara 20411</td>
<td>Jalan Perdagangan No: 17</td>
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<tr>
<td>Indonesia</td>
<td>Sabang</td>
</tr>
<tr>
<td>Tel: 061-6941919</td>
<td>Sumatra</td>
</tr>
<tr>
<td>Fax: 061-6941300</td>
<td>Indonesia</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:belawan@inaport1.co.id">belawan@inaport1.co.id</a></td>
<td>Tel: +62-65221208</td>
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<td>Myanmar Port Authority</td>
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</tr>
<tr>
<td>10, Pansodan Street</td>
<td>444 Tarus Road</td>
</tr>
<tr>
<td>P.O. Box</td>
<td>Klongtoey</td>
</tr>
<tr>
<td>Yangon</td>
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<td>Myanmar</td>
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</tr>
<tr>
<td>Tel: +95-1-382772</td>
<td>Tel: 2269-3000</td>
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<tr>
<td>Fax: +95-1-295134</td>
<td>Fax: 2672-7156</td>
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<td>Sri Manjung</td>
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</tr>
<tr>
<td>Perak Darui Ridzuan 32040</td>
<td>Fax: 22-367248</td>
</tr>
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<td>Malaysia</td>
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<tr>
<td>Tel: 605-6889166</td>
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<tr>
<td>15, Strand Road</td>
<td>Bandar Bhatan</td>
</tr>
<tr>
<td>Kolkata 700-001</td>
<td>P.O. Box 2013</td>
</tr>
<tr>
<td>Kolkata</td>
<td>Chittagong 4100</td>
</tr>
<tr>
<td>India</td>
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<tr>
<td>Tel: 91-33-22303451</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Colombo 01, P.O. Box 595</td>
<td>Colombo 01, P.O. Box 595</td>
</tr>
<tr>
<td>Colombo</td>
<td>Colombo</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td>Tel: 94-11-2421201</td>
<td>Tel: 94-11-2421201</td>
</tr>
<tr>
<td>Fax: 94-11-2440651</td>
<td>Fax: 94-11-2440651</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:webmaster@sipa.lk">webmaster@sipa.lk</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Port of Male</th>
<th>Port of Penang</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maldives Port Authority</td>
<td>Penang Port Sdn. Bhd</td>
</tr>
<tr>
<td>Boduthakurufoaunu Magu</td>
<td>Headquarters</td>
</tr>
<tr>
<td>Maafannu</td>
<td>No: 1 Pesara King Edward</td>
</tr>
<tr>
<td>Male 20250</td>
<td>Georgetown 10300</td>
</tr>
<tr>
<td>Maldives</td>
<td>Penang</td>
</tr>
<tr>
<td>Tel: 960-229339</td>
<td>Malaysia</td>
</tr>
<tr>
<td>Fax: 960-325293</td>
<td>Tel: 04-201-2211</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:info@maldport.com.mv">info@maldport.com.mv</a></td>
<td>Fax: 04-2634792</td>
</tr>
<tr>
<td></td>
<td>E-mail: <a href="mailto:info@penangport.com.my">info@penangport.com.my</a></td>
</tr>
</tbody>
</table>
### Appendix II  
**Government ministries responsible for maritime transport in the countries of the Bay Of Bengal Large Marine Ecosystem region**

<table>
<thead>
<tr>
<th>Ministry of Transport</th>
<th>Ministry of Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Transport</td>
<td>Jl. Merdeka Barat No:8</td>
</tr>
<tr>
<td>Ministry of Transport</td>
<td>Jakarta 10110</td>
</tr>
<tr>
<td>Building No: 5</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Nay Pyi Taw</td>
<td>Tel: 021-3911308</td>
</tr>
<tr>
<td>Myanmar</td>
<td>Fax:021-3451657</td>
</tr>
<tr>
<td>Tel: +95-1-293038</td>
<td></td>
</tr>
<tr>
<td>Fax:+95-1-202837</td>
<td></td>
</tr>
<tr>
<td>E-mail: <a href="mailto:dept.transport@mptmail.net.mn">dept.transport@mptmail.net.mn</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ministry of Shipping</th>
<th>Ministry of Highways, Ports and Shipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Bhawan</td>
<td>9th Floor</td>
</tr>
<tr>
<td>Sansad Merg</td>
<td>Sethsiripaya</td>
</tr>
<tr>
<td>New Delhi 110001</td>
<td>Barraramulla</td>
</tr>
<tr>
<td>India</td>
<td>Colombo</td>
</tr>
<tr>
<td>Tel: +91-11 23714938</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td>Fax:+91-112371665</td>
<td>Tel: +94-112862739</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:secyship@nic.in">secyship@nic.in</a></td>
<td>Fax: 94-112862705</td>
</tr>
<tr>
<td></td>
<td>E-mail: <a href="mailto:sec@mohsl.gov.lk">sec@mohsl.gov.lk</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ministry of Shipping</th>
<th>Ministry of Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIWTA</td>
<td>Marine Department</td>
</tr>
<tr>
<td>Bhaban 141-143 Motijheel C/A</td>
<td>38, Radchadamnoen Knock Rd,</td>
</tr>
<tr>
<td>Dhaka 1000</td>
<td>Khet Pom Prob Sattru Pal,</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>Bangkok 10100</td>
</tr>
<tr>
<td>Tel: +880-9513305</td>
<td>Thailand</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:info@dos.gov.bd">info@dos.gov.bd</a></td>
<td>Tel: 0-2283-3000</td>
</tr>
<tr>
<td></td>
<td>Fax: 0-2281-3659</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ministry of Transport and Communication</th>
<th>Ministry of Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>11th Floor, Velaanaage Office Building</td>
<td>Marine Department</td>
</tr>
<tr>
<td>Male</td>
<td>38, Radchadamnoen Knock Rd,</td>
</tr>
<tr>
<td>Maldives</td>
<td>Khet Pom Prob Sattru Pal,</td>
</tr>
<tr>
<td>Tel: 33-05808</td>
<td>Bangkok 10100</td>
</tr>
<tr>
<td>Fax: 33-07674</td>
<td>Thailand</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:admin@mote.gov.mv">admin@mote.gov.mv</a></td>
<td>Tel: 0-2283-3000</td>
</tr>
<tr>
<td></td>
<td>Fax: 0-2281-3659</td>
</tr>
</tbody>
</table>
Appendix III  Summary of measures to address international priorities for action for shipping in relation to the marine environment (OSPAR 2010)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Issues identified</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil pollution</td>
<td>Reducing the risk of accidental spills</td>
<td>IMO revised MARPOL Annex 1 to reduce the risk of accidental oil pollution. A phasing out scheme for single hull tankers was introduced</td>
</tr>
<tr>
<td>Loss of ships and cargo</td>
<td>Improved traffic separation schemes</td>
<td>IMO SOLAS Convention Chapter V amended to allow States to establish Vessel Traffic Monitoring Systems International Conventions provide a provision for Port State Control IMO SOLAS Chapter V amended to include automatic identification of ships (AIS) for enhanced ship monitoring and Voyage Dara Recorders (VDRs) to facilitate investigations following accidents (to be implemented between 2002 and 2007)</td>
</tr>
<tr>
<td>Pollution from oil and noxious substances</td>
<td>Reduce the risk of related impact from accidental spills and loss of cargo through regional cooperation for emergency preparedness and prevention response</td>
<td>The IMO International Convention on Oil Pollution, Preparedness, Response &amp; Cooperation (OPRC Convention) entered into force in 1995. Obligations placed on State parties concerning their preparedness for and response to oil pollution incidents. It is a framework for international cooperation for combating major oil pollution incidence. Additional protocol being developed to combat hazardous substances other than oil.</td>
</tr>
<tr>
<td>Cargo loss</td>
<td>Promotion of measures to recover lost cargos by tags and transponders</td>
<td>No known developments to date</td>
</tr>
</tbody>
</table>
### Litter
- Establish reception facilities for litter or oily waste where such facilities are not available, providing incentives for the use of such facilities and improving enforcement of existing rules and regulations
- IMO MARPOL Convention regulates what waste can be discharged from ships. Annex V entered into force in 1988 and requires State parties to ensure adequate waste reception facilities in ports for ship generated waste

### Air pollution
- Improve through the appropriate IMO regulations, the fuel quality in order to prevent both the risk of engine failure and problems arising from the environmentally hazardous combustion residues of bunker oil
- IMO MARPOL Annex VI Regulations for the Prevention of Air Pollution from Ships entered into force in 2005. Annex VI has been amended to further reduce harmful emissions from ships

### Non-indigenous species
- Develop through IMO, global and regional measures for preventing the spreading of non-indigenous species via ballast water and promoting the development and inter-compared sampling techniques as well as monitoring programmes
- IMO adopted the International Convention for the Control and Management of Ship Ballast Water and Sediments. The Convention is still pending entry into force as sufficient States representing the required merchant shipping tonnage have not ratified the Convention

### Tributyltin (TBT)
- Establish within IMO the legal basis for the intended global prohibition of the application of organotin compounds which act as biocides in anti-fouling systems in ships by 1 January 2003, and the required removal of organotin compounds acting as biocides on ships by 1 January 2008
- The IMO Convention on the Control of Harmful Anti-Fouling Systems on Ships entered into force in 2009 and prohibits the use of harmful organotins in anti-fouling systems.
Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project to lay the foundations for a coordinated programme of action designed to better the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The Food and Agriculture Organization (FAO) is the implementing agency for the BOBLME Project.

The Project is funded principally by the Global Environment Facility (GEF), Norway, the Swedish International Development Cooperation Agency, the FAO, and the National Oceanic and Atmospheric Administration of the USA.

For more information, please visit www.boblme.org