tropical coasts

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The importance of the maritime sector in socioeconomic development: A Southeast Asian perspective

Measuring the marine economies of Southeast Asia in times of economic and environmental change

Contributions of the marine sector to national economies

The Marine Economy in Times of Change

East Asia's Marine Economy: Our history, our future

The Seas of East Asia are integral to the food, culture, livelihoods, leisure, and the very identity of the East Asian region. These interconnected water bodies support a rich, complex web of marine and coastal ecosystems on which millions of people in the region depend for employment, income and daily sustenance. They are also the medium for transportation and communication, facilitating trade and commerce, and economic growth. The region is strategically located within one of the world's fastest growing trade and economic territories. The Straits of Malacca is one of the world's most strategic and important shipping lanes in the world, hosting half of the oil supply and a third of world trade. Twelve of the world's top 20 container ports, by throughput, are located in the region (Khalid, et al). Three countries in the region, China, Japan and RO Korea, are highly competitive in the world ship building market, with China overtaking Japan in the number one spot in contract orders for bulk cargo ships in 2007, and running second to RO Korea in terms of contracts for tankers and container ships (Liu).

The traditional industrial sectors normally associated with the marine economy, such as shipping, fishing, aquaculture and oil and gas, have been joined by emerging sectors including marine chemistry, biomedicine, ocean power, sea water use, ocean engineering and construction, and marine tourism. Marine-based activities are creating jobs and wealth through the people and businesses directly involved in these activities. They also give rise to substantial economic spin-offs as goods and services are purchased from other sectors and wages are re-spent. [In China alone, about 10.75 million people (2007) are employed in 12 main marine industries.] These "multiplier" ripples (indirect and induced effects) mean that the ocean sector, as a whole, makes a significant contribution to total economic measures, which may be far greater than its direct impacts alone (Shin and Yoo).

But while the ocean environment offers tremendous economic opportunities, it also faces considerable challenges from over-exploitation of natural resources, pollution, climate change, and the resulting threats to marine and coastal species. All countries of the region have a vital stake in ensuring that the use of these ocean resources is conducted in a way that protects valuable ecosystems and the services they provide for present and future generations (Jarayabhand, et al; Tuan and Duc). The economic value of goods and services provided by coastal and marine living and non-living resources, such as mangroves, coral reefs, sea grass, mudflats, estuaries, and sandy beaches and so on, are particularly relevant given their contribution to food security, poverty alleviation and socioeconomic development, and the potential loss due to inappropriate policy and mismanagement.

This issue of *Tropical Coasts* presents the initial results of the economic contribution of the ocean to the countries of the region. Why is this important? As explained by McIlgorm, by identifying the economic contribution of the ocean sector, policymakers can be more aware of how external events, such as climate change, sea level rise, degradation and destruction of natural resources and pollution impact on economic growth and prosperity. For example, inundation of coastal areas by seawater may have a high economic impact, well beyond the value of the land that is lost. Some coastal areas can be surrendered at low cost, while others will have major infrastructures and facilities that are vital to local, regional and national economies, and must be defended.

The initial results of the marine economy studies are quite promising. Preliminary information indicates that the marine economy contribution to the national GDP of countries in this region may be greater than in OECD countries. But, there are some constraints in assessing the contribution of the marine sector. Commonalities and differences of definitions of the marine sector, and procedures for collating and analyzing statistics exist among and between the various economies of the region (Virola, et al). Future research is required to address these constraints.

However, what is evident across the countries is that the ocean sector is being recognized as an engine for growth. Governments are putting in place policies and programmes to strengthen ocean governance. Companies and universities are developing world-class expertise in marine research, technology, and services, and are forging partnerships with governments, corporations, universities and investors to accelerate the learning and development process. But just as we need to know more about the vast resources of the Seas of East Asia, so too must our understanding of their economic role and potential be improved, including the potential impact of existing and emerging threats to their sustainability. There is an urgent need to better understand these issues and their interlinkages. The forthcoming EAS Congress 2009, 23 to 27 November, in Manila, will provide an opportunity for experts and researchers from the concerned countries, and from countries outside of the region, to explore the way forward.

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The Importance of the Maritime Sector in Socioeconomic Development: A Southeast Asian Perspective

Introduction

The seas play an important pivotal role in shaping the history and charting the destiny of countries and the people in Southeast Asia (SEA), one of the world's most populous and economically vibrant subregions. Then and now, the significance of the seas to the development of societies and economies in the region is immense. Barring Lao People's Democratic Republic, which is land-locked, other countries in the region are coastal states bordering bodies of water, whether seas, straits or gulfs. Nations in the region depend greatly on the seas to facilitate their trade and economic development, and the lives of many people are strongly influenced by the seas.

Figure 1. Map of Southeast Asia.

The SEA region **(Figure 1)** can essentially be divided into a landmass and a maritime area. Its mainland hosts Myanmar, Thailand, Cambodia, Vietnam, Lao PDR and Peninsular Malaysia; and its archipelagoes and islands make up parts of Malaysia, Singapore, Indonesia, Brunei Darussalam, Philippines, and Timor-Leste. An estimated 80 percent of the region's area is covered by sea. Though now straddling across a huge expanse of water, the SEA region used to be part of a giant landmass before the rising of the sea levels eons ago. The regional seas include the Andaman Sea and the South China Sea, one of the world's largest seas after the five oceans, which serves as a passageway to Asia and is rich with fisheries, minerals, and oil and gas resources. South of the island of Java in Indonesia is the mighty Indian Ocean, the world's fifth largest ocean. The Strait of Malacca, one of the busiest and most strategic sealanes in the world, snakes through the region between the west coast of Peninsular Malaysia and the eastern part of the Indonesian island of Sumatra. Since time immemorial, this waterway has provided the theater for socioeconomic and geopolitical developments, trade, and the conquest of nations by powerful armadas.

The socioeconomic importance of the maritime sector to SEA must be seen in the context of the region's long, complex history and checkered maritime tradition. Records provide evidence of the existence of a regional maritime trading network as far back as 500 BC that stretched between modern-day Vietnam and the Malay archipelagoes known as *Nusantara* (Solheim, 2000). In the third century, Indian traders travelled across the ocean to the region and introduced Hinduism and Buddhism, followed by the arrival of Arab traders who brought Islam in the 14th century and Europeans in the 15th century who introduced Christianity. Seafarers from the region sailed as far as Madagascar, and regional kingdoms and empires thrived on the back of their maritime strengths and leveraged on the maritime features of the region to promote trade and socioeconomic exchange with the rest of the world.

The seas of the region have borne witness to the rise and fall of empires and the colonization and conquest of nations. SEA's largest and arguably most powerful empire, Majapahit, which emerged in Java late in the 12th century, prospered in part due to income derived from ships stopping by its ports along northern Java. These ports attracted traders traveling from

far and wide along the legendary Spice Route to obtain spices from the island of Maluku. Best known among the regional maritime powers is the Malacca Sultanate which grew into a significant regional power in the 15th century with the Malacca Port at its center of power. The seas, which helped the Malacca Sultanate to spread its influence through trade, also proved to be its undoing. The conquest of Malacca Port by the Portuguese armada in 1511 marked the decline of the sultanate and changed the course of history for the Malay Peninsula.

The seas also acted as a conduit for several events that dramatically altered the socioeconomic development in the region. Francis Light set up a British colony on the island of Penang in the late 17th century and leased the island for British East India Company from the Sultan of Kedah – an event that acted as a prelude to dramatic changes to the land then known as Malay Peninsula. Stamford Raffles established a trading post in Singapore in the 18th century that paved the way for the island to emerge as a major regional trading hub featuring one of the world's most prominent and important container ports.

Through the centuries, many events, some with long-lasting implications to SEA's history and societies, have unfolded in the region with its seas providing a backdrop. All these events directly or indirectly charted the course of history and civilization in SEA and have left an indelible mark in the region which can be felt until today.

The Seas and Society

The relationship between the people in the region and the seas goes way beyond recalling historical accounts. It is a multidimensional and complex relationship that extends beyond the waters as a provider of resources and a backdrop to events. The human-

Photo: Nguyen Dinh Lac

maritime bond runs deep and is closely interwoven into the social and ethnic fabric of societies and communities in the region.

So ingrained are the seas to the lives of the peoples of the region that the folklore, traditions and beliefs are greatly influenced by the maritime realm. In Malaysia, for example, the now abolished practice of *mandi safar* – which entailed bathing in the seas to ward off bad luck – used to figure prominently among the coastal community in the state of Malacca. There are various rituals associated with fishing among fisherfolks in the region, including in various coastal communities in Java which practice the ritual of *jamu laut* - Malay for "feting the sea"- which is steeped in animistic and ethno-religious beliefs to "pacify" the seas and seek protection from spirits dwelling therein. The legendary Ratu Nyai Loro Kidul, a goddess believed to dwell in the south sea of Java, is still a venerated mythical figure in Javanese folklore.

The seas played a significant part in shaping the region's societies that feature approximately 595 million people of various ethnicities and faiths. In certain communities, the seas have a significant hold on the psyche of the people. In the case of the Dayak Laut tribe in Malaysia's state of Sarawak, a group of people with a strong seafaring tradition, even the word sea – or *laut* in Malay - is used in identifying their ethnicity to underline

Photo: Edgar Castañeda

their proud maritime orientation and strong affiliation with the seas. In the Philippine archipelago, many groups of people depend on the seas for their livelihood. Some even live in dwellings built on stilts in the waters. They even trace their family trees to Malayo-Polynesian origins and have inherited the seafaring skills of their ancestors.

Now and then, the seas act as a means to promote intraregional travel, transmigration, social integration and the spread of religions among the peoples of the region. The commonalities in culture, customs, language and the influences of faraway people which are evident across the SEA region today can be attributed to the migration of peoples across the seas.

During ancient times encompassing the reign of several dynasties, traders from various parts of the world set sail to the SEA region and exerted their influences on its peoples. The Cholas, renowned seafarers from India, came to the region circa the ninth century

and repeatedly raided the state of Kedah in the Malay Peninsula and conducted sorties on the Srivijaya Empire (Kulke and Rothermund, 2000). They introduced Indian and Hindu influences to SEA and their contacts with the Chinese also exerted significant influence to the region. Chinese envoys of yore also sailed to the region to promote goodwill and trade. The most illustrious among them was Zheng He, who headed various naval expeditions during the Ming Dynasty in the 14th century. During his expeditions to the region which included stopovers in Malacca, Palembang in Sumatra, and Surabaya in Java, he brought with him Muslim Chinese who played a significant role in spreading Islam in Indonesia. In Malaysia, it was widely believed that Admiral Zheng He also brought Princess Hang Li Po to be married to Sultan Mansur Shah, one of Malacca's most well- known sultans, who ruled in the 14th century. Although uncommon then, such transboundary unions of people in ancient times made possible by long travels across challenging seas, had a huge impact in spreading the diaspora of various cultures to the SEA region.

In Malaysia, many Malays can trace their ancestry from Indonesia, mainly Sumatra and Java. Waves of travelers and traders from those islands sailed across the seas to settle in what is now Peninsula Malaysia. Arab merchants calling at Malacca Port in the 14th century spread Islam to the land, and altered the course of the nation's history.

These events charted the course of history and civilization. They underline the immense role played by the seas in defining the destiny of the SEA region and in making it into the multicultural, economically dynamic region it is today.

Maritime Economic Activities in the SEA Region

The people and nations of SEA have continued its proud history of maritime trade for their livelihood and economic expansion. Many people in the region obtain resources, earn a living off the seas and use them as a means of transport and recreation.

The development of the maritime sector and accompanying infrastructures in the region provides lots of economic opportunities to communities along the coast and has benefited hinterland development as well. Many economic activities are carried out at sea and in support of activities at sea contribute significantly to the economic development of individual nations in the region and the region as a whole.

Photo: Nguyen Dinh Lac

The major economic activities in the maritime sector carried out in the region are as follows:

Maritime trade

The SEA region is strategically located within one of the world's fastest growing trade and economic territories. The Strait of Malacca, being one of the world's most strategic and important shipping lanes in SEA, hosts half of the oil supply and a third of world trade (Khalid and Basiron, 2007). Its proximity to China and India, two of the world's most populous nations, makes it well-placed to leverage on growing trade volumes involving the two. Although resource-rich SEA nations still actively engage in the production of minerals and primary commodities, many of them have taken steps to industrialize their economies, focus on manufacturing, and adapt an export-driven approach to boost their growth. This has resulted in ever-growing trade volume not only among SEA nations but also between the region and the rest of the world.

The Association of Southeast Asian Nations (ASEAN)[1], the region's major geopolitical and economic grouping, is fully aware of the SEA region's strategic location and of the need to boost its competitiveness as an economic area to attract investments and improve the economic condition of its members. ASEAN has undertaken several initiatives to enhance economic cooperation and boost trade relations in the region.

[1] ASEAN was founded by Malaysia, Indonesia, the Philippines, Thailand, and Singapore in 1967 as a display of solidarity against the perceived threat of expansion of communism in Vietnam and insurgencies within their own borders. The main objectives of ASEAN are to accelerate economic growth, social progress, and cultural development among its members, and to promote peace in the SEA region.

Table 1. Intra-ASEAN trade (selected years) (ASEAN Secretariat, 2008).

Year	Trade value (US$ billiion)
1993	82.4
1995	123.8
1997	150.0
1999	131.5
2001	152.1
2003	159.5
2005	304.9
2006	352.8

The economic success of the region can be attributed to, inter alia, spot-on macroeconomic policies, a focus on private sector development initiatives, and growing investment and international trade linkages. Owing to the forces of globalization and liberalization, ASEAN countries have gradually opened up their economies and become more export-oriented. They are also increasingly integrating their respective economies and enhancing trade with one another. Many policies have been introduced by ASEAN towards integrating the region's economies and creating an economically unified bloc to enhance its attractiveness and competitiveness as an economic region and a destination for foreign direct investment (FDI).

At the forefront of these initiatives is the ASEAN Free Trade Area (AFTA). It has played a catalytic role in boosting regional intra-ASEAN trade and regional cooperation in the transport sector (**Table 1**). Through AFTA, the production bases of ASEAN member-nations have become larger, thanks to the larger market created and the dismantling of trade barriers (ASEAN Secretariat, 2002), along with other agreements entered into between ASEAN and its trading partners. Most of the SEA region is currently a free trade area and 96 percent of ASEAN trade involves the first six signatories of the Common Effective Preferential Tariff (CEPT) scheme (ASEAN Secretariat, 2002). The expansion of intra-ASEAN trade since the introduction of AFTA is seen in **Table 1**.

AFTA's successful implementation is highlighted by the growth of inter-regional trade in ASEAN, which represented 25 percent of the region's total trade in 2005 (ASEAN Secretariat, 2008).

The increase in intra-ASEAN trade brings the attendant rise in demand for transportation services to facilitate greater trade in the region. Initiatives to integrate transportation services and infrastructure in the SEA region are further complemented by investment liberalization measures under the ASEAN Investment Area Framework Agreement. The combination of liberalization, cooperation, and facilitation in transport and investment in the SEA region has spurred investment in the transport sector and hence boosted its growth.

At the forefront of the transport sector is maritime trade that facilitates much of intra-ASEAN trade and the region's trade with its partners. Thanks to AFTA, there has been much development of maritime infrastructures and services in the region to support greater volumes of trade among member-nations of ASEAN and between them and other nations. These include the development of new seaports, upgrading of port terminals, expansion of shipyards, modernization of shipping lines, introduction of more shipping services, increasing support services for the offshore oil and gas industry, and improvements in multimodal links and in the logistics chain.

Ports

From the days of spice and metallurgical trade centuries ago in the SEA region to today's seaborne trade facilitated by state-of-the-art ports and huge, sophisticated merchant vessels, maritime trade continues to flourish in the area. From the time Malacca Port emerged as the entrepot of its time to the present when Singapore Port consistently challenges the mantle of the world's busiest container port, the ports in SEA have always been at the forefront of its maritime development and global trade. Today, the significance of ports to the region's socioeconomic development is even more pronounced, given the dependence of regional nations on international trade and the marked shift of the balance of power in the shipping industry from the West to the East.

Ports help catalyze a country's economic growth by facilitating trade of manufactured products, raw materials, and commodities and by generating ancillary activities such as transportation, services, and construction, among others.

Table 2. Throughput of ASEAN container ports vis-a-vis the world (UNCTAD, 2007).

Year	ASEAN ports throughput (million TEUs)	World ports throughput (million TEUs)	ASEAN ports share of world ports throughput (percentage)
1975	0.404	17.410	2.3
1985	1.802	37.163	4.8
1980	3.364	55.903	6.0
1990	9.466	85.597	11.1
1995	19.965	137.239	14.4
2000	50.546	225.294	22.4

The existence of seaports helps turn undeveloped areas into trade centers and industrial zones, which create jobs and business opportunities. Facilities and infrastructures built around port areas contribute to raising the standard of living of the residents around the vicinity, eventually leading to the development of port cities and coastal communities. For example, the Malaysian cities of Klang and Butterworth are developed close to Port Klang and Penang Port, respectively. In Vietnam, Ho Chi Minh enjoys a symbiotic relationship with Saigon Port and Jakarta with Tanjung Priok Port. In the case of the city-state of Singapore, its maritime-oriented economy depends heavily on Singapore Port, without which the republic's economy would arguably be rendered crippled.

Ports in the region have registered phenomenal growth in recent decades, as underlined by their container throughput increase (**Table 2**). The growth of the region's share of container throughput vis-à-vis the total world throughput has been remarkable, marking an unmistakable shift of the world's maritime trade center of gravity from the West to the East. The spread of containerization in trade throughout the SEA region accelerated the expansion of main ports in the region in the 1980s and even benefited the smaller ports which act as feeder ports (Rimmer, 2003). Investments in ports in the region continued well into recent years, with new ports such as the Port of Tanjung Pelepas (Malaysia) and Muara (Brunei) being built and also established ones, such as Port Klang (Malaysia), Singapore, Laem Chabang (Thailand) and Tanjung Priok (Indonesia), undergoing growth expansion and capacity improvement to cater to greater trade mainly within the ASEAN region.

The presence of many main line operators in the region and the heavy volume of seaborne trade handled by its ports create many job and business opportunities to the regional communities. As a crucial facilitator of seaborne trade, the shipping sector generates plenty of ancillary services and provides impetus for the development of ports in the region. In turn, many activities such as business, manufacturing, education, services, and engineering, to name a few, are generated from the growth of the shipping sector and in maritime trade.

Thanks to the heavy shipping traffic traversing its sealanes, five SEA container ports are included among the world's top container ports by volume of cargo handled, namely, Singapore Port, Port Klang and Port of Tanjung Pelepas in Malaysia, Laem Chabang Port in Thailand, and Port of Tanjong Priok in Indonesia (**Table 3**).

The boom in port development in SEA has attracted much needed foreign direct investments (FDI) to developing countries in the region. For example, Maersk, the largest container operator in the world, is an equity partner in Port of Tanjung

Table 3. World's top container ports, by throughput (million TEUs) (UNCTAD, 2007).

2006 ranking	2007 ranking	Port	2006 throughput	2007 throughput	% change (2006-2007)
1	**1**	**Singapore**	**27.90**	**24.79**	**12.5**
2	**3**	**Shanghai**	**26.15**	**21.71**	**20.5**
3	**2**	**Hong Kong**	**23.88**	**23.54**	**1.4**
4	**4**	**Shenzen**	**21.10**	**18.47**	**14.2**
5	**5**	**Busan**	**13.27**	**12.03**	**10.3**
6	7	Rotterdam	10.79	9.65	11.8
7	8	Dubai	10.65	8.92	19.4
8	**6**	**Kaoshiung**	**10.26**	**9.77**	**5.0**
9	9	Hamburg	9.90	8.86	11.7
10	**11**	**Qingdau**	**9.46**	**7.70**	**22.9**
11	**13**	**Ningbo-Zhoushan**	**9.36**	**7.07**	**32.4**
12	**15**	**Guangzhou**	**9.20**	**6.60**	**39.4**
13	10	Los Angeles	8.36	8.47	-1.3
14	14	Antwerp	8.18	7.02	16.5
15	12	Long Beach	7.31	7.29	0.3
16	**16**	**Port Klang**	**7.12**	**6.33**	**12.5**
17	**17**	**Tianjin**	**7.10**	**5.95**	**19.3**
18	**19**	**Tanjung Pelepas**	**5.50**	**4.77**	**15.3**
19	18	New York / New Jersey	5.40	5.09	6.1
20	20	Bremerhaven	4.89	4.43	10.4
21	**21**	**Laem Chabang**	**4.65**	**4.12**	**12.9**
22	**22**	**Xiamen**	**4.63**	**4.02**	**15.2**
23	**24**	**Tanjung Priok**	**3.90**	**3.60**	**8.3**

Pelepas and Hong Kong's Hutchison Port Holdings, a leading port management company, invested in Vung Tau Port in Vietnam. Their presence as investors and strategic partners also bring much needed injection of expertise to regional port operators and help them adapt international best practices in the industry to improve their performance and boost their growth and throughput volumes.

Underlining the success of regional ports, Singapore Port has emerged as a regional container hub and consistently figures among the world's top three container ports by way of volume handled. The port handled a stunning one-fifth of the world's container transshipment throughput, while its parent company, PSA International, one of the world's top port management companies, has stakes and interest in 28 ports worldwide.

Shipping

The seas of the SEA region feature some of the world's busiest and most strategic shipping routes, serving much of the maritime trade among East Asia and South Asia, Persian Gulf, Africa, Europe, and the Americas. They also provide a crucial intra-Asian link between SEA and major Asian economies such as India, PR China, Japan, RO Korea, and Taiwan, and with crucial oil-rich Gulf region. One of the most important sealanes in SEA is the Strait of Malacca which hosts over 70,000 vessel transits annually. Vessels from the American, African and European regions travelling eastwards to South Asia would pass through the Strait which host many important seaports along its coast.

The region's islands and peninsula are wedged between the Pacific and Indian Oceans, while its north-south maritime path links Australia and New Zealand to the vibrant North East Asian economic region. Much intra-regional trade depends on the region's waterways, as does much of the trade between the region and the rest of the world.

An analysis of SEA's shipping pattern clearly reveals a key characteristic of the regional ports – they are linked together through a complex "hub and spokes" relationship in a system of mainline-feeder shipping networks connecting one major regional port to another.

The SEA figures prominently in the world maritime trade equation by way of contribution to the world's merchant fleet (**Table 4**). Many regional and international shipping companies provide a considerable number of shipping services that cater to intraregional trade. Several regional shipping lines become global players in international shipping. They include Malaysia's national carrier, Malaysia International Shipping Corporation (MISC), which is the world's largest carrier of liquefied natural gas (LNG), Singapore's Neptune Orient Lines (NOL), one of the world's top ten container operators, and Indonesia's Berlian Laju, one of the world's largest chemical fleet operators.

Table 4. Merchant fleet capacity of SEA nations (UNCTAD, 2007).

Country	Total fleet capacity ('000 DWT)	
	2006	2007
Brunei Darussalam	421	421
Cambodia	-	2,699
Indonesia	5,308	6,268
Lao PDR	-	5
Malaysia	7,755	8,571
Myanmar	645	574
Philippines	7,129	6,698
Singapore	48,562	50,981
Thailand	4,591	4,318
Vietnam	2,479	3,144
SEA Total	**76,890**	**83,769**
World Total	**959,964**	**1,042,328**

The shipping sector in SEA has undergone rapid expansion as the volumes of bilateral trade of regional countries, intraregional trade, and the region's trade with its trading partners continue to expand at an impressive rate. Several regional countries have emerged among the world's leading maritime nations, thanks to their growing merchant fleet and their increasing trade volumes with its major partners.[2] The number of ship calls in regional ports, many of which carry intra-ASEAN trade, has increased substantially over the years. Singapore Port, the world's largest transshipment hub port, boasts a

Table 5. Major offshore sites on SEA and foreign contractors involved.

Location	Foreign contractors
Gulf of Thailand	Unocal
Indonesia - Makassar Strait	ConocoPhillips, Anadarko
Malaysia - Sabah/Sarawak	Murphy Oil, Shell, Total, Technip
Myanmar - Gulf of Martaban	Daewoo, KOGAS, Total
Timor-Leste - Masela	ConocoPhillips, Shell
Offshore Vietnam	KNOC, Talisman, Halliburton

wide connection with almost 600 ports in over 120 countries, while Port Klang has connectivity with over 500 ports worldwide.

Maritime ancillary services

The maritime industry in the region has expanded beyond maritime trade to include service-based maritime ancillary services in support of the major components of maritime transport, namely, ports and shipping that are essential to the growth of trade in the region.

Maritime ancillary services, such as logistics, banking, insurance, law, ship classification, bunkering, crewing and information technology, among others, provide crucial support to the operations of ports and shipping which serve as the main pillars of maritime transportation and facilitate much of the region's trade. Without these supporting activities, the region's ports would not be able to handle increasing trade volume efficiently. Their trade and economic growth could be hampered by an inefficient trade supply chain.[3] This, in turn, could erode their competitiveness as trading nations and could dilute SEA's attractiveness as a trade area and an investment destination.

Amid increasing competition among nations to attract FDI and among ports to lure shipping lines and their cargo, countries that could not provide the spectrum of services needed to facilitate trade in a smooth and effective manner would be shunned by investors, and their ports would be bypassed by international shipping lines.

Already, the region faces stiff competition from nations such as PR China and India for FDI. Key to attracting FDI and more trade into the region is to have ports that are efficient and productive and can host increasingly bigger merchant ships and handle big volumes of trade effectively. It is essential to develop the maritime ancillary services to ensure that its maritime sector can facilitate growing trade volume and to enhance SEA's attractiveness as a trading region and investment destination.

Offshore oil and gas

The offshore oil and gas industry has emerged as an essential industry to several nations in the region. With the findings of energy deposits in the waters of SEA, especially in the deepwaters, the region has made a mark on the map of the world offshore energy sector. Malaysia, for example, which counts on crude oil and gas among its major export earners, has gained prominence in offshore oil and gas exploration and production.[4]

The oil and gas boom provides opportunities to other support service providers as well. There is huge demand for skilled human resources and equipment such as oil rigs, floating production storage offloading (FPSO) vessels, tankers, and offshore service vessels (OSV). Naturally, the demand for supporting services by oil and gas industry creates employment and

Table 6. SEA's fish landing, by country (2005-2006) (FAO, 2007).

Country	Landing (tons)	
	2005	2006
Cambodia	384,000	482,500
Indonesia	4,381,260	4,759,080
Malaysia	1,214,183	1,296,335
Myanmar	1,742,956	2,006,790
Philippines	2,246,352	2,318,984
Singapore	1,920	3,103
Thailand	2,599,387	2,776,295

[2] The United Nations Conference on Trade and Development (UNCTAD) ranked Singapore's merchant fleet 10th among the world's principal merchant fleets in a list of the 35 most important maritime countries and territories as of 1 January 2007 in terms of deadweight tonnage (DWT) of its vessels (including national and foreign flagged), with a total of 25.72 million DWT, contributing 2.63 percent to the global DWT capacity. In the same list, Indonesia and Malaysia were ranked 13th with a total of 6.68 million DWT and 14th with a total of 6.65 million DWT, respectively, contributing 0.68 percent each to the global DWT capacity.

[3] The trade supply chain is a network of organizations involved in the upstream (supplier end) and downstream (user end) linkage of trade. This link involves different processes and activities that link producers of raw materials and manufacturers of goods with the ultimate consumers who use those materials and goods. Key to this chain are ports, which act as crucial trade facilitators that enable trade to flow smoothly along the chain.

[4] In 2007, crude oil and LNG made up 39.5 percent and 30.8 percent, respectively of Malaysia's total exports for minerals. Thanks to the rising prices of oil and gas, Malaysia's total exports for minerals in 2007 grew from RM 79.3 billion in 2006 to RM 84.8 billion in 2007.

facilitates technology transfer of technical skills and knowledge in the field to regional players.

Several regional countries are located on the Sunda Shelf, known to be a site with prolific hydrocarbon deposits. Indonesia, Malaysia, Thailand, Brunei, Vietnam, Myanmar and Timor-Leste benefit from the rich energy resources available in the subsea of this massive continental shelf. Recent discoveries of potential and proven sites in the Sunda Shelf, namely, Kikeh offshore Sabah in Malaysia, mark SEA's entry into the field, triggering a wave of prospecting activities in the region.

The boom in deepwater energy activities in the region has attracted huge amounts of FDI from oil majors, such as ExxonMobil and Shell and international oil companies such as Murphy Oil, Total, Halliburton, and Technip, to name a few (**Table 5**). Their presence also augurs well with increasing the competency and experience of regional national oil companies and players in the industry in this technically challenging endeavor.

Fishery

The waters of SEA are generally warm and have the highest concentrations of biodiversity among the world's marine coral reef ecosystems. Teeming with corals, the waters in the region's seas provide a conducive breeding ground for a wide variety of food fish.

Approximately 15.6 million tons of total landings of fish were recorded in SEA in 2006, a 7.59 percent increase from 2005 (**Table 6**). The fishery industry provides more than just a source of protein for rural fishers. It has generated many resource-based maritime economic activities, such as mariculture, seafood processing, and marine biotechnology. Fishing is an important source of living for regional countries bordering the seas. In Malaysia, for example, there are about 97,947 fishers (DOF, 2006).

Table 7. Export value (US$'000) of fishery products of selected SEA nations, 2004-2006 (FAO 2007).

Ranking	Country	2004	2005	2006
3	Thailand	4,034,590	4,465,767	5,236,272
8	Vietnam	2,443,850	2,756,139	3,356,960
12	Indonesia	1,702,742	1,797,948	1,957,068
32	Malaysia	583,736	634,370	637,590
40	Philippines	413,716	352,598	389,865
43	Singapore	393,075	402,130	381,064
45	Myanmar	318,514	460,057	362,951
Top 50 SEA countries Total		9,890,223	10,869,009	12,321,770
World Total		71,637,100	78,365,822	85,890,558
SEA percentage compared to World Total		13.81%	13.87%	14.35%

Besides fishing activities, seafood processing is also a significant economic activity in countries like the Philippines, Indonesia, and Malaysia. Seafood products like salted fish, seafood crackers, and canned seafood from these countries are exported and known worldwide. The contribution of SEA countries to the world trade of fishery commodities has been increasing in value over the past few years (**Table 7**). Thailand is third among the world's main exporting countries, while Vietnam and Indonesia are among the top 20.

Ship building and repairing

The huge demand for shipping services to support growing intraregional and world trade and increasing offshore activities has been a boon to the ship building and repairing industry in the region. Many yards in the region have upgraded their capacity and expanded their business, while new ones have been built to meet the demand for merchant vessels by regional and foreign shipowners. Although not as big and technically sophisticated as yards in Japan, RO Korea and PR China, some of the top SEA yards have proven capable of building increasingly bigger vessels and undertaking technically challenging jobs such as retrofitting and conversion of ocean-going vessels. Some yards in Malaysia, for example, are known for building quality offshore support vessels (OSVs) and marine leisure crafts, which are also in demand abroad. Also, regional yards specializing in the fabrication and installation of offshore units and structures such as oil rigs, platforms, and FPSO, such as Keppel in Singapore and MMHE in Malaysia, have also benefited from the boom in the offshore oil and gas industry.

The booming industry has also attracted FDI from reputable foreign players. The Norway-based Aker, Europe's biggest yard, has investments in Malaysia and Vietnam, while Hyundai has teamed up with Vinashin to build a shipyard in Vietnam. This trend is a welcome development, which will boost the capacity and skills of regional players in the industry who will benefit from the technological

BOX 1. Major agreements relating to the establishment, implementation, and development of maritime transport initiatives in the region.

ASEAN Vision 2020

The main transport agreement in the SEA region, the ASEAN Vision 2020, lays down the roadmap that sets the goals for the region's transport development. Adopted by ASEAN leaders at the Second Informal ASEAN Summit held in Kuala Lumpur in December 1997, it envisioned the development of an integrated trans-ASEAN transportation network and multimodal transport to meet ever-increasing regional demand for improved infrastructure and communications, to promote the development of multimodal transport, and to facilitate goods in transit. Maritime transport mode figures prominently in multimodal transport, given its critical role in facilitating the proficient carriage of goods, the smooth flow of the region's production system and its extensive linkages with various transport modes and nodes.

Hanoi Plan of Action

To further the ASEAN Vision 2020, ASEAN leaders adopted the Hanoi Plan of Action (HPA) at the Sixth ASEAN Summit in Hanoi, Vietnam, in December 1998. Three agreements were signed in line with the objective of this milestone agreement in maritime transport integration in the region. They were meant to speed up the economic integration of ASEAN member-countries and to enhance and facilitate easier intra-ASEAN trade.

Central to the objective to boost trade in the region is to link ASEAN transport facilities in a network of airports, seaports, highways, and railways. To achieve this, the HPA urged the conclusion and operationalization of interstate and multimodal transport agreements. The plan also charted the course for the ambitious ASEAN Highway Network Projects and the Singapore-Kunming Rail Link.

The HPA features a set of proposals to thrust forward maritime transport cooperation in the region spelling out the following:

- Developing a maritime/shipping policy for ASEAN to facilitate, among others, transshipment of intraregional trade;
- Enhancing the competitiveness of ports;
- Achieving further liberalization of maritime transport services; and
- Integrating maritime transport in the intermodal and logistics chain.

ASEAN Transport Cooperation Framework Plan 1999-2004

The HPA was followed up with the ASEAN Transport Cooperation Framework Plan/ Successor Plan of Action 1999-2004. This plan, adopted by the Fifth ASEAN Transport Ministers Meeting in Hanoi, Vietnam, in September 1999, governs the overall transport cooperation initiatives in ASEAN. It was designed to achieve a fluid, integrated, and coordinated transport system in the region through the following broad-based strategies: (1) infrastructure development; (2) competitive transport services promotion; (3) capacity-building initiatives; (4) transport and environment safety improvement; and (5) greater private sector participation.

Subsequently, the ASEAN Transport Plan of Action 2005-2010 was agreed to in February 2004 with the objective to build, consolidate, and improve on the achievements of the previous two transport cooperation five-year plans.

A major focus of the Transport Action Agenda of the HPA and the Successor Plan of Action 1999-2004 is the development of a trans-ASEAN transportation network. This visionary project maps out the plan to build the ASEAN Highway and to designate ports and airports in member- nations as ASEAN ports and airports. It articulates the creation of a competitive policy environment for the ASEAN maritime transport sector, in which the private sector is encouraged to invest in infrastructure and in opening transport services. It envisions that in such an environment, ASEAN ports will have improved capacity, efficiency and productivity, and the region's shipping operators will operate in a more liberalized regime.

transfer of their more experienced counterparts.

Given the strong demand for merchant and supporting vessels for offshore operations, the prognosis for the ship building and repairing industry is bright. However, the specter of credit crunch emanating from the global financial crisis could well put a dent on the expansion plans of regional yards.

Marine tourism and leisure

Marine tourism is an important economic activity in the SEA region, particularly in archipelagic countries such as Indonesia and Philippines. These countries receive significant number of marine tourists keen to savor their maritime attractions such as islands, beaches, sailing and diving. For example, the islands of Bali in Indonesia, Sipadan in Malaysia, and Boracay Islands in the Philippines are world-famous resort and diving attractions. The region also plays host to many marine recreation and sporting events such as boat races and beach runs which attract participants and media coverage worldwide. Marine tourism helps boost SEA economic activities to local communities by providing jobs and spurring the development of supporting infrastructures such as hotels and resorts.

The Maritime Sector and Socioeconomic Development: A Regional Perspective

Despite being a region consisting of nations with varying degrees of development, political ideologies, and priorities, SEA has done well to project a united front in managing its maritime affairs. In this respect, ASEAN has played an enormous role in acting as a unifying force to group regional governments to work towards common causes where

Photo: Edilberto Magpayo

Photo: Jihyun Lee

Photo: Narciso Cabanilla

affairs of the seas are concerned. It is to ASEAN's credit that the regional nations, while occasionally finding themselves at loggerheads and tangled over maritime issues, have generally managed to cooperate well to leverage on the region's maritime features and benefit from its resources.

Many initiatives in areas such as maritime transport, safety, security and environmental protection have been undertaken in a spirit of amity and collaboration over the years among the regional nations. They provide solid evidence of the quality of tolerance and esprit de corps from which the people in the region are renowned.

Regional initiatives on maritime transport

As the bulk of the region is moved by maritime means, it is fitting that ASEAN pays keen attention to enhance the capacity, improve the competitiveness, and integrate the links of the maritime transport sector in the region. This is a glowing acknowledgment by the region's governments of the importance of the maritime sector in boosting the social status of their citizens and the economic development in the region.

Several major agreements relating to the establishment, implementation, and development of maritime transport initiatives in the region have been initiated to support the ideals of AFTA. They include ASEAN Vision 2020, Hanoi Plan of Action, ASEAN Transport Cooperation Framework Plan 1999-2004 (see **Box 1**).

Regional cooperation initiatives

Besides these agreements, there are also several other regional maritime transport cooperation initiatives in the SEA region. They include:

- Maritime transport sectoral negotiations between business entities;
- Priorities ASEAN-wide ports system;
- Cooperative partnerships with international maritime associations such as the Asian Port Association, Federation of ASEAN Shipowners' Associations, and Federation of ASEAN Shippers' Council;
- Port Electronic Data Interchange network;
- Simplification and harmonization of port and documentation and procedures;
- Regional cruise tourism;
- Common ASEAN near-coastal voyage;
- Information system for dangerous goods based on electronic data processing (EDP);
- Training of trainers for seafarers' academies in ASEAN member-countries; and
- Training programs at the ASEAN Inland Waterways and Ferries Training Center in Palembang, Indonesia.

In line with the HPA, ASEAN Transport Ministers reaffirmed the importance of the overall improvement of transport infrastructure linkages and of strengthening institutional arrangements for transport facilitation and logistics in the region. During the Sixth ASEAN Transport Ministers Meeting held in October 2000 in Bandar Seri Begawan, Brunei Darussalam, they concurred to formulate a framework for the development of ASEAN's maritime transport sector. This was envisioned to promote closer economic integration in ASEAN and the implementation of AFTA.

These agreements and initiatives have been enacted to facilitate trade and transport services to enable ASEAN member-countries to reap the full benefits of the implementation of AFTA and to further integrate the region's transport infrastructure and systems and its economies. Through

the promotion of such initiatives, the region has acknowledged the need to push for the liberalization of critical services, such as transportation, to keep pace with efforts to liberalize goods and investments in the region.

Maritime security initiatives

In addition to the above, there have been many efforts at the bilateral and regional levels among nations in SEA to enhance security and navigational safety in the regional seas. This is seen as crucial to provide for safe and secure seas to enable them to be used for economic activities and for people in the region to benefit from their features and resources. Among the initiatives aimed at maintaining and enhancing security and security in the waterway include:

- the formation of enforcement agencies, such as the Malaysian Maritime Enforcement Agency, which looks after the safety of vessels transiting Malaysian waters and protects its exclusive economic zone;
- the implementation of coordinated patrol scheme involving regional navies, such as MALSINDO, an initiative of Malaysia, Singapore, and Indonesia to safeguard the Strait of Malacca and to provide effective policing along the waterway;
- the implementation of the "Eyes in the Sky" initiative, a maritime-cum-air surveillance operation over the Strait of Malacca and Singapore to detect and deter acts of piracy and transnational criminal activities in the Strait;
- the introduction of Long Range Identification and Tracking (LRIT) of ships initiative by the Maritime Security Committee of the International Maritime Organization (IMO) – LRIT enables ships to identify each other's registration and type of cargo being carried, hence contributing to enhance security in the busy sealane;
- the establishment of an agreement on information exchange and communication procedures, a treaty of mutual assistance in criminal matters and a regional forum framework on measures against terrorism, counter-terrorism and transnational crime – To this end, agencies such as the South East Asian Regional Center for Counter-Terrorism and the Regional Cooperation Agreement on Combating Piracy and Armed Robbery Against Ships;
- the establishment of a cooperative mechanism among the littoral states of the Strait of Malacca to enhance safety, security, and environmental protection in the sealane; and
- the development of the Marine Electronic Highway project by the littoral states and IMO to provide a marine information system to enhance maritime services and improve navigation safety and management of coastal and marine areas in the Straits of Malacca.

These efforts underline the commitment by nations in the region to set aside national interests and at times clashing perceptions to maintain peace and order in the regional waters for the sake of socioeconomic development.

Maritime environment initiatives

Equally important is the task of protecting the seas from pollution to ensure the integrity of the marine environment and resources. Protecting the marine environment from vessel-

Photo: Jisoon Kang

Photo: Kara Santos

Photo: Edilberto Magpayo

and land-based pollution is essential to ensure that the livelihoods of people dependent upon maritime economic activities and resources from the seas are not affected. To this end, various regional initiatives have been set at the ASEAN level to prevent pollution from ships and to protect the marine environment. These are carried out through the Senior Transport Officials Meeting Working Group on Maritime Transport in activities such as:

- intensifying efforts to attain safer and environmentally sustainable shipping;
- establishing an EDP-based information system for dangerous goods;
- cooperating in transboundary oil spill prevention and preparedness; and
- intensifying cooperation in ports state control activities.

Conclusion: Our Seas, Our Destiny

The SEA region's reliance on maritime transportation has enabled international trade and socioeconomic development, and is a backbone to regional economic prosperity.

The regional nations have done remarkably well to develop their maritime sectors and to boost intra-regional maritime trade. They also face numerous challenges to further improve their maritime infrastructure capacity so as to enhance their competitiveness in maritime trade. This will also require moving up the value chain in the maritime industry to develop a broad-based, resilient and competitive sector to support growing trade volumes, lure more shipping lines to their ports and attract more investment.

While the SEA nations have spent much effort to maintain navigation safety, enhance security, and protect the marine environment in the region, they need to meet the challenge to allocate the necessary resources to maintain safe passageway for the ever-growing shipping traffic in the region. It is inevitable that the region will require assistance in cash and in kind from the international community that uses the regional waters intensively for commerce. While regional nations welcome external help to maintain busy sealanes such as the Straits of Malacca, assistance must be extended in a manner that does not compromise their national interests or sovereign rights.

It is crucial that the region's nations cooperate and collaborate to harness the riches of the regional seas and protect the seas from many threats that may undermine their integrity and security. It is imperative that the governments set aside their differences and work together to exploit, manage, and protect the seas. There has been significant progress made recently in solidifying common positions, enhancing capacity building, and cooperating in maritime economic activities among SEA nations. For example, Malaysia and Thailand havebeen engaged, for many years, to exploit the riches of a gas-rich area claimed by both countries on a Joint Development Authority platform. Several maritime territorial disputes involving regional nations have been settled amicably using arbitration and at the International Court of Justice. There has been much progress made at the multilateral level to enhance navigation safety, security, and environmental protection in the Strait of Malacca. These include the establishment of the Cooperative Mechanism, joint and coordinated naval patrol, intelligence sharing, and launching of the Marine Electronic Highway project.

These laudable developments should be looked upon as a golden opportunity to build a solid platform on which further advances can be made to foster maritime cooperation among regional nations. The people should rightly subscribe to the old saying "the land divides but the seas unite." The regional seas will continue to play a defining role in the socioeconomic development of the people of this blessed, bountiful region, as they have for millenia.

References

ASEAN Secretariat. 2008. "Total ASEAN trade." Association of Southeast Asian Nations (ASEAN) Secretariat. Accessed on 7 October 2008 from http://www.aseansec.org/Stat/Table17.pdf.

ASEAN Secretariat. 2002. Southeast Asia: a free trade area. Jakarta: ASEAN Secretariat.

ASEAN Secretariat. 2000. Joint Press Statement of the Sixth ASEAN Transport Ministers Meeting, 4-5 October 2000, Bandar Seri Begawan, Brunei Darussalam. Accessed on 13 August 2008 from www.aseansec.org.

DOF (Department of Fisheries), Malaysia. 2006. "Number of fishermen working on licensed fishing vessels by fishing gear groups and state 2006." Accessed on 22 October 2008 from http://www.dof.gov.my/v2/fperangkaan/table_nelayan_dan_vessel/jadual+nelayan.pdf.

FAO (Food and Agriculture Organization), Fisheries and Aquaculture Department. 2007. "FAO yearbook of fishery statistics summary tables. Accessed on 17 October 2008 from ftp://ftp.fao.org/fi/STAT/summary/default.htm#commodities.

Khalid, N. and Basiron, M.N. 2007. "Securing energy transportation in the Strait of Malacca," p. 513-533. In Chircop, A., Coffen-Smout, S., and McConnell, M., eds. Ocean Yearbook 22. (March 2008). Leiden/Boston: Martins Nijhoff Publishers.

Kulke, H. and Rothermund, D. 2000. A History of India. Kentucky: Routledge. 124 p.

Rimmer, P. 2003. "The spatial impact of innovations in international sea and air transport since 1960." In China, L.S., ed. South East Asia transformed: a geography of change. Singapore: ISEAS. 290 p.

Solheim, W.G. 2000. "Taiwan, Coastal South China and Northern Vietnam and the Nusantao maritime trading network." Journal of East Asian Archaeology 2(1-2): 273-284.

UNCTAD (United Nations Conference on Trade and Development). 2007. Review of maritime transport 2007. Geneva: UNCTAD.

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The Importance of the Maritime Sector in Socioeconomic Development: A Malaysian Perspective

Maritime economic activities in Malaysia

By virtue of an extended exclusive economic zone (EEZ), Malaysia's sea area is larger than its land mass. Its unique feature of being a country split apart by the sea – with a peninsula and two states on the island of Borneo – accentuates its maritime credentials. It also has a glorious maritime past, reaching its epoch as a maritime hub of prominence at the height of the Malacca Sultanate in the 15th century when the Port of Malacca emerged as the global port of its time.

Underlining Malaysia's reliance on the seas for its socioeconomic development, most of its oil and gas resources are found offshore. Malaysia is now a major center for deepwater exploration and production of hydrocarbon energy, thanks to the discovery of prolific sites offshore Sabah and Sarawak at the turn of the millennium.

The fishery industry contributed 16 percent to the nation's GDP in 2006, providing employment to around 95,000 people (Treasury Department Malaysia, 2009). Malaysia also generates substantial revenue from tourism via its island resorts and other marine features and attractions. The Straits of Malacca that snakes along the western coast of Peninsular Malaysia is one of the world's busiest and most important sea lanes, and Malaysia's major container ports are located along its shores. There are also many key installations, such as naval bases, shipyards, and power plants, along the Malaysian coast and most of its major economic areas are also located near the sea and are connected to seaports. In short, the sea provides sustenance to many Malaysians and is a key source of socioeconomic growth for the nation.

The tremendous growth of ports and shipping activities in the country over the years underlines the value of the maritime sector to its economic well-being and of the seas to the lives of its people. Ports and shipping are recognized as essential contributors in facilitating Malaysia's trade, hence, crucial to its economic prosperity. Given this, it is appropriate that Malaysia, a nation surrounded by a sea area much larger than its land mass, is acknowledged as a leading maritime nation.

In a matter of a few decades, Malaysia has successfully transformed its economy from one that was agricultural and commodities-dependent to a manufacturing and trade-based one. In 2008, the country's total trade was valued at RM 1.185 trillion, an increase of 6.8 percent from 2007. Exports rose by 9.6 percent to RM 663.51 billion, while imports increased by 3.3 percent to RM 521.5 billion, resulting in a trade surplus of RM 142.01 billion. Malaysia is now among the 20th largest trading nations in the world, with a share of approximately 1.4 percent of global trade.

Table 1: Maritime economic activities in Malaysia (APEC Categories).

Activity	Availability of economic data
Oil and gas (minerals)	Yes
Fisheries/ aquaculture (living resources)	Yes
Shipping (marine transportation / shipbuilding / ship repairing)	Yes
Defence / Government	No
Marine construction	No
Manufacturing (equipment)	Yes
Marine tourism (leisure services)	Yes
Marine services (mapping / surveying / consulting)	No
Marine research and education	No

The phenomenal growth in global trade has had a huge impact in the development of ports and shipping in Malaysia. This has spurred investment and development of various infrastructures to support the explosion in its increasing trade with the world's nations. The development of maritime infrastructure especially has benefited tremendously from this trade and investment boom. This is underlined by the estimation that 95 percent of Malaysia's international trade, the lifeblood of its economy, is being carried through the oceans via its international seaports (MASA, 2008).

Located in a vibrant economic area, Malaysia, as a founding member of the Association of Southeast Asian Nations (ASEAN), is also a member-economy of the Asia Pacific Economic Cooperation (APEC) forum. APEC provides a platform for its 21 members to facilitate economic growth, trade and investment in the region. Over the years, Malaysia has benefited from its APEC membership by having access to a bigger market and making its economy more efficient through the elimination of tariffs and other trade barriers. **Table 1** shows the economic activities in Malaysia according to an APEC summary format.

Despite the importance of the maritime sector to its economy, there is a dearth of literature on the contribution of the sector to the national socioeconomic development. There is also a lack of serious and sustained effort to measure the worth of the maritime sector. Any such effort is done piecemeal by academics and industry associations such as the Malaysian Shipowners Association, Federation of Malaysian Port Operating Companies, and Association of Marine Industries of Malaysia. There is also a chapter on Maritime Transport Sub-sector in the Third Industrial Master Plan 2006-2020, the third edition of a blueprint that lays the foundation for industrial development in Malaysia. As such, it is not possible to delve into the national accounts to measure data on each of the maritime economic activities listed in **Table 1**. This shortfall can be addressed by researchers in the field as the availability of economic data can be useful in developing policies to enhance the contribution of Malaysia's maritime sector to its economy.

Photo: Port of Tanjung Pelepas

The evolution of ports in Malaysia

The dramatic transformation and rapid industrialization of Malaysia's economy over the last few decades has made it into one of the world's major trading nations. Ports went through intensive growth and tremendous development during the period of rapid economic development in the country and in the Southeast Asian region in the 1980s and 1990s. This, and the well thought-out infrastructure development policies of the Government, has brought about well-developed transportation infrastructure and facilities such as highways, railways, airports, and especially ports.

In Malaysia, ports have evolved beyond places where ships load and unload cargos and passengers. The country's ports have assumed a critical role in the overall pattern of trade and transport, providing a link between the shipping service and the inland transport system. Realizing the need to meet the challenge of matching its transport sector's efficiency with its rapidly growing industrialized economy, Malaysia has put in place an infrastructure development plan focusing on interconnectivity among various transport modes. This reflects the acknowledgement of the need to come up with an integrated, comprehensive approach to address the unevenness in the development of its transport modes and to link them in an efficient, seamless multimodal interface. Malaysia's ports today, featuring world-class facilities, act as crucial points of interface with other transport modes such as road, rail, river and air. In 2008, Malaysian ports handled a total of 16.4 million TEU (twenty-foot equivalent units), and Port Klang and Port of Tanjung Pelepas emerged as the 16th and 17th largest container ports in the world respectively by way of volumes of container throughput handled.

Port operations in Malaysia, as is the case worldwide, have entered into a phase of sophisticated development with the computerization of container terminal operations. There are dynamic and revolutionary changes that are taking place in the various aspects of container sizes, ship sizes, equipment, intermodal transport, information technology, data exchange, and communication. There is keen competition among ports in the region to attract cargos and service their

users. All these exert demand on the ports to keep pace with the speed of technology advancement in operations and to provide excellent services to enhance their attractiveness and boost their competitiveness.

The country's major seaports in Penang, Port Klang and Tanjung Pelepas, located along the coast of the Straits of Malacca, feature excellent facilities and connectivity. This is not coincidental as the west coast of Peninsular Malaysia is where the majority of the population resides and most economic activities take place, hence enjoying better transportation and connections compared to other areas of the country.

Sustained high levels of economic growth have resulted in increasing complexities in the functions and operations of ports, inland transport networks linking ports, and the related institutional framework. Malaysia has taken an approach of emphasizing the expansion of capacity to provide a supply-driven environment and upgrading the equipment and facilities of its ports to ensure efficiency. In addition, niche ports have been established in the form of Port Klang as the national load center and Port of Tanjung Pelepas as the transshipment hub, which have aggressively spread their wings to enhance their global connectivity. All these bear testimony to Malaysia's tremendous rise and growing clout as a maritime nation.

Photo: Port of Tanjung Pelepas

The tremendous growth in cargo throughput in Malaysian ports and in commercial shipping activities in the country over the years can be attributed to the relentless efforts made by the Malaysian government and its agencies. All these are done without undermining the need for the nation's ports and carriers to develop competency, competitiveness, and economic efficiency. The Government spares no efforts to develop Malaysia as a maritime nation capable of enhancing shipping and ports capacity, optimizing human resource, ensuring the safety of ships and navigation, and providing efficient ancillary services. It is active in promoting local ports overseas, highlighting the facilities available, and providing capable management and high level of services.

Through the Maritime Division of the Ministry of Transport, the Government is committed to build a modern, efficient and a safe maritime sector and carry out intersectoral activities towards making Malaysia a successful maritime country. These are achieved via the fulfillment of the roles of the Maritime Division to:

- formulate policies relating to shipping and maritime safety, as well as development and operation of sea transportation, ports, and shipping;
- plan, coordinate, and monitor projects relating to ports and also projects under the Marine Department;
- study, review, and prepare new laws relating to ports and shipping, and ratify international conventions under the International Maritime Organization; and
- process domestic shipping licenses.

To achieve the objective of enhancing the competitiveness and attraction of Malaysian ports, the government has been undertaking the following:

- ensuring a supply-driven environment by providing ample capacity in ports to mitigate congestion and reduce waiting time;
- developing services such as feedering and bunkering at local ports, and other ancillary services such as banking, insurance, and legal;
- facilitating supply of adequate facilities to accommodate large vessels and increasingly larger types of ships;
- creating a commercially competitive environment to provide value-added logistics services and infrastructure to encourage transshipment traffic;
- creating a conducive environment to attract main line operators, such as offering shipping lines to buy into equity of ports;
- promoting ship financing by setting up financial institutions to assist the maritime community via competitive financing;
- designating Port Klang as the national load center in 1993 to serve as a hinterland with a large cargo base; and
- designating Port of Tanjung Pelepas as a transshipment hub port.

In addition to port development, efforts have also been undertaken to facilitate and promote trade. Free commercial zones have been created at ports to simplify documentation processing and procedures for cargo consolidation and to attract value-added services. Several ports use community-based Electronic Data Interchange (EDI) systems. A nationwide electronic trade declaration system, which allows users to link to the Custom's information system, is in place and is continuously enhanced to facilitate more efficient trade..

The development of merchant shipping in Malaysia

Shipping is the lifeline of the country's economy, playing an important role in moving exports and imports, serving a crucial link in the entire national

transport system, and providing employment to many. In its pursuit to become a global, competitive maritime nation, the rapid expansion and increasing complexity of the Malaysian maritime industry has resulted in an ever-growing demand for capital and ancillary financial products and services, such as the following:

- Ocean shipping is undertaken mainly by Malaysia International Shipping Corp. (MISC) and other local companies with international shipping services. The majority of the vessels are liquefied natural gas (LNG) carriers, bulk carriers, chemical tankers, and container ships.

- Domestic or coastal shipping falls within the jurisdiction of the Domestic Shipping Licensing Board under the Ministry of Transport, the authority responsible for issuing shipping licenses. Entry into this sector is governed by the Cabotage Policy, introduced in 1980 to restrict the transportation of cargo and passengers by sea between local ports to locally owned and registered ships only. Domestic shipping involves a large number of local operators and vessels, mostly single-vessel operators from the private sector.

Malaysia embarked on the journey towards setting up its own commercial shipping line in the late 1960s to serve its own exports and to address the problem of balance of payments as a result of the absence of a national carrier. The impetus also came from the dissatisfaction of local shippers over the rates charged by shipping conferences handling most of the Malaysian cargos. The establishment of the national carrier, MISC, in 1968 with government equity participation marked a milestone in the development of modern commercial shipping in Malaysia. Petronas purchased a 29 percent stake in MISC and took over its management in 1997, marking another momentous progress in the company's transformation into a leading liner. Its growth was further enhanced by the acquisition of Konsortium Perkapalan Bhd and PNSL Ltd in 1998. MISC's merger with Petronas Tankers Sdn Bhd in the same year boosted Petronas' stake in the company to 62 percent.

Today, MISC has grown into one of the world's largest shipping operators with over 100 vessels. MISC has a modern and well-diversified relatively young fleet of 27 LNG tankers, making it the world's single largest owner operator of LNG tankers. Besides MISC, major commercial shipping companies such as Gagasan Carriers, Global Carriers, Malaysia Bulk Carrier, and Wawasan Shipping also have modern and well-diversified fleets, plying the world's oceans carrying all types of cargos and loads. Some are listed on Bursa Malaysia and most are members of Malaysian Shipowners' Association (MASA). As of 1 January 2008, Malaysia had 392 vessels of 1,000 gross register tons (GRT) and above with a combined tonnage of 11.17 million deadweight tonnage (DWT), making it the 20th largest controlled merchant fleet in the world.

The local shipping sector has benefited from substantial rise in the country's foreign trade and rising demand for shipping services. The cargos carried by Malaysian ships consist mainly of export products, heading mainly to the country's largest trading partners which include the United States, Singapore, Japan, PR China, Taiwan, RO Korea, Germany, and United Kingdom.

Malaysia has also made great strides in ship financing to support the growth of the shipping sector. The establishment of Bank Industri in 1979 was testimony to its intent to develop the shipping sector. The bank earmarked shipping as a prime sector to benefit from its loans provided at special rates and terms. The creation of a Shipping Fund in 1992 was another show of support by the Government towards shipping. From the fund, RM 800 million was set aside for Ship Financing Facility directly managed by Bank Industri, and RM 500 million for the Shipping Venture Fund. In 1994, another RM 300 million was added to the fund aimed at financing expansion of shipyard capacity to build larger vessels. In the 2000 budget, the Government announced another RM 1 billion to replenish the fund. These funds were made available to shipping players. Further to this, a shipping venture capital company, Global Maritime Venture (GMV), was formed in 1994 to act as a catalyst to the maritime sector by forming strategic alliances with Malaysian partners involved in the maritime sector.

In addition to shipping activities, Malaysia also has several shipyards of international class, albeit limited in their building capacity. Generally, they have a maximum building capacity of around one million DWT and a majority of them is dedicated to ship repair. This inadequacy continues to force local shipping companies to purchase vessels and commission major reparation works from foreign shipyards. The biggest shipyard, Malaysian Marine and Heavy Engineering, became a subsidiary of MISC in 2004, marking a huge leap forward in taking the industry to greater heights.

Malaysia can rightfully boast of having a shipping sector that is internationally competitive and capable of leveraging on the strengths of the country in maritime transport, shipping and other supporting activities. But despite the steady growth of its national fleet and the shipping sector over the years, Malaysia still has some way to go towards achieving self-sufficiency in shipping.

The Government's commitment in promoting commercial shipping in Malaysia is underlined by the many fiscal,

financial, administrative, and legislative efforts it has taken. In promoting local commercial shipping, the Government offers attractive financial incentives to shipping players, which include:

- tax exemption on income derived from activities involving Malaysian ships, applicable only to Malaysian residents;
- tax exemption on income of any person employed on board a Malaysian ship; and
- competitive financing in the form of shipping loan and venture funds.

The Government also encourages activities in the country that provide training for maritime personnel. Departments teaching Marine Technology and Marine Science have been set up at public universities. The Government also lends its support to many local and international training programs, seminars, and conferences held in the country. It actively promotes seafaring as a profession to Malaysian youths through promotional activities, financial incentives, and institutional support to reduce dependence on foreign seafarers.

The development of maritime support services in Malaysia

The General Agreement on Trade in Services (GATS) under the aegis of the World Trade Organization (WTO) has delineated six main support services in the maritime industry. These activities, also termed as maritime ancillary services, include cargo handling, storage and warehouse, Customs clearance, container station and depot, maritime agencies, and maritime freight forwarding.

Although many local players are involved in these activities, the development of the maritime support services sector is neither backed by a coherent strategy nor by a structured, long-term development approach. This results in nonlinkage between the activities with one another and also between maritime sector and other production sectors of the economy.

There is a wide variety of maritime support services in Malaysia focusing on providing support to ports and shipping companies and facilitating maritime trade. A number of companies are involved in these activities (**Table 2**).

Malaysia's resolve to attract foreign participation is clearly evident in the maritime sector. Although the Government is committed to develop the maritime industry and encourage local participation, Malaysia very much welcomes the involvement of foreign players in the sector. Aware of the fact that the maritime sector is one of the most international of activities, the country acknowledges the need to welcome the participation of foreign companies, many of which have greater capacity, experience, skills and knowledge than local players, in the maritime sector.

Table 2. Number of local companies offering maritime support services in Malaysia (as of May 2008).

Service	No. of local companies involved
Cargo handling	165
Freight broker	13
Cargo clearance	52
Logistics management	50
Shipping agencies	733
Stevedoring contractors	24
Storage	28
Freight forwarding	1,084
Customs clearance	71
Warehouses	222

Source: www.eguideglobal.com.my

The presence of foreign companies in activities such as logistics, shipping, ship classification, and ship management underlines Malaysia's openness to foreign investment, resources, and talents to help develop its maritime industry. Malaysia's openness is also evidenced by the privatization of federal ports, and by allowing foreign companies to hold equity stake in local ports and by granting foreign shipping lines permission to provide services in the domestic shipping under certain conditions. These mark Malaysia's commitment to liberalize its economy and integrate it with the global economy in order to enlarge its share of the global trade.

Challenges for the Malaysian maritime sector

Although Malaysia can be proud of its achievements in the maritime sector thus far, it still has its work to do in order to become a true maritime nation. More needs to be done especially in the area of ports and shipping for the country to fully exploit its maritime resources, infrastructure, and expertise to enhance its socioeconomic standing. Indeed, Malaysia has several criteria to become a maritime powerhouse – glorious maritime heritage, strategic location, excellent ports, and shipping facilities – but much more can be achieved by optimizing these attributes.

For a trading nation like Malaysia whose economic prosperity depends a lot on the efficiency of its maritime industry, it is critical to adjust and respond to fast-changing market conditions. This is important in the light of increasing competition in the maritime sector, especially in ports and shipping, and the increasing demand for efficiency by the benefactors, industry players, and other stakeholders in the maritime industry. The competition for ports to attract cargo and the neverending pursuit of shipping liners for operational efficiency and economies of scale

exert tremendous pressure on maritime players to provide the best, most effective services at all times.

Malaysia's dependence on and demand for maritime transportation system will continue to grow in tandem with these developments. The maritime industry is an extremely dynamic field, and will continue to be so. This is evidenced in the growing emphasis on logistics and supply chain management that offers fresh approaches to business processes, techniques, and technology to manage the transportation sector more efficiently. With the concept of multimodalism fast becoming a reality, and with the maritime sector being at the forefront of this concept, it is paramount that port and shipping players stay abreast of its development. They must give careful thought to enhance their respective sector's efficiency and subsequently integrating it into the rest of the transport chain.

Port development will continue to be a priority as Malaysian ports prepare to increase their share of the rapidly expanding transshipment business. This is emphasized by the bullish forecast of container throughput in the country's ports, which is expected to reach 36 million TEUs by 2020. The Government has privatized several ports to enhance management and boost development of port facilities, with positive results. The investments of Maersk-Sealand in Port of Tanjung Pelepas and of Hutchinson in Westport have boosted operational efficiency, competitiveness, and cargo volumes at these ports.

Investment opportunities also exist in the free zones of several local ports, which have been developed with distripark infrastructure and facilities, and have the potential of enhancing further Malaysia's role as a regional distribution center. The onus is on ports to be able to present a strong case and a package of attractive investment opportunities and growth plans to attract private investments for their expansion plans, in the wake of declining public funds.

With regard to the commercial shipping link in the chain of maritime transportation in Malaysia, it is necessary to put in perspective the rationale for the shipping policies in place as they have certainly contributed tremendously to address the balance of payments (BOP) problem. But alas, decades after the national shipping line policy was initiated, only a small fraction of containerized goods is carried by Malaysian-flagged vessels. This is largely due to the shift in Malaysian exports from primary commodities to manufactured goods. As a consequence of the mismatch between the national fleet growth and the boom in export volume, containerized exports continue to "leak out", aggravating the BOP problem. Foreign shipping lines continue to dominate the local shipping scene, causing Malaysia to incur huge outflow of payments of freight.

Although many local shipping companies have gone on from strength to strength over the years, Malaysia's fleet expansion has not been able to meet the rapid growth and demand in the shipping services sector. The size of the Malaysian merchant fleet is still small by global standards. It is estimated that only 10 percent of the country's trade is carried by national shipping lines. In the case of certain trades like palm oil, an overwhelming majority of the cargo is carried by foreign vessels, underlining Malaysia's reliance on foreign shipping services.

As shipping, an essential segment of the maritime transport sector, continues to face intense competition from other modes of transportation, the sector must position itself to integrate seamlessly into the bigger picture of the transportation network. This should be achieved in a manner that meets the challenge of carrying and handling cargos in a speedy, efficient, and cost-competitive manner. Ports and shipping, at the forefront of the transport sector and trade facilitators, must enhance their competitiveness and efficiency to contribute to enhance Malaysia's export competitiveness in a viciously competitive global market. The two sectors need to face the challenges and realities of the environment they operate in determinedly, and overcome obstacles hindering their competitiveness decisively. It is imperative that port and shipping operators provide more efficient and cost-competitive services, leveraging on the support and incentives already extended by the Government.

Conclusion

The Malaysian Government has steadfastly affirmed its commitment to provide a conducive regulatory framework, policy direction and administrative support to ensure that Malaysian ports and shipping strategies continue to be responsive to market developments and customer needs. While the country can be rightfully proud of the performance of its ports and shipping services, the onus is on the stakeholders not to rest on their laurels. Amidst keen competition in the maritime industry and international trade, and the current global economic downturn, they must continue to improve their services and pursue greater efficiency.

References

Malaysian Shipowners' Association (MASA). 2008. Malaysia Maritime Yearbook 2007-2008. MASA, Malaysia.

Treasury Department Malaysia. 2009. Economic report 2007-2008. Accessed on 25 September 2009 from http://www.treasury.gov.my/index.php?ch=20&pg=155&ac=2048.

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Contribution of the marine sector to Thailand's national economy

Introduction

Thailand has large marine areas. The internal waters, territorial seas, contiguous zone, and economic exclusive zone, as defined by the United Nations Convention on the Law of the Sea (UNCLOS), make up about 420,000 km^2 (Gulf of Thailand, 304,000 km^2 and Andaman Sea, 116,000 km^2) (See **Figure 1**). The length of the coastline is about 2,800 km bordering the Gulf of Thailand and the Andaman Sea. There are 513 islands in the Thai seas (OMCC, 2005). For many decades, Thailand has enjoyed having rich marine natural resources to use for the well-being of the people. Coastal and marine resources are used for various kinds of development activities. Thailand also participates in fishing activities in the high seas as well as marine areas under the jurisdiction of other countries.

Potential of marine sector to country economy

Marine resources contribute greatly to the country's economy. Thailand is very successful in the development of fisheries. It has become one of the top ten producers of fisheries products since 1992. It is also among the top exporters of fisheries products. The gross domestic product (GDP) contribution from fisheries in 2006 was US$ 29,000 million or 11.9 percent of GDP from the agriculture sector or 1.27 percent of the total GDP (Jarayabhand, et al., 2008). Average annual production from marine capture fisheries was 2.6-2.8 million tons, while production from coastal aquaculture was 0.35-0.75 million tons during 1995-2006 (DOF, 2006). More than 220,000 people were employed in fisheries sector (NSO, 2000). There were about 16,000 fishing boats operated within and outside Thailand's waters. (DOF, 2006). In 2004, coastal tourism's total contribution to the economy was US$5,639.72 million (Jarayabhand, et al., 2008). This constituted about 30 percent of the national revenue from tourism which was US$19,072.48 million (NESDB, 2008). About half of the total income from tourism in 2004 was from international tourists.

In terms of maritime transport, an increase in export and import has caused an increase in shipping, port operation, and other related activities. Export from Thailand in 2008 was estimated at US$178.4 billion which ranked 26th in the world (CIA, 2008).

Traditionally, the estimation of contribution from the marine sector is based mainly on the economic benefits from direct use. The estimation of GDP has been done by the National

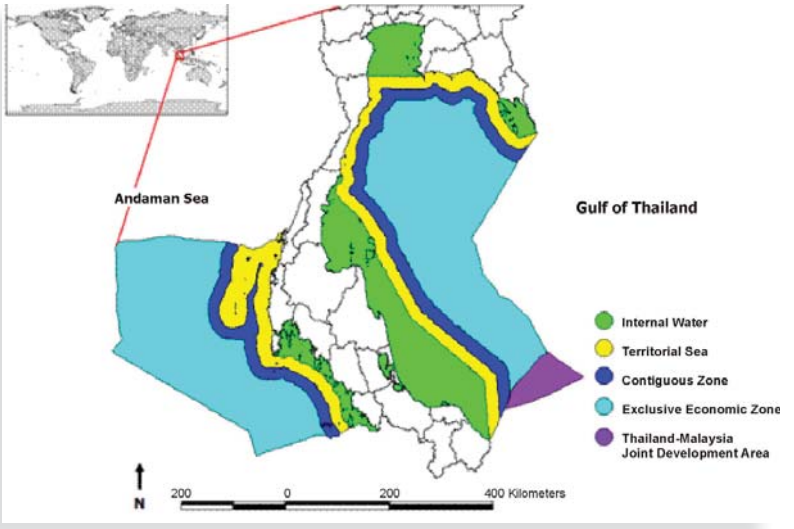

Figure 1. Maritime Zones of Thailand (Adapted from Jarayabhand, et al., 2008)

[1] 1 USD = 35 Baht (This exchange rate is used throughout the paper).

Economic and Social Development Board (NESDB), based on data provided by respective ministries. The GDP has been estimated for three main sectors, i.e., agriculture, industry, and service sectors. The contribution of GDP from marine activities has been estimated as part of these sectors but not as a separate sector. For example, the contribution from marine fisheries and aquaculture is part of the contribution from fisheries which is under the agriculture sector.

Although the Office of the National Environment Board has encouraged an inclusion of economic valuation of indirect use of marine resources in the development of the environmental impact assessment since 1977, the application of economic valuation in marine environment has been very limited (Limpasaichol, 2003). Recently, under the United Nations Environment Programme/Global Environment Facility (UNEP/GEF) Project on Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand, the economic values of mangrove, coral reefs, and seagrass were estimated. Moreover, in 2004, the UNEP/International Union for the Conservation of Nature (IUCN) conducted a project to evaluate the protective value and cost of damage to the coastal ecosystems after the India Ocean tsunami (IUCN, et al., 2005).

Table 1. Definition of economic values (Adapted from Dziegielewska, et al., 2009 and The World Bank, 2004).

Value	Description
Direct use	Direct income from goods and services
Indirect use	Special functions of ecosystems such as assimilative capacity of coastal waters, habitats and nursery grounds for marine organisms provided by coral reefs; mangrove forests' role in carbon sequestration, prevent coastal erosion and supply of nutrients and sediments.
Option value	Value of goods and services that may not be used at present
Existence value	Value people are willing to pay for the existence of species or habitats without using those resources.
Bequest value	Benefits from ensuring that certain goods will be preserved for future generations.

Table 2: Resources and activities in the marine sector of Thailand (Jarayabhand, et al., 2008).

Resources and activities	Source of data/ information	Year
1. Natural resources		
1.1. Living resources		
• Coral reef	UNEP GEF South China Sea Project	2005
• Mangrove forest	UNEP GEF South China Sea Project	2005
• Seagrass	Research	2000
• Fisheries and Aquaculture	Department of Fisheries	2004
• Rare and Endangered species	Research	2000
1.2 Nonliving		
• Oil and gas	Department of Mineral Fuels	2006
• Salt	Nongovernmental organization and research	2007
• Coastal land	Department of Land Development	2005
2. Maritime development activities		
2.1 Marine transport	Ministry of Transport	2006
2.2 Related maritime transport activities		
• Ship yards and ship repairing	Transportation Institute, Chulalongkorn University	1998
• Seafood export	Department of Fisheries	2004
• Frozen industry	Research	1998
• Processed seafood	Research	1998
• Maritime insurance	Research	1998
2.3 Tourism	Tourism Authority of Thailand (TAT)	2004
2.4 Others		
• Defense (Navy)	Budget Bureau	2006
• Archeological surveys	Research	1999
• Pharmaceutical products	Research	1999

Recent Assessment

Thailand, similar to many countries in the Southeast Asian region, has no single ministry responsible for marine affairs. The responsibilities related to the marine sector are shared by many ministries, such as the Ministry of Agriculture and Cooperatives, Ministry of Transport, Ministry of Energy, and Ministry of Natural Resources and Environment.

Due to the declaration of the marine zones into territorial seas, contiguous zone, and exclusive economic zone, and its potential for economic development, the Government has recognized the importance of the coastal and marine resources. Recently, the Thailand Research Fund has conducted a project on the Present Status and Future Trend of Thailand's Sustainable Utilization of the Sea, with the following objectives:

- to identify problems and impacts from various uses of marine resources;
- to assess opportunity and constraints for sustainable use of marine resources; and
- to develop national marine policies.

This paper highlights the results of the aforementioned project, which stressed the need for national marine policies

and a more integrated approach to the management of marine resources. The marine sector contribution has been estimated to highlight its importance to the Thailand economy. The project was the first attempt in assessing the total economic value of marine resource uses to take into account the economic value of goods and services provided by the ecosystems. This differs from an assessment of the economic contribution of the marine economy.

Methodology and results

According to Dziegielewska, et al. (2007), the total economic value is broken down into two main categories, namely, use and nonuse values. In general, use value comprises direct and indirect uses of resources, and nonuse value comprises existence and bequest values. There is a different interpretation of how option value is categorized as shown in the dotted line in **Figure 2** with the short description of each value as shown in **Table 1**.

In the process of determining the use and nonuse values, the marine sector was divided into three groups, i.e., natural resources, marine economic activities, and environmental impacts (**Table 2).**

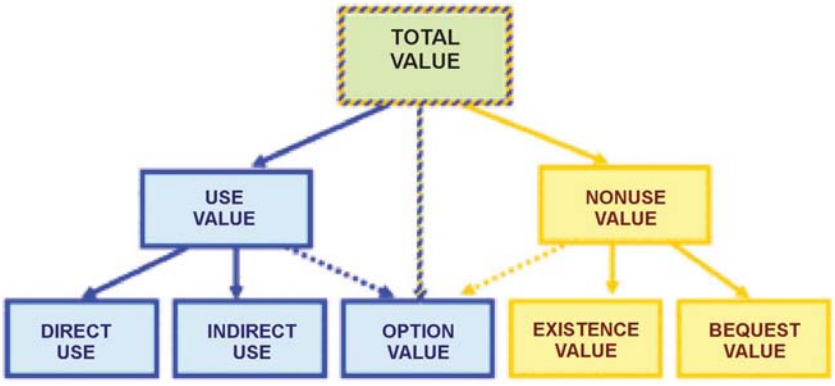

Figure 2. Component of total economic value (Dziegielewska, et al., 2009).

As shown in **Table 2**, the marine sector is under the responsibility of different government departments. These organizations are responsible for collecting information as well as formulating policies and plans related to the marine sector.

The values shown (see **Table 3)** are estimations based on secondary data from published and unpublished government reports and research studies. The economic benefits from natural resources and activities are expressed in US dollars**.** The economic values derived from the project are overestimated for some resources or activities and underestimated for others, depending on the availability of data. For example, maritime transport contribution, which is the value of export and import products, represented about 82 percent of the total contribution from the marine sector. This figure might be overestimated. However, this might be offset by the income from passenger ship and marine transport. The underestimated value was for endangered species as this value only included the sea turtle but there are other endangered species in Thailand's waters.

Table 3. Total Economic value of the Marine Sector in Thailand (Jarayabhand, et al., 2008).

	US$ Million	Percentage
1. Contribution from marine resources		
1.1 Living	6,703.11	3.15
1.2 Nonliving	14,259.12	6.71
2. Contribution from marine activities		
2.1 Maritime transport	174,882.88	82.24
2.2 Related industries	9,744.61	4.58
2.3 Tourism	5,639.72	2.65
2.4 Others	1,422.47	0.67
Total contribution	212,651.91	100
3. Economic cost of resources degradation and environmental impact of marine activities		
3.1 Coastal erosion	133.06	
3.2 Oil spill	54.83	
3.3 Tsunami	2,430.97	
Total cost	2,618.86	

Living and nonliving resources

In estimating the value of living resources, coral reefs, mangrove, seagrass, beach forest, fisheries, *dugong* (sea cow) and sea turtles were considered. However, the values for beach forest and dugong cannot be estimated due to lack of information on their economic values. Furthermore, the indirect uses of most of these resources cannot be estimated due to lack of information on ecological goods and services they provide.

The estimation of use value for mangrove forest was by far better than that of other resources because it included direct and indirect uses (**Table 4)**. Direct uses include timber and nontimber products such as food and medicine, and recreation. Indirect uses include support to coastal fisheries, coastal protection, and carbon sink and supply of nutrients.

In terms of endangered species, the existence value for sea turtle was used based on a study by Boondet (2000). The total value was US$158.62 million, which

was estimated using the contingent valuation method (CVM) to determine the cost of conservation that people are willing to pay or to accept.

In terms of nonliving resources, only the value of direct use of oil, gas and salt was estimated. These three main nonliving resources are an important contribution to Thailand's economy. Other mineral resources were not considered. For example, sand is used for construction and as raw material in making glass. Sandy beaches are also used for a recreational purpose. There are several studies on the direct value of recreation use in national parks. One such study was on Mae Ram Pung Beach on the east coast of the Gulf of Thailand. With the use of questionnaires, the economic value of the beach's recreational use was estimated at US$6.20 million per year (Wongwattananukul, 2004).

Activities

The contribution from tourism was estimated based on income from visitors to some of the major coastal resorts in 2004. The value was an average spending for accommodation, food, souvenir, entertainment, transportation, and others by both local and international tourists.

Maritime transportation was estimated from the value of imports and exports but not the contribution from within the country, due to limitation of data. Shipyards and ship repairing and maritime insurance were included. However, most of the data were mainly based on secondary sources and estimations by experts. Others included were naval activities, archeological surveys and pharmaceutical products.

Problems

The above assessment was the first attempt to assess the overall contribution from the marine sector.

Table 4: The estimation of direct and indirect uses of mangrove forest (UNEP, 2005).

Goods and Services	Description	USD per rai
Local use of mangrove	timber products, non-timber products and recreation use	48.86
Coastal fisheries	fisheries products	5.34
Coastal erosion	Cost of building protection structure by the Marine Department	355.54
Carbon sequestration	total amount of carbon per rai (one ton of C equals US$ 4.05)	9.77
Environmental goods and services	Nutrient release to the environment (US$ 22.54/rai/year)	22.80
	Total	**442.31**

Table 5. Marine Resources, direct uses and activities (Cortez, 1988).

1. Space
a. maritime transport: passenger and freight
b. marine cables and pipelines: telegraph, telephone cables; oil gas, water and bulk pipelines; sewage outfalls
c. deep water ports
d. offshore industrial complexes: floating structures, artificial islands, nuclear power plants, etc.
e. other offshore installations: lighthouses, buoys, anchorages, signalization and research
f. national defense: exercise zones, testing and firing zones, seabed installations, etc.
g. recreation and sports: beaches, bathing zones, sailing, ski rig and diving, etc.
h. waste disposal: domestic sewage disposal; industrial effluents; deposit zones of dredging materials, explosive materials, nuclear waste products, etc
2. Living Resources
a. ocean and coastal fishing industry
b. aquaculture
c. sport fishing
d. extraction of energy from marine biomass
3. Mineral Resources
a. exploitation of dissolved minerals: common salt, bromine, magnesium, potassium, etc.
b. exploration and mining of unconsolidated, heavy, rare and precious minerals
c. exploration and exploitation of consolidated and marine fuel minerals
4. Ocean Water
a. desalination plants: fresh water
b. use of salt water for cooling systems in industries
5. Physical Energy Resources
a. power plants; tides, waves, winds, currents and temperature gradients
6. Others
a. education and training
b. science and research
c. conservation and protection
d. administration, regulation and policing

This assessment needs to be improved. However, the outcomes of this effort have laid a foundation that can be used to estimate the total economic value (TEV) of the marine sector in the future. Problems related to the estimation of total contribution from marine sectors are as follows:

- lack of framework and guidelines for assessment of the marine sector;
- lack of data for direct and indirect uses;
- lack of knowledge and understanding of the indirect uses of

marine resources; and
- lack of appropriate methodology for nonuse assessment.

There is no framework or guidelines for the assessment of total economic value of the marine sector. For example, there is no identification on which resources or activities are to be included in the assessment. Under the recent assessment, the list of marine resources and activities was compiled by the researchers involved in the process (**Table 5**), mainly depending on data availability.

Conclusion and recommendations

The adoption of the UNCLOS has resulted in the declaration of marine zones by many coastal nations around the world and in the expansion of marine areas where countries have sovereign rights over resource uses. Although Thailand has an extensive marine area, the government has not given high priority to the marine sector. At present, fisheries and tourism contribute significantly to the country's economy. However, rapid and unsustainable development in these two sectors has resulted in degradation of the marine environment and natural resources and pollution of coastal areas. Also, fisheries resources have dwindled due to overfishing, pollution, and loss of ecological services provided by resources.

Thailand still has an opportunity to reverse the environmental degradation trend if the government recognizes and takes appropriate action to address these problems. Management of the marine sector needs to be improved in order to enhance its role in the economic development of the country. There is a need to develop a national marine policy as well as to incorporate it in the national economic and social development policy.

A sound policy and appropriate management approach depends much on an accurate assessment of the contribution of marine resources. Based on experiences gained from the recent assessment, it is recommended that a framework and guidelines for assessment be established. Such a framework should identify resources and activities in the marine sectors as well as those related to the use of marine resources. Data collection should be improved and updated by concerned agencies. There should be a system where data could be integrated, updated, and analyzed to provide useful inputs to the assessment.

Research should be encouraged to evaluate the non-use value of the resources. Capacity- building is also needed to increase expertise in the marine sector. Regional collaboration in the field of research and capacity-building will also be very useful in enhancing the knowledge of management and sustainable use of marine resources.

References

Boondet, I. 2000. "A valuation of sea turtles conservation in Thailand." Master's thesis, Kasetsart University. (In Thai).

CIA (Central Intelligence Agency). 2008. "World Factbook: Thailand." From https://www.cia.gov/library/publications/the-world-factbook/geos/TH.html

Cortez, A.L. 1988. "Methodological issues involved in the definition of marine sector." GeoJournal 16.3: 247-255.

DMF (Department of Mineral Fuels). 2005. Annual report 2005. From http://www.dmf.go.th/resources/annualReport/factFigure/th/Fact&Figures_2005_th.pdf (In Thai).

DMF (Department of Mineral Fuels). 2006. Annual report 2006. From http://www.dmf.go.th/resources/annualReport/factFigure/th/Fact&Figures_2006_th.pdf (In Thai).

DOF (Department of Fisheries). 2006. Fisheries statistics. From http://www.fisheries.go.th/it-stat/data_2542/menu_2542.htm (In Thai).

Dziegielewska, D. Tietenberg, T. and Niggol, S. 2007. "Total economic value." In Encyclopedia of earth. Edited by C.J. Cleveland. Retrieved on 11 June 2009 from http://www.eoearth.org/article/Total_economic_value

Intarapirote, P. 2005. "Recreational value of Pran Buri Forest Park, Prachup Khiri Khan Province." Master's thesis, Department of Forestry, Kasetsart University. (In Thai).

IUCN (International Union for the Conservation of Nature), Department of Marine and Coastal Resources, and UNEP (United Nations Environment Programme). 2005. Counting the environmental costs of natural disasters: evaluating tsunami-related damages to coastal ecosystems in Thailand. 35 p.

Jarayabhand, P., et al. 2008. "Present status and future trend of Thailand's sustainable utilization of the sea." Final report submitted to Thailand Research Fund, Bangkok. (In Thai).

Limpasaichol, P. 2003. Valuation of marine resources: Methodology and case studies. Department of Marine and Coastal Resources, Thailand. (In Thai).

Limprayoon, N. 1994. "Value of national park: Case study on Koh Samed, Rayong Province." Master's thesis, Kasetsart University. (In Thai).

Loypha, S. 1989. "An evaluation of the Thale Noi non-hunting area, Phatthalung Province, Songkhla, Nakhon Si Thammarat as a recreation site." Master's thesis, Kasetsart University. (In Thai).

NESDB (National Economic and Social Development Board). 2008. Regional development strategies. Final Report, NESDB, Bangkok. (In Thai).

NSO (National Statistical Office). 2000. From http://service.nso.go.th/nso/nso.th_center/project/table/files/S-mf/2543/000/00 _S-mf_2543_000_010000_00102.xls (In Thai).

OMCC (Office of Marine and Coastal Conservation). 2005. Coastal land and waters. Department of Marine and Coastal Resources, Bangkok. (In Thai).

ONEP (Office of Natural Resources and Environmental Policy and Planning). 2005. State of environment 2005. ONEP, Thailand. (In Thai).

TAT (Tourism Authority of Thailand). 2004. Tourist statistics. From http://www.tourism.go.th/index.php?option=com.content&task=view&id=2610 &Itemid=25 (In Thai).

The World Bank. 2005. "Assessing the economic value of ecosystem conservation." Environment Department Paper No. 101. The World Bank, Washington, D.C.

UNEP (United Nations Environment Programme). 2005. State of natural resources and environment. Report No. 1 Mangrove. UNEP/GEF Project on Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand. (In Thai).

Vithayaveroj, T. 2003. "The valuation of fishery resources and existence value of seagrass beds: A case study of Pha Ngan Island, Surat Thani province." Master's thesis, Mahidol University. (In Thai).

Wongwattananukul, N. 2004. "An evaluation of recreation benefits, Mae Ramphueng, Rayong Province." Master's thesis, Kasetsart University. (In Thai)

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Economic Contribution of the Marine Industry to RO Korea's National Economy Using the Input-Output Analysis

Photo: Jisoon Kang

Introduction

The Republic of Korea (RO Korea) is ranked the sixth largest aquaculture nation in the world, the first in the ship-building industry, and thirteenth as a fisheries nation. The wide range of natural conditions along RO Korea's long coastline has resulted in a diverse array of marine activities and developments. Almost all RO Korean industrial complexes are located in the coastal area.

The marine industry is regarded as a key sector in terms of employment, value-added, and infrastructural development. It covers a wide range of economic activities, including construction, maintenance and restoration of onshore and offshore equipment and technology. It also includes transport, port operations and services, ship construction and repair, construction and restoration of platforms and marine structures, marine-military industries and fisheries, among others. With this marine potential, the government is now trying to strengthen the competitiveness of marine, environmental, and ocean-related industries and to expand them as new growth engines for early economic recovery.

However, the RO Korean marine industry is facing great challenges. The economy has not yet recovered from the global financial crisis. The domestic market is facing a drop in growth rate and employment instability. The situation requires marine and other researchers to provide policymakers with pertinent and reliable understanding of the role of the marine industry in the overall national economy. More than anything, a comprehensive description of the marine industry and analysis of national data are necessary to guide policymakers if industrial development is to be a major factor in future economic growth.

Table 1 presents the output and added values of the RO Korean marine sector. As indicated, the output of the RO Korean marine sector is 3.25 percent of the total national economic output.

This paper aims to analyze the role of four maritime industries in the country's national economy using a static input-output (I-O) approach.

The paper also presents: an overview of the static I-O model employed; the results which address the production-inducing effects and the supply-shortage

Table 1. Total gross output of marine industry (2006, KRW billion).

	Total value-added of all industry	Total value-added of marine industry	Total gross output of all industry	Total gross output of marine industry
Marine transportation		3,402,610 (0.399%)		19,872,555 (0.961%)
Harbor		2,473,783 (0.290%)		4,379,334 (0.212%)
Fishery and marine products		2,958,014 (0.347%)		10,220,020 (0.494%)
Shipbuilding		6,504,610 (0.763%)		23,222,843 (1.123%)
Other marine sectors		5,072,717 (0.595%)		9,653,175 (0.467%)
Total	851,982,152	20,411,734 (2.396%)	2,068,807,934	67,347,926 (3.255%)

Note: The numbers in parentheses are the portion of each industry.

effects of the marine sector, intersector linkage effects of 33 sectors, and the pervasive effects of price change in the marine sector; and the potential uses of these results for maritime policy.

Methodology: I-O analysis

The economist Leontief developed an "input-output" (I-O) model for estimating economic impacts and tracing the flows of monetary values. The I-O model is quite useful for analyzing maritime sector issues in the national economy context. The I-O model recognizes the interdependence of all sectors of the economy and their consumption of marine industry products, which is embodied in the sectoral outputs (Hirschman, 1985). The RO Korean marine sectors, however, have not previously been investigated using I-O analysis.

The final products of the marine industry are supplied to industries consuming maritime goods and services as intermediate goods. Thus, the demand for maritime products is determined based on their levels of production. Similarly, the maritime supply has direct and indirect effects on their production activities. The effects of maritime sector supply shortages are especially important since the marine industry, a social overhead capital, significantly affects other industries that consume maritime goods and services as intermediate goods. Moreover, the analysis of direct and indirect influences of price changes of maritime goods and services on price levels of other sectors should be emphasized.

General framework of the I-0 analysis

The I-O model is a linear, intersectoral model, which shows the relationships among the productive sectors of a given economic system. The I-O model is centered on the idea of inter-industry transactions. For example, ship makers use many intermediate inputs such as steel, electricity, oil, plastic and human labor to produce vessels. Accordingly, outputs from one industry become inputs to another industry. If a ship is bought, it would affect the demand for steel, electricity, oil, plastic, and labor forces for a ship. After all, all industries use the products of other industries to produce their own products.

The I-O model captures some basic aspects of the national economy, namely: (1) the production-inducing effect; (2) inter-industry linkage effect (Hirschman, 1985; Pietroforte and Bon, 1995; Yoo and Yang, 1999)[1]; (3) value-added and employment-inducing effects; and (4) supply shortage effect.

Analysis data used

To identify the national economic roles of the marine industry, this study used 2006 I-O domestic tables available for RO Korea (The Bank of Korea, 2008). For the sake of maritime sector-based analysis, the original tables are aggregated into 33-sector tables including five marine industry subsectors. These sectors include: (1) marine (coastal, inland water, and deep sea) transportation; (2) harbor (construction and services); (3) fishery and marine products; (4) shipbuilding; and (5) others such as marine tourism, defense and marine materials.

Results

Inter-industry linkage effect

The interlinkages are created as a consequence of each sector's role as supplier of inputs to and receiver of inputs from other sectors of the economy. Table 2 shows the forward and backward linkage effects of all 33 economic sectors. The forward linkage effects of the maritime sectors are lower than those of other sectors, which mean that when economic activities are booming, the maritime sectors are

[1] The high amount of intermediate inputs means the nature of the marine sector involves the assembly of many different products purchased from a large number of industries. Forward and backward linkage effects are useful in assessing the impact of the maritime sector on the national economy as a whole.

[2] June 2009: US$1.0 = KRW 1,350.

less stimulated by overall industrial growth than other sectors. These results show that the maritime sector is not influenced much by business fluctuations of other sectors and is thought to be a vital input to national economy. The backward linkage effects of maritime sectors are higher than those of other sectors (**Table 2**). This implies that the marine industry has greater impacts in terms of investment expenditures on the national economy than other sectors. That is, it has a relatively strong capacity for pulling in other industries.

Production-inducing effects

Table 3 summarizes the production-inducing effects of maritime investment. The sum of effects of one Korean Won (KRW) change in maritime investment on the output of other sectors was KRW 3.1983 (marine transportation, 0.2575; harbor, 0.6954; fishery and marine products, 0.6009; shipbuilding, 0.8723; and other marine sectors, 0.7572).[2] The amount of total gross output of the marine sector was KRW 67.34 trillion in 2006, from which we can derive that the marine sector induced KRW 148.01 trillion of production and a total of KRW 215.35 trillion of production into the economy.

Primary metal products services (sector 10), petroleum and coal products (7), real estate and business services (24) were the top three sectors with higher production-inducing effects generated by the overall marine sectors. Shipbuilding industry showed the highest production-inducing effect of 0.8723 followed by other marine sectors, at 0.7572.

Table 2. Forward linkage and backward linkage effects of marine industry for 33 business sectors.

Sector	Forward linkage effects	Rank	Backward linkage effects	Rank
1. Agriculture and forestry	1.0143	15	0.8969	24
2. Mining and quarrying	0.5905	29	0.9071	23
3. Food and kindred products, and tobaccos	1.1881	7	1.0808	8
4. Textile mill products, apparel, and leather	0.8474	19	1.0741	10
5. Paper and wood products	1.0847	11	1.0438	16
6. Printing, publishing, and reproduction	0.7003	23	1.0665	12
7. Petroleum and coal products	1.4930	4	0.5941	33
8. Chemicals and allied products	2.0760	2	1.0753	9
9. Nonmetal mineral products	0.7886	20	1.0578	13
10. Primary metal products	2.1538	1	1.1788	5
11. Fabricated metal products	1.0128	16	1.2306	3
12. General machinery and equipment	0.9636	17	1.2214	4
13. Electronic and other electrical equipment	1.0662	12	0.9631	19
14. Precision instruments	0.6022	28	1.0685	11
15. Transportation equipment	1.0561	13	1.3682	2
16. Miscellaneous manufacturing products	0.6324	25	1.1436	7
17. Electric and gas services	1.1594	9	0.7606	31
18. Construction	0.6318	26	1.0555	15
19. Wholesale and retail trade	1.4517	5	0.8633	26
20. Catering and accommodations	1.0164	14	1.0572	14
21. Transportation and warehousing	1.1782	8	0.8765	25
22. Communications	0.9480	18	0.9441	20
23. Finance and insurance	1.2949	6	0.8280	27
24. Real estate and business services	1.9342	3	0.8058	30
25. Public administration and defense	0.5435	32	0.8128	29
26. Education and health services	0.6400	24	0.8137	28
27. Social and personal services	0.7413	22	1.0223	17
28. Dummy sector	1.1136	10	1.4798	1
29. Marine transportation	0.5426	33	0.6798	32
30. Harbor	0.5900	30	0.9135	22
31. Fishery and marine products	0.7673	21	1.1570	6
32. Shipbuilding	0.5712	31	1.0164	18
33. Other marine sectors	0.6058	27	0.9431	21

Value-added and employment-inducing effects

Table 4 presents the value-added inducing effects of the marine industry. These effects show the value-added monetary unit from the investment of one KRW in the marine industry. For example, if there is KRW 1 investment then KRW 0.3135 of value-added would be created.

Table 5 summarizes the employment-inducing effects of all sectors. It shows that the total demand increase of KRW 100 million (approximately US$ 0.74 million) in overall marine sectors would generate employment of an average of 4.28 persons. These results show that the marine industry has the trait of technology intensiveness.

Supply shortage effect

The supply shortage effect (**Table 6**) refers to the cost of supply shortage when the products of a specific marine sector had not been supplied. For example, there would have been KRW 30.62 trillion in shortage costs of maritime production. Sectors where shortage costs are highest in each

Table 3. Production-inducing effects of marine sectors (2006, KRW).

Sector	Marine transportation		Harbor		Fishery and marine products		Shipbuilding		Other marine sectors		Total marine sectors	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank
1. Agriculture and forestry	0.0010	22	0.0054	23	0.0181	11	0.0027	25	0.0636	3	0.0128	14
2. Mining and quarrying	0.0003	26	0.0068	21	0.0006	28	0.0013	27	0.0006	28	0.0011	27
3. Food and kindred products, and tobaccos	0.0021	16	0.0108	19	0.0264	9	0.0053	22	0.1389	1	0.0267	9
4. Textile mill products, apparel, and leather	0.0011	20	0.0065	22	0.0065	19	0.0072	18	0.0073	21	0.0055	22
5. Paper and wood products	0.0012	19	0.0122	18	0.0326	7	0.0094	15	0.0117	16	0.0113	16
6. Printing, publishing, and reproduction	0.0012	18	0.0046	25	0.0029	23	0.0020	26	0.0055	24	0.0026	26
7. Petroleum and coal products	0.1153	1	0.0808	2	0.0814	2	0.0250	9	0.0411	6	0.0664	2
8. Chemicals and allied products	0.0066	7	0.0296	9	0.0910	1	0.0659	5	0.0347	8	0.0446	4
9. Nonmetal mineral products	0.0004	25	0.0633	3	0.0023	24	0.0081	17	0.0037	25	0.0071	18
10. Primary metal products	0.0035	12	0.0603	4	0.0117	14	0.2211	1	0.0129	15	0.0867	1
11. Fabricated metal products	0.0043	9	0.0312	8	0.0094	17	0.0677	4	0.0092	19	0.0287	8
12. General machinery and equipment	0.0022	15	0.0165	15	0.0100	15	0.1210	2	0.0170	13	0.0421	5
13. Electronic and other electrical equipment	0.0027	13	0.0104	20	0.0098	16	0.0506	7	0.0117	17	0.0208	12
14. Precision instruments	0.0003	27	0.0013	27	0.0016	26	0.0159	13	0.0016	26	0.0060	21
15. Transportation equipment	0.0017	17	0.0170	14	0.0063	20	0.0059	20	0.0106	18	0.0062	19
16. Miscellaneous manufacturing products	0.0005	24	0.0024	26	0.0016	25	0.0053	21	0.0068	23	0.0029	25
17. Electric and gas services	0.0039	10	0.0359	7	0.0197	10	0.0238	10	0.0318	9	0.0197	13
18. Construction	0.0010	21	0.0054	24	0.0031	22	0.0034	24	0.0072	22	0.0033	24
19. Wholesale and retail trade	0.0090	5	0.0289	10	0.0712	3	0.0542	6	0.0527	5	0.0420	6
20. Catering and accommodations	0.0037	11	0.0187	13	0.0168	12	0.0088	16	0.0238	12	0.0113	17
21. Transportation and warehousing	0.0133	4	0.0259	11	0.0316	8	0.0216	11	0.0291	10	0.0225	11
22. Communications	0.0058	8	0.0187	12	0.0131	13	0.0121	14	0.0263	11	0.0125	15
23. Finance and insurance	0.0384	2	0.0418	6	0.0338	6	0.0272	8	0.0364	7	0.0337	7
24. Real estate and business services	0.0263	3	0.0897	1	0.0463	4	0.0744	3	0.0972	2	0.0592	3
25. Public administration and defense	0.0002	28	0.0007	28	0.0007	27	0.0004	28	0.0008	27	0.0005	28
26. Education and health services	0.0010	23	0.0124	17	0.0088	18	0.0069	19	0.0078	20	0.0046	23
27. Social and personal services	0.0024	14	0.0164	16	0.0059	21	0.0051	23	0.0138	14	0.0062	20
28. Dummy sector	0.0083	6	0.0420	5	0.0379	5	0.0198	12	0.0535	4	0.0253	10
Total	0.2575		0.6954		0.6009		0.8723		0.7572		0.6124	

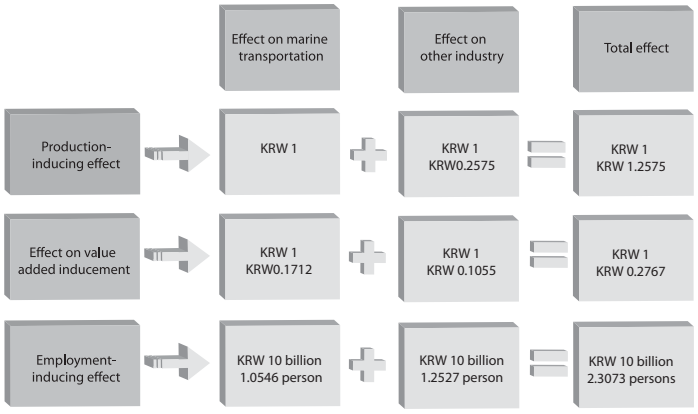

Figure 1. Spin-off effects of marine transportation industry.

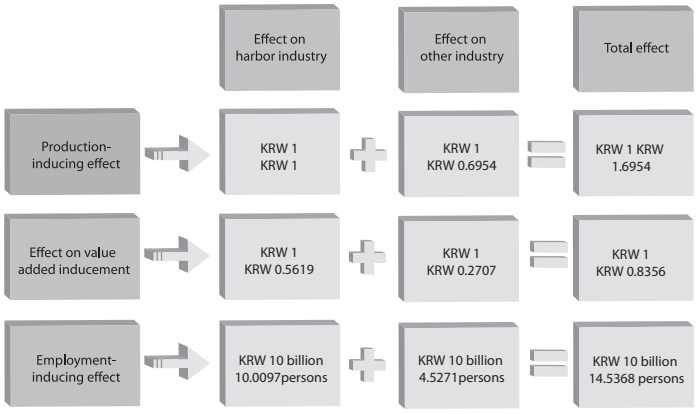

Figure 2. Spin-off effects harbor industry.

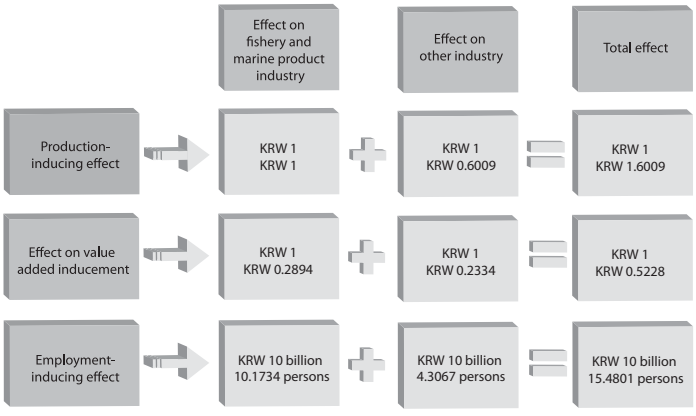

Figure 3. Spin-off effects of fishery and marine product industry.

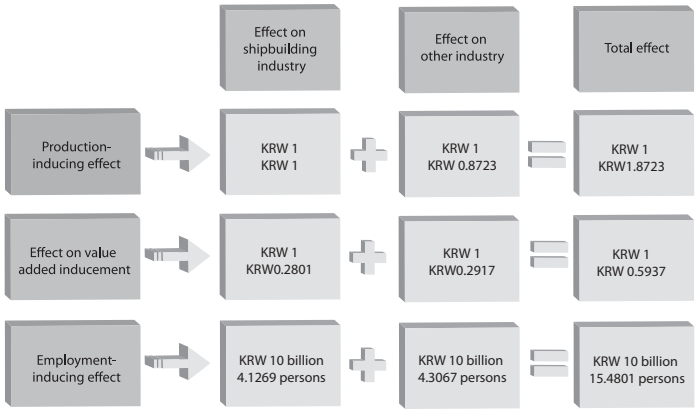

Figure 4. Spin-off effects of shipbuilding industry.

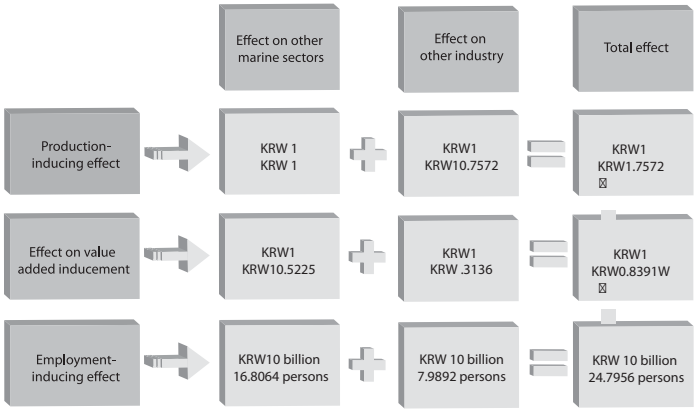

Figure 5. Spin-off effects of other marine sectors industry.

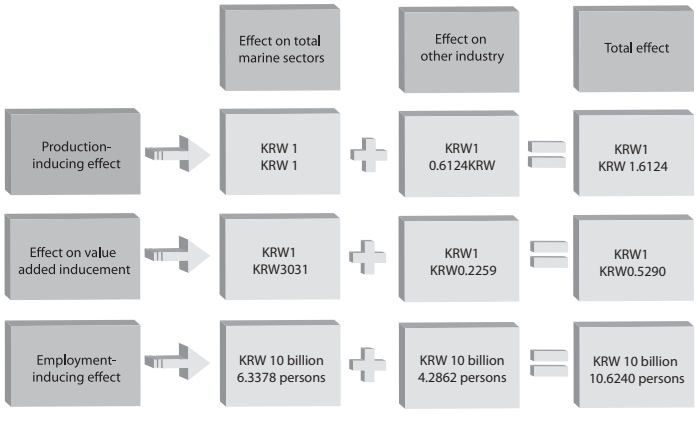

Figure 6. Spin-off effects of total marine sectors.

Table 4. Effects on value-added inducement of marine sectors (2006, KRW).

Sector	Marine transportation		Harbor		Fishery and marine products		Shipbuilding		Other marine sectors		Total marine sectors	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank
1. Agriculture and forestry	0.0006	16	0.0033	19	0.0109	7	0.0016	20	0.0383	3	0.0077	12
2. Mining and quarrying	0.0002	23	0.0039	16	0.0003	27	0.0008	26	0.0003	27	0.0006	26
3. Food and kindred products, and tobaccos	0.0006	15	0.0032	20	0.0078	10	0.0016	22	0.0411	2	0.0079	11
4. Textile mill products, apparel, and leather	0.0003	21	0.0020	23	0.0020	19	0.0022	19	0.0022	21	0.0017	21
5. Paper and wood products	0.0003	22	0.0034	18	0.0090	8	0.0026	16	0.0032	16	0.0031	17
6. Printing, publishing, and reproduction	0.0005	18	0.0019	24	0.0012	22	0.0009	25	0.0023	20	0.0011	24
7. Petroleum and coal products	0.0348	1	0.0244	3	0.0246	3	0.0076	11	0.0124	9	0.0201	4
8. Chemicals and allied products	0.0015	8	0.0068	14	0.0209	5	0.0152	7	0.0080	11	0.0103	8
9. Nonmetal mineral products	0.0001	26	0.0201	4	0.0007	23	0.0026	17	0.0012	24	0.0022	19
10. Primary metal products	0.0007	13	0.0116	8	0.0023	18	0.0426	2	0.0025	19	0.0167	5
11. Fabricated metal products	0.0013	10	0.0098	9	0.0029	15	0.0212	5	0.0029	18	0.0090	9
12. General machinery and equipment	0.0006	17	0.0046	15	0.0028	16	0.0336	3	0.0047	14	0.0117	6
13. Electronic and other electrical equipment	0.0007	12	0.0026	21	0.0024	17	0.0126	8	0.0029	17	0.0052	14
14. Precision instruments	0.0001	27	0.0004	27	0.0005	26	0.0045	14	0.0005	26	0.0017	20
15. Transportation equipment	0.0003	20	0.0034	17	0.0013	21	0.0012	24	0.0021	22	0.0013	23
16. Miscellaneous manufacturing products	0.0001	25	0.0007	25	0.0005	24	0.0016	21	0.0020	23	0.0009	25
17. Electric and gas services	0.0016	7	0.0147	6	0.0080	9	0.0097	10	0.0130	7	0.0081	10
18. Construction	0.0005	19	0.0024	22	0.0014	20	0.0015	23	0.0033	15	0.0015	22
19. Wholesale and retail trade	0.0054	5	0.0172	5	0.0424	1	0.0323	4	0.0314	4	0.0250	2
20. Catering and accommodations	0.0015	9	0.0075	13	0.0068	11	0.0035	15	0.0096	10	0.0045	15
21. Transportation and warehousing	0.0068	4	0.0132	7	0.0161	6	0.0111	9	0.0149	6	0.0115	7
22. Communications	0.0028	6	0.0091	10	0.0064	12	0.0059	12	0.0128	8	0.0061	13
23. Finance and insurance	0.0241	2	0.0262	2	0.0212	4	0.0171	6	0.0228	5	0.0211	3
24. Real estate and business services	0.0179	3	0.0613	1	0.0316	2	0.0509	1	0.0665	1	0.0405	1
25. Public administration and defense	0.0001	24	0.0005	26	0.0005	25	0.0003	27	0.0006	25	0.0003	27
26. Education and health services	0.0007	14	0.0085	11	0.0060	13	0.0047	13	0.0053	13	0.0031	16
27. Social and personal services	0.0012	11	0.0081	12	0.0029	14	0.0025	18	0.0069	12	0.0031	18
28. Dummy sector	0.0000	28	0.0000	28	0.0000	28	0.0000	28	0.0000	28	0.0000	28
Total	0.1055		0.2707		0.2334		0.2917		0.3136		0.2259	

Table 5. Employment-inducing effects of marine sectors (2006, KRW100 million per individual).

Sector	Marine transportation		Harbor		Fishery and marine products		Shipbuilding		Other marine sectors		Total marine sectors	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank
1. Agriculture and forestry	0.0479	6	0.2528	8	0.8408	2	0.1248	11	2.9596	1	0.5969	2
2. Mining and quarrying	0.0020	26	0.0384	22	0.0032	27	0.0076	25	0.0033	27	0.0062	26
3. Food and kindred products, and tobaccos	0.0077	18	0.0400	21	0.0974	11	0.0195	22	0.5122	5	0.0984	11
4. Textile mill products, apparel, and leather	0.0092	16	0.0560	17	0.0555	13	0.0619	15	0.0628	14	0.0475	16
5. Paper and wood products	0.0060	19	0.0631	13	0.1693	8	0.0487	16	0.0607	16	0.0586	15
6. Printing, publishing, and reproduction	0.0106	15	0.0410	20	0.0261	19	0.0183	23	0.0488	18	0.0237	23
7. Petroleum and coal products	0.0209	9	0.0147	25	0.0148	21	0.0045	26	0.0075	26	0.0121	25
8. Chemicals and allied products	0.0178	11	0.0802	12	0.2466	6	0.1786	8	0.0939	10	0.1209	9
9. Nonmetal mineral products	0.0019	27	0.2751	6	0.0098	25	0.0351	21	0.0161	22	0.0307	20
10. Primary metal products	0.0035	23	0.0611	14	0.0118	23	0.2239	6	0.0130	23	0.0878	12
11. Fabricated metal products	0.0283	8	0.2071	9	0.0624	12	0.4500	4	0.0614	15	0.1909	8
12. General machinery and equipment	0.0110	13	0.0820	11	0.0495	14	0.5999	2	0.0843	11	0.2086	7
13. Electronic and other electrical equipment	0.0087	17	0.0336	23	0.0317	17	0.1639	10	0.0378	20	0.0673	14
14. Precision instruments	0.0020	25	0.0091	26	0.0117	24	0.1137	12	0.0115	24	0.0426	17
15. Transportation equipment	0.0043	21	0.0439	19	0.0162	20	0.0153	24	0.0273	21	0.0161	24
16. Miscellaneous manufacturing products	0.0039	22	0.0194	24	0.0133	22	0.0432	17	0.0552	17	0.0239	22
17. Electric and gas services	0.0058	20	0.0533	18	0.0292	18	0.0354	19	0.0472	19	0.0293	21
18. Construction	0.0109	14	0.0566	16	0.0326	16	0.0353	20	0.0759	13	0.0347	19
19. Wholesale and retail trade	0.2283	2	0.7326	1	1.8061	1	1.3760	1	1.3366	2	1.0659	1
20. Catering and accommodations	0.0908	5	0.4603	3	0.4153	4	0.2168	7	0.5867	4	0.2774	5
21. Transportation and warehousing	0.2156	3	0.4194	4	0.5117	3	0.3503	5	0.4712	6	0.3648	4
22. Communications	0.0179	10	0.0580	15	0.0405	15	0.0375	18	0.0816	12	0.0388	18
23. Finance and insurance	0.2396	1	0.2609	7	0.2108	7	0.1700	9	0.2270	8	0.2104	6
24. Real estate and business services	0.1976	4	0.6746	2	0.3481	5	0.5597	3	0.7315	3	0.4453	3
25. Public administration and defense	0.0021	24	0.0069	27	0.0070	26	0.0041	27	0.0085	25	0.0048	27
26. Education and health services	0.0153	12	0.1985	10	0.1408	9	0.1109	13	0.1244	9	0.0732	13
27. Social and personal services	0.0429	7	0.2888	5	0.1045	10	0.0892	14	0.2431	7	0.1095	10
28. Dummy sector	0.0000	28	0.0000	28	0.0000	28	0.0000	28	0.0000	28	0.0000	28
Total	1.2527		4.5271		5.3067		5.0942		7.9892		4.2862	

Table 6. Supply shortage effects of marine sectors (2006, KRW).

Sector	Marine transportation		Harbor		Fishery and marine products		Shipbuilding		Other marine sectors		Total marine sectors	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank
1. Agriculture and forestry	0.0022	21	0.0363	18	0.0152	20	0.0002	21	0.0166	21	0.0030	20
2. Mining and quarrying	0.0002	28	0.0015	28	0.0013	28	0.0000	28	0.0026	28	0.0004	28
3. Food and kindred products, and tobaccos	0.0067	10	0.1108	6	0.0472	10	0.0004	15	0.0466	14	0.0114	11
4. Textile mill products, apparel, and leather	0.0041	14	0.0491	13	0.0247	16	0.0003	19	0.0299	18	0.0051	18
5. Paper and wood products	0.0025	20	0.0221	20	0.0080	22	0.0001	22	0.0160	22	0.0025	23
6. Printing, publishing, and reproduction	0.0005	27	0.0059	27	0.0041	27	0.0000	27	0.0064	27	0.0007	27
7. Petroleum and coal products	0.0027	19	0.0426	16	0.0042	26	0.0001	25	0.0079	25	0.0037	19
8. Chemicals and allied products	0.0194	2	0.1657	3	0.0481	9	0.0009	6	0.0979	6	0.0162	5
9. Nonmetal mineral products	0.0091	8	0.0197	22	0.0110	21	0.0004	16	0.0985	5	0.0142	8
10. Primary metal products	0.0190	3	0.1510	4	0.0339	13	0.0007	9	0.0938	7	0.0133	9
11. Fabricated metal products	0.0075	9	0.0522	12	0.0200	18	0.0003	17	0.0398	15	0.0052	17
12. General machinery and equipment	0.0123	6	0.0906	8	0.0295	14	0.0005	13	0.0577	11	0.0083	13
13. Electronic and other electrical equipment	0.0140	5	0.2068	1	0.0510	7	0.0009	5	0.1106	3	0.0168	4
14. Precision instruments	0.0010	26	0.0132	26	0.0044	25	0.0001	26	0.0079	26	0.0011	26
15. Transportation equipments	0.0190	4	0.1730	2	0.0401	12	0.0008	8	0.0886	8	0.0117	10
16. Miscellaneous manufacturing products	0.0018	23	0.0161	24	0.0075	23	0.0001	23	0.0115	23	0.0017	24
17. Electric and gas services	0.0019	22	0.0177	23	0.0065	24	0.0001	24	0.0101	24	0.0017	25
18. Construction	0.0212	1	0.1222	5	0.0541	5	0.0011	4	0.1757	2	0.0184	3
19. Wholesale and retail trade	0.0092	7	0.1053	7	0.0516	6	0.0007	10	0.0761	9	0.0147	7
20. Catering and accommodations	0.0040	15	0.0615	10	0.2198	2	0.0008	7	0.0296	19	0.0264	2
21. Transportation and warehousing	0.0039	16	0.0444	15	0.0165	19	0.0007	11	0.0348	16	0.0062	16
22. Communications	0.0017	24	0.0203	21	0.0217	17	0.0003	20	0.0264	20	0.0027	22
23. Finance and insurance	0.0014	25	0.0152	25	0.0281	15	0.0003	18	0.0316	17	0.0030	21
24. Real estate and business services	0.0055	11	0.0546	11	0.0873	3	0.0013	3	0.1028	4	0.0108	12
25. Public administration and defense	0.0028	18	0.0286	19	0.0507	8	0.0284	1	0.0548	13	0.0157	6
26. Education and health services	0.0050	13	0.0456	14	0.0552	4	0.0006	12	0.0651	10	0.0076	14
27. Social and personal services	0.0036	17	0.0369	17	0.0467	11	0.0005	14	0.0567	12	0.0064	15
28. Dummy sector	0.0052	12	0.0673	9	0.2259	1	0.0016	2	0.1905	1	0.0410	1
Total	0.1874		1.7762		1.2143		0.0422		1.5815		0.2699	

maritime sector and overall marine sector were construction (sector 18, 0.0125) for marine transportation; food and kindred products and tobacco (sector 3, 0.0485) for harbor; food and kindred products and tobacco (sector 32, 0.0534) for fishery and marine products; construction (sector 18, 0.0591) for shipbuilding and other marine sectors; and construction (sector 18, 0.1114) for overall marine sector. The sum of the shortage costs of all sectors, except the maritime sectors, decreased from KRW 0.28 to 0.87. Suppose the maritime products had never been supplied in 2006. There would have been KRW 35.75 trillion in shortage costs of maritime production. Sectors where shortage costs were highest in overall marine sectors included catering and accommodations (sector 20, 0.0328); public administration and defense (sector 30, 0.0168); and electronic equipment (sector 13, 0.0167).

Conclusion

From an economic point of view, it is often regarded that industrial development is the source of economic growth and an indispensable part of national economy. In RO Korea, the marine industry constitutes a major pillar of the industrial sector as a whole. However, it has been grossly neglected. It has not received as much attention as it deserves within the framework of national economic policy unlike other sectors, such as energy, auto industry, and construction. To better understand and manage the marine industry and related resources, decision-makers will need to comprehend the broad spectrum of industrial impacts, including fisheries, marine transportation, port industry, etc. A sound understanding of the economic role of the marine industry should be the basis for sustainable development of marine and coastal sectors.

In this context, this paper examined the application of I-O analysis to maritime sectors over the long term. It showed that the marine industry has a low forward linkage effect, a high backward linkage effect, a high production-inducing effect, a low supply shortage cost, a low pervasive effect of price changes, and a high employment-inducing effect.

Judging from other literature, there are few studies in which the I-O model has been used for analyzing maritime sectors. For research purposes, this study has presented the feasibility of extending the use of I-O analysis at least for the maritime sector. It could also provide some guidelines for marine industry policy. A comprehensive description of the maritime sector's relationships with the rest of the RO Korean economy is necessary to guide policymakers.

This study focused on assessing the national economy-wide effects of the marine industry in RO Korea. The extension of the present framework needs to be undertaken in a future study. In this regard, a dynamic I-O analysis, which allows the changing of input coefficients over time, will provide more insights for both policymakers and researchers by significantly increasing the precision of analytical results.

References

The Bank of Korea. 2006. Input-output tables 1975-1998. Seoul.

Castellucci, L. 2002. "Economic assessments of the value of marine industries and services and user requirements." Elsevier Oceanography Series 66: 45-56.

Davis, H.C. and E.L. Salkin. 1984. "Alternative approaches to the estimation of economic impacts resulting from supply constraints." Annals of Regional Science 18(3): 25-34.

Doloreux, D. and Y. Melançon. 2008. "On the dynamics of innovation in Quebec's coastal maritime industry." Technovation 28(4): 231-243.

Hirschman, A.O. 1985. The strategy of economic development. Yale University Press, New Haven, USA.

Hoagland, P., Jin, D., Thunberg, E. and S. Steinback. 2005. Economic activity associated with the northeast shelf large marine ecosystem: Application of an input-output approach. Large Marine Ecosystems 13: 157-179.

Kang, S.-M. and M.-S. Park. 2007. Growth accounting analysis of Korean port-logistics industry. Journal of Korea Port Economic Association 23(4): 49-69.

Kwak, S.-J., Yoo, S.-H. and J.-I. Chang. 2005. "The role of the maritime industry in the Korean national economy: An input–output analysis." Marine Policy 29(4): 371-383.

Lin, S.J. and Y.F. Chang. 1997. "Linkage effects and environmental impacts from oil consumption industries in Taiwan." Journal of Environmental Management 49: 393-411.

Miller, R.E. and P.D. Blair. 1985. Input-output analysis: Foundations and extensions. Prentice-Hall, New Jersey, USA.

Oosterhaven J. 1996. "Leontief versus Ghoshian price and quantity models." Southern Economic Journal 62(3): 750-759.

Oosterhaven J. 1988. "On the plausibility of supply-driven input-output model." Journal of Regional Science 28: 203-217.

Pérez Labajos, C. 2001. "Spending pattern of the recreational maritime sector and its impact on employment: the case of Cantabria, Spain." Marine Policy 25: 187-196.

Pietroforte, R, and R. Bon. 1995. "An input-output analysis of the Italian construction sector, 1959-1988." Construction Management and Economics 13: 253-262.

Smith, H.D. and C.S. Lalwani. 1999. "The call of the sea: The marine knowledge industry in the UK." Marine Policy 23(4-5): 397-412.

Van der Linden, J.A. 2001. "The economic impact study of maritime policy issues: application to the German case." Maritime Policy and Management 28(1): 33-54.

Yoo, S.H. and C.Y. Yang. 1999. "Role of water utility in the Korean national economy." International Journal of Water Resources Development 15(4): 527-541.

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The contribution of Viet Nam's economic marine and fisheries sectors to the National Economy from 2004-2007

Photo: Nguyen Dinh Lac

Overview of Viet Nam's Marine Sector

Viet Nam is located on western side of the East Sea, one of the largest and the most important seas in the Asia-Pacific region. Throughout the country's long history, the coastal area and associated islands have been closely linked to social, cultural and economic activities of the Vietnamese people. The Viet Nam sea area, which occupies approximately one million km^2, is three times larger than the land territory, with total length of coastline approximately 3,260 km extending over 13 latitudinal degrees. Viet Nam has one of the highest coastline length-to-sea ratios in Southeast Asia, and is ranked 27th among 157 coastal nations in the world with respect to land-to-coastline length ratios (i.e., Viet Nam has a ratio of 100 km^2 of land per km of coastline; the global average is 600 km^2 of land to km of coastline).

Viet Nam has more than 3,000 islands distributed from nearshore to offshore. Nearshore islands are mainly located in the Gulf of Tonkin. The total area of islands is approximately 1,700 km^2, with three islands having surface areas greater than 100 km^2 (i.e., Phu Quoc, Cai Bau, and Cat Ba), 23 islands having surface areas larger than 10 km^2, and 82 islands with areas greater than one km^2.

Marine natural resources and advantage in Viet Nam nautical economy

Our investigations show that the East Sea has very diversified natural resources, which include both bio and non-bio resources existing on the surface, in the water column, and on and below the seabed.

Regarding bio-resources, according to statistical data of islands and seas of Viet Nam, there are more than 11,000 aquatic species residing in 20 coastal and marine ecosystems, with 1,300 species found in various islands. Of this number, there are 6,000 benthic fauna species and 2,000 fish species. Eighty-three marine species are recorded in the Red Book of Endangered Species of Viet Nam (i.e., 37 fish species; 6 coral species; 5 Echinoderm species; 4 lobster species; one king-crab species; 21 snail species; 6 bivalve species; and 3 squid species) and 110 fish types having high economic value (e.g., sardines; codfish; scads; etc.). The total marine fishery reserves are estimated to be 3 to 3.5 million tons, in which exploitable reserves is over 1 million tons per year.

Non-bio resources are also diversified, consisting of various minerals, such as oil and gas with total estimated reserves of 10 billion tons and coal with significantly high reserves. In addition, marine and island areas of Viet Nam contain various coastal mineral placers, such as Ilmenite, with estimated reserves of 13 million tons, and silica sand reserves of several hundreds of thousand tons. Manganese nodules, polymetallic mud and a recently discovered hydrocarbon (methane hydrate) have also been found, but their reserves have not been defined as yet. The largest reserve of natural mineral in sea water is salt of which there is a huge reserve, with a salt concentration in sea water of 32 percent along the 3,260 km coastline of Viet Nam.

Table 1. Contribution of Economic Marine and Fisheries Sectors to the National Economy in Gross Domestic Product and Labor Usage (Year 2007).

2007	GDP (billion VND)	Percentage of GDP	Labor usages (in thousand people)
GDP	1.143.715	100	40.000
The contribution of economic marine and fisheries sectors to National Economy in GDP			
Fisheries	46.091	4.03	1.684
Oil and Gas	217.306	19.00	22.000
Marine Transportation	51.124	4.47	1.217
Marine Tourism	21.730	1.94	2.267
Construction	79.716	6.97	N/A
Manufacturing	243.153	21.26	5.963

(Source: General Statistics Office)

The geographical position and coastal and island topography of Viet Nam also signify the high potential for development of Viet Nam's marine economy. There are more than 100 locations along the coastline with the potential for port development. Many islands have high potential as tourist destinations, with beautiful beaches and vistas. In addition, five sites located in coastal provinces have been recognized by UNESCO as world natural and cultural heritages. Viet Nam is also the beneficiary of much sunlight and wind, providing favorable conditions to develop alternative clean energy resources.

Development of the marine economy of Viet Nam

In the period from 1945 to1980, the development of Viet Nam's marine sector was slowly and inefficiently implemented. During this period, the marine economy was focused on exploiting nearshore fisheries using rudimentary equipment and tools, with limited technical and scientific input. After 1980, there was increased awareness of the importance of the marine economy to the national economy. The government began concentrating on the development of the marine economy, especially the following sectors: fisheries (marine fisheries, aquaculture, fish processing); mineral exploitation; shipping (e.g., ship building; transportation; construction); marine tourism; marine-related manufacturing (e.g., marine equipment and products) and national defense (e.g., sea surveillance and management). Among these sectors, fisheries, mineral exploitation, shipping and marine tourism are considered to be the most important, accounting for 98 percent of the total marine economy (i.e., oil and gas exploitation accounts for 64 percent; sea food exploitation 14 percent; transportation 11 percent; and sea tourism 9 percent).

The structure of Viet Nam's economic sectors is similar to the classification of standard marine economy sectors proposed by APEC. The balance of this paper mainly focuses on the following six sectors with data from 2004 to 2007: fisheries; oil and gas; marine transportation; marine tourism; manufacturing; and construction.

Income from these six marine industries is considered to be a measure of the contribution of the marine economy to Viet Nam's economy. As indicated in Table 1, the marine economy and coastal economy of Viet Nam account for an estimated 57 percent of the national GDP, in which GDP derived from marine sectors is of the order of 20 to 22 percent. Among the marine economy sectors, the contribution of the six industries account for up to 98% of the total GDP of the sector.

From **Table 1**, we can see that income from the marine economy comprised about 57 percent of the country's GDP in 2007. Of this contribution, the mineral exploitation and manufacturing sectors had the highest percentage contribution to the GDP of all sectors, namely 19 percent and 21.26 percent respectively. Fisheries, construction and marine transportation had an average contribution to the GDP of 4.03 percent, 6.97 percent and 4.47 percent respectively. Marine tourism and entertainment had an income comprising 1.94 percent of the GDP, which was the lowest of all marine sectors. *(Editor's Note: The GDP estimate of 57 percent includes both the coastal economy and the ocean economy. The ocean economy, as stated in the previous paragraph, is estimated to be 20 to 22 percent of the national GDP. The total marine GDP estimate of 57% also includes government expenditure on defence. The components of manufacturing require further clarification, while marine tourism estimates appear to be low.)*

The reason for the difference in the contribution among the six economic marine and fisheries sectors to the national economy is that products from the marine manufacturing and mineral exploitation sectors, such as oil and gas, are valued much higher than others. Although, output from the fisheries sector has been estimated to increase annually, the income from this sector, by comparison to oil and gas, is not a high contributor to the GDP of Viet Nam.

Regarding employment in the marine sector, the two marine sectors with the highest percentage contribution to GDP, namely manufacturing and mineral exploitation, also have the highest levels of employment, with about 22 million persons and 6 million persons employed respectively.

From **Figure 1**, we can see that total income of the marine economic sectors has been steadily increasing as a

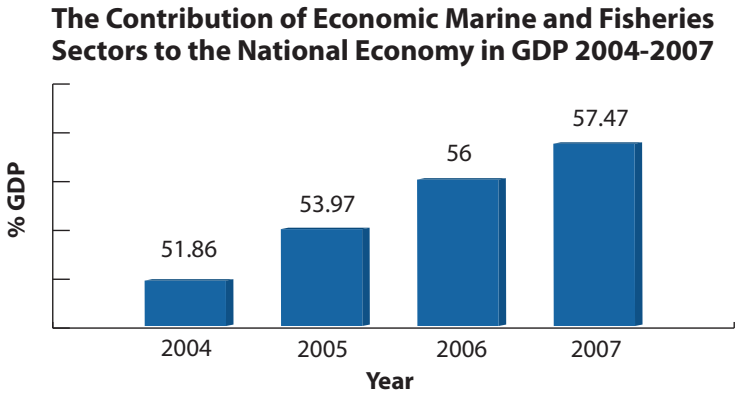

Figure 1. The increase in the contribution of marine economy and fisheries sectors to the National Economy in GDP from 2004-2007.

percentage of national GDP, moving from 51.86 percent in 2004 to 57.47 percent in 2007, about a 10 percent increase over the four-year period. **Figure 2** presents further information on the growth rate of the six marine sectors from 2004 to 2007.

Figure 2 shows that the contribution of the six main marine and fisheries sectors to the national economy increased from 2004 to 2007. There was significant growth in the contribution of marine tourism to the GDP, from 1.5 percent in 2004 to 1.9 percent in 2007, equivalent to an increase of 26 percent. Recently, the government has concentrated on developing the country's tourism, especially marine tourism, by investing in the construction of tourist resorts and marine entertainment centers to attract more tourists.

Meanwhile, the manufacturing sector, which has the highest contribution to the GDP, experienced a modest growth rate of 3.73 percent from 2004 to 2007.

Evaluation of actual situation of the marine economics of Viet Nam

In recent years, the sea has made important contributions to the economic development of Viet Nam. However, numerous problems related to economic planning and development, environmental management and social improvements are becoming apparent, and these need to be solved.

Due to old exploitation and processing technology, the export of raw materials and unfinished, pre-manufacture products still presents a high proportion of exports, e.g., oil, seafood, etc., and hence the value-added contribution of the marine economy to export products is low. The marine tourism industry has a high growth potential, but most development opportunities are focused on recreational, ecological, environmental and cultural tourism, which is very competitive market in East Asia. This situation means that exploitation of marine tourism has been quite limited.

Coastal infrastructure, such as ports, roads and communication systems, requires larger investment in order to fulfill requirements of marine economic development. Unfortunately, planning and development has been made on the basis of independent economic sectors. An integrated master plan for the development of the marine sector is needed.

In addition, the overexploitation of marine resources has given rise to the depletion of natural resources, including nearshore fisheries by small boats, which are unable to operate offshore and continue to use illegal/ unregulated nets that are destructive to the fishery. An emerging issue is the significant impact that climate change is having, and will continue to have on the coastal and marine areas of Viet Nam. Viet Nam has been identified as one of 20 countries facing the most serious impacts of storm surges and sea-level rise, due to its location in the typhoon belt and coastal topography. Twenty-eight of Viet Nam's sixty-one provinces are coastal, with an estimated 30 percent of the total population living in

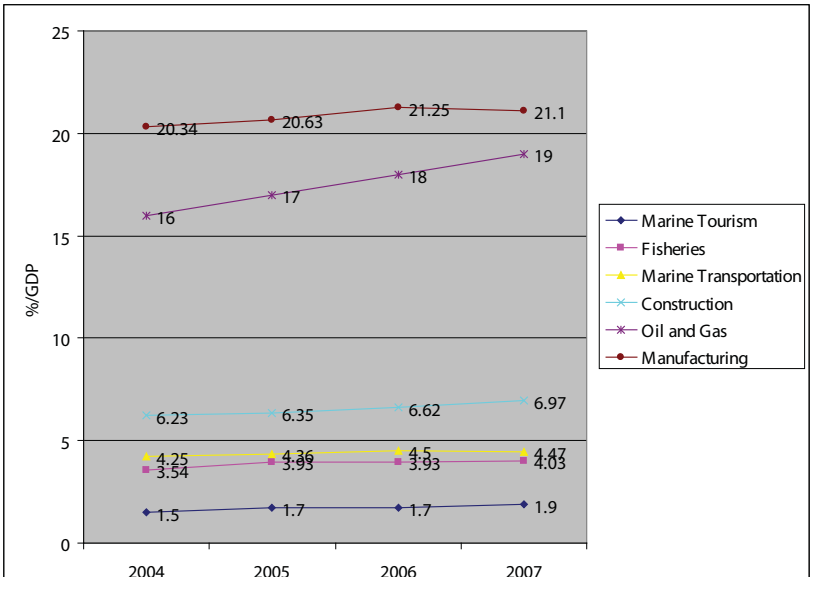

Figure 2. The trend of the Contribution of Marine economy and Fisheries Sectors to the National Economy in GDP from 2004-2007.

the coastal zone of the country. Coping with climate change, particularly sea-level rise, is extremely difficult for Viet Nam considering that a high percentage of people living in coastal areas and islands are poor, despite the high potential of the marine area's natural resources.

These are the problems that need to be addressed as part of the government's effort to develop the marine sector. Unsustainable exploitation and management of marine resources has been identified as a concern of the Vietnamese government, and efforts are now being made to rectify the situation by the Vietnamese Government.

Orientation and solutions

The Vietnamese government is increasingly recognizing the importance of the sea and the marine economy to its sustainable development. The adopted vision of the government is, "Viet Nam must be stronger and richer by the sea."

In recent years, investment in the development of the marine economy has shown very clearly the determination of Viet Nam, e.g., investment in shipbuilding facilities and personnel, in improving and developing ports in the three major regions of the country (i.e., north, central, and south Viet Nam), and in constructing shipyards that are capable of building hundreds-of-thousand-ton ships. In order to develop the oil and gas industry, Viet Nam has invested greatly in exploration in many high-potential marine areas as well as in the construction of Dung Quat Oil Refinery. A series of large projects on remote fisheries and aquaculture have also been approved by the government.

Conclusion

In order to carry out the strategy for marine economic development and integrated management, Viet Nam established a state agency for

Photo: Nguyen Dinh Lac

management of seas and islands, referred to as the General Department of Seas and Islands of Viet Nam. This was a landmark decision of the government, indicating the important recognition and determination of Viet Nam to marine economic development.

The main objectives of Viet Nam in marine economic development in the forthcoming years are as follows:

1. Integrated planning and implementation of integrated management of seas and island exploitation and utilisation, in order to overcome limitations of sectoral planning and management;
2. Sustainable development of the marine economy with due consideration to environmental protection and management, especially with the economic development of renewable natural marine resources and islands, as well as non-renewable resources, including oil and gas, titanium, and other mineral resources;
3. Scientific research and development, technology development, and scientific surveys to better evaluate the potential of the marine economy, how to use the resources effectively and sustainably, and how to develop potential resources, such as methane hydrate, wind and solar energy;
4. International cooperation in investigating, surveying and developing the potential of the marine sector, in order to optimize opportunities for capital investment, scientific development and application of new and innovative technologies;
5. An effective and consistent regulatory system for ocean and coastal governance in order to better manage the Viet Nam sea area;
6. Incentive policies and programs to encourage long-term planning and investment in the marine economy, including the development of islands; and
7. Adaptation to climate change impacts, particularly storm surges and sea level rise, including research, development and implementation of proposed solutions by authorised institutions.

References

General Statistics Office.
Documents and information centre.
Nguyen Huy Cuong and Hoang Van Thu. 2006. Assessing Vietnam's state for sustainable development of aquaculture. Summary report of the National Conference on Sustainable Development of Aquaculture: Issues and ways to approach. Do Son, Hai Phong, p. 32-39.
Doan Thien Tich. 2001. Viet Nam oil and gas. National University Publishing House, Ho Chi Minh City, HCM, 232 pp.
Phung Ngoc Dinh. 1999. Resources of East Asia, Viet Nam. Educational Publishing House. 64 pp.
United Nations. 1992. Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-4 June 1992, Chapter 17. 51 pp.
Vu Van Phai. Sea and sea economic development in Viet Nam: Past, present and future.

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Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

What can measuring the marine economies of Southeast Asia tell us in times of economic and environmental change?

Introduction

Communities in Southeast Asian nations with coastlines have had a long association with the sea and the food, security, and trade benefits it can bring. Many communities have led a subsistence life beside the sea, harvesting seafood and other wood and plants resources in the coastal zone. For most people, the sea contributes to community identity and personal well-being.

Villages and towns have been built in low-lying areas of coast and houses have even been built on reefs. Traditionally over the centuries it has not been clear how sustainable living in these locations will be. Many of the region's industrialized cities keep expanding around their traditional locations to meet the housing and industry needs of expanding populations, in the face of increasing risks from a range of environmental and economic challenges.

It is within this context that we can see that traditional economic measurements of the production and industrial economy, such as gross domestic product (GDP), are not generally presented in a way that is relevant to addressing the issues that these coastal communities will face in their longer-term relationship with the sea. This article shows how having information on economic drivers and the nature and size of industries in the marine economy is essential for national and coastal planning.

Photo: Belyn Rafael

What is the marine economy?

There is no one definition of the marine economy as it is both a measure of economic activity related to ocean industries and activities, but also includes the economic goods and services in coastal region, which are there due to being adjacent to the sea. The research in the area has definitions for the ocean economy and the coastal economy.

Colgan (2004) defines the *ocean economy* as: "that portion of the economy which relies on the ocean as an input to the production process or which, by virtue of geographic location, takes place on or under the ocean. It is a function of both industry and geography …. While most of the ocean economy is located in coastal regions, some of the ocean economy (for example, boat building, seafood retailers and many ocean instrumentation, equipment and surveying industries) may be located in non-coastal regions;" … it is that "portion of economic activity which takes place on or near the coast (whether defined as coastal watershed, coastal zone, or near shore areas). The coastal economy consists of all economic activity in the coastal region, and is thus the sum of employment, wages, and output in the region."

We will see that while some of the coastal economy is the ocean economy, the coastal economy incorporates a broader set of economic activity (Colgan, 2004). It has been found to be much larger than the ocean economy in the United States (Kildow, et al., 2009).

How can we measure the marine economy and what can it tell us?

The industrial sectors in the marine economy

Measuring the marine economy requires an exercise to define the different industrial sectors in the marine economy. In 2005, an Asia-Pacific Economic Cooperation (APEC) Marine Resource Conservation (MRC) Working report included participation in an APEC-sponsored workshop among the 21 member-economies (McIlgorm, 2004) The Easter Island workshop proposed the following industry categories in **Table 1**.

The first three categories, oil/gas, fisheries/aquaculture, and shipping are clearly seen to be ocean industries and the marine data can be readily identified. In the rest of the categories, there are issues in delineating between land and sea components of economic activity. Marine tourism is an example, where a hotel adjacent to the ocean is counted as being part of marine tourism expenditure. The apportioning arrangements for the percentage of marine activity can vary and make using replicable methods a significant issue.

There is also a differing capacity among economies to provide data for each category. **Table 2** shows the different ocean industry sector data available for six international economies in a recent study (Kildow and McIlgorm, 2009). The treatment of the government and defense sector can be influenced by national security and political issues. Marine construction, manufacturing, and marine services may have significant issues in apportioning their marine economic content.

Measuring economic activity in the marine economy

The general approaches in assessing economic activity use standard economic measures related to production; for example, output-GDP, input measures, and value added. Employment is also a key indicator. Taxation and export revenues may also be measured and are of interest to government.

GDP is an accepted measure of the "value added" from economic activity and is preferred as it (Kildow, et al., 2009): removes the danger of double counting (noted in all previous studies); provides a meaningful basis for comparison across industries; and simplifies analysis of regional impacts. The term gross value added (GVA) is the value of outputs produced by an industry less the value of its inputs and can be directly compared with GDP, but GVA understates the economic importance of an industry to a region, because it excludes the value of inputs produced within the region.

The following five-stage process for measuring the marine economy has been recommended by Kildow and McIlgorm (2009):

Table 1. APEC MRC roundtable on Easter Island (McIlgorm, 2004).

1. Oil and Gas (i.e., minerals);
2. Fisheries/Aquaculture (i.e., living resources including sea plants);
3. Shipping (i.e., transportation and shipbuilding);
4. Defense/Government (i.e., government services);
5. Marine Construction (e.g., coastal defenses and restoration);
6. Marine Tourism (i.e., leisure services);
7. Manufacturing (i.e., equipment, medicines, etc);
8. Marine Services (e.g., mapping, surveying, consulting); and
9. Marine Research and Education.

Table 2. Ocean economy industry sectors proposed by APEC for six different national studies (Kildow and McIlgorm, 2009).

Ocean economy - APEC industry sectors	Australia	Canada	France	New Zealand	United Kingdom	USA
Oil and gas (minerals)	•	•	•	•	•	•
Fisheries/aquaculture (living resources)	•	•	•	•	•	•
Shipping (marine transportation and ship building)	•	•	•	•	•	•
Defense/government		•	•		•	n/a
Marine construction		•	•	•	•	•
Marine tourism (leisure services)	•	•	•	•	•	•
Manufacturing (equipment)		•		•	•	
Marine services (mapping, surveying, consulting)		•	•	•	•	
Marine research and education			•		•	

* n/a - data not available.

1. define industries that are part of the ocean economy;
2. identify those industries via the use of data from the national accounts;
3. estimate the proportion of total economic activity that is ocean / marine-related;
4. record the estimated expenditure in the marine economy and in the case of the USA, include employment, number of establishments, earned wage, and productivity numbers; and
5. compare official government estimates with available information from industry sources.

Identifying the marine activity in national accounts may be difficult and require additional survey activity. For example, Kildow, et al., (2009) reported that when using only national accounts data, marine construction, offshore minerals, and fisheries categories suffer in the North American Industrial Categories (NAICS) from two problems:

1. Incomplete data on the sectors because of the configuration of the category for identifying the full spectrum of offshore activities and the inconsistency of reporting from the fishing industry; and
2. Inability in some cases to distinguish what is land-based and ocean-based from the available information.

Surveying may assist in defining the proportion of a national account's total in the ocean economy; and provide missing data not available in the national accounts (Kildow and McIlgorm, 2009). However, the survey estimates may be arbitrary, not easily replicated, and may be based on limited and inaccurate survey data or information. There may also be industry pressure for the estimate of the value of the industry to be overestimated for lobbying purposes. This may lead to issues with double counting which is why we prefer to use standardized national accounts data.

Nonmarket values

In addition to market-based economic indicators, some national studies include "nonmarket" value estimates, or values of goods and services not traded in the market place, and which do not have a societally derived price. These estimates require specific measurement studies of specific sites, assets, and services for particular purposes and are randomly produced depending on funding sources and policy needs. Nonmarket estimates, which are snapshots in time, are quite separate from GDP measures that indicate changes over time. Their purpose is to estimate recreational and environmental asset and service values, which are not measured in the market place, but have unmeasured values, or consumer surplus values that provide benefits. Estuaries, beaches, watersheds, and mangroves are but a few of these natural assets. These areas provide pollution filtration, nursery grounds for fisheries, and buffering from storms, and are examples of natural assets providing environmental services.

What size is the marine economy?

The estimated national contribution of the ocean economy in six international economies is reported in a comparison of results in **Table 3**. The studies calculate the GDP, or value added, and present the results as a percentage of GDP.

The Canadian study reports value added by the ocean economy as 1.5 percent of GDP. The British study has a value of 4.9 percent of GDP in 2000 and is the highest proportion of the national economies examined. The US ocean economy was 1.2 percent

of total GDP in 2004 and the French marine economy was 1.4 percent in 2003. The Australian marine sector is reported as 3.6 percent of GVA in the national economy and the New Zealand marine economy is 2.9 percent of national GDP.

The equivalent results for the East Asian region are not currently available and are the subject of a PEMSEA project with participants presenting national studies at the East Asian Seas Congress in November 2009.

Has the marine economy been measured in East Asia?

Recently, there have been several marine economy studies in East Asia. Preliminary investigations reveal the need for a consistent framework to enable accurate comparisons between economies to be made. Measuring industry sectors ensures the final estimates are accurate for comparative purposes. The following economies have commenced studies through a PEMSEA project. A summary of data available for industry categories is reported in Table 4.

In **Table 4**, it is apparent that there is most agreement on categorization of oil and gas, fishing, shipping/marine transport, and marine tourism. This does not mean these sectors are identical among different countries, as categories will vary depending on resources and industry practices. Marine tourism data are diverse and need careful interpretation.

Defense and government expenditures are either omitted from the marine economy profile, or some parts, such as navy expenditure, are included. The inclusion or exclusion of the defense force and the government sector will impact the measurement of the marine economy as a percentage of the total economy. Where government marine expenditure is large, the marine economy would gain from this activity.

The definitions of marine construction and manufacturing categories may differ among economies. Lastly, the marine education and research category is not available in all economies and often requires a specific study exercise for measurement.

What is the value of marine economy information?

The size of the ocean economy expressed as a percentage of the total national economy is an indicator of contribution of the marine economy to the whole national economy. It also indicates the dependence of the economy on the ocean for goods and services and when compared with other marine economies, gives a profile of the strengths and diversity of the marine economy in comparison to the marine economies of other nations.

The studies in North America have shown that developed economies with a high degree of industrialization and large population, have an apparently small contribution from the ocean economy when measured as a percentage of total economic activity. Current research is moving towards examining small, less developed and island economies, where a priori we may expect the ocean economy to be a higher percentage of the national economy.

It is also important to recall that the ocean economy, not the coastal economy is being measured. International data on coastal economies are not available for comparisons with ocean economy studies.

Trends and changes in the marine economy

Repeating marine economy studies every year, or biannually, creates a time series of marine economy data by category that enables sectors of the

Table 3. The national estimates of the ocean economy as a percentage of the total national economy from past studies (Kildow and McIlgorm, 2009).

Country	Author	Date of Study	Date of Data in Study	$ Marine Sector GDP/ GVA*	Percentage of national GDP/GVA
Australia	Allen	2004	1996-2003	A$26.7 billion	3.6 GVA
Canada	RASCL	2004	1988-2000	C$22.7 billion	1.5 GDP
France	Kalaydjian, et al.	2006	2003	Eur18.9 billion	1.4 GDP
France	Kalaydjian, et al.	2008	2005	Eur21.5 billion	1.2 GDP
NZ	Statistics NZ	2006	1997-2002	NZ$3.3 billion	2.9 GDP
UK	Pugh and Skinner	2002	1999-2000	GB£39 billion	4.9 GDP
UK	Pugh	2008	2005-2006	GB£46 billion	4.2 GDP
USA	Colgan	2004	2000	US$118 billion	1.2 GDP
USA	Kildow et al.	2009	2004	US$138 billion	1.2 GDP

*The Australian data are GVAs.

Table 4. A comparison of APEC industry category data availability among Southeast Asian economies.

Ocean economy - APEC industry sectors	Indonesia	Japan	RO Korea	Malaysia	Philippines	Thailand	Vietnam
Oil and gas (minerals)	•	•	•	•	•	•	•
Fisheries/aquaculture (living resources)	•	•	•	•	•	•	•
Shipping (marine transportation and ship building)	•	•	•	•	•	•	•
Defense/government	n/a	n/a	Some	n/a	Some	•	•
Marine construction	•	•	•	n/a	n/a	•	•
Marine tourism (leisure services)	•	•	•	•	•	•	•
Manufacturing (equipment)	•	n/a	•	•	•	n/a	•
Marine services (mapping, surveying, consulting)	•	n/a	Some	n/a	n/a	•	n/a
Marine research and education	n/a	n/a	n/a	n/a	•	•	n/a

Sources: National marine economy studies in this volume of Tropical Coasts.

marine economy to be monitored and compared through time. Trends in the growth or decline of the contribution of the ocean sector can be observed, but are usually made up of changes in several of the industries within the marine sector.

For example, in several of the North American studies, growth and declines in the ocean economy followed changes in the service sectors and in the manufacturing and production sectors. The Canadian and National Ocean Economics Project (NOEP) studies noted a declining trend in fishing industry production values over the last decade, and also an increase in the value of marine tourism during the same period, with a decline in the production/manufacturing sectors and a rise in the services sectors. Sectoral evaluation of trends in each specific ocean sector gives decisionmakers a more complete picture of the changes in the ocean economy and how the different economic activities compare with each other, which is important when tradeoffs must be made by decisionmakers (Kildow and McIlgorm, 2009).

What is not measured in the national accounts approach is the sustainability of ocean activities, e.g., fish catches may reduce the total fish stocks, and oil and gas production is depleting nonrenewable resources. Even in the service sectors, large activities such as tourism are volatile and vulnerable to events such as changes in the weather, the economy and in public perception of amenity and attractiveness of the region.

Externalities and unmeasured values

When economic growth in the marine sector is measured by GDP, there can be external costs and changes in value that are not included in the GDP measure. For example, the growth in shipping or oil production, may increase pollution and its costs on the environment. Such external costs are not generally included in the ocean economy analysis, though if vessels were used to clean up spills this is recorded in GDP measures. Using the sea for waste disposal through land water runoff, may not be sufficiently included in measures of the ocean economy, being borne by the environment and the public who pays for the impacts and mitigation measures.

The GDP data do not include environmental stocks and ecosystem values, which are not direct goods and services. The international community has attempted to take wider environmental values into account in national accounting frameworks including the environment in measures of human well being. The value of the oceans to humankind has both use and nonuse values, though the nonuse values are not measured explicitly in the national accounts.

How can knowledge about the marine economy assist policymakers?

The information on the marine economy can be used by policymakers in several ways.

First, in identifying the economic contribution and its origins, policymakers can be more aware of potential policy impacts on producers and consumers in the marine economy. In many East Asian economies, large ports, coastal fishing communities, and marine tourism are near to each other and policymakers should be aware of the economic contributions made by each in policy development. For example, a plan to expand port facilities may reduce

marine tourism in a given area. Having data makes for a more informed political and community debate.

Kildow and McIlgorm (2009) note that in the USA, Florida represents a large segment of the national ocean economy, because its coastal and ocean economies are so extensive. Yet, Florida is the most vulnerable state to climate change impacts, particularly sea level rise and coastal inundation from storms, that protecting this economy should be of concern to the national government also, not just a regional issue. Having data on the value of the marine economy focuses this policy question.

Second, knowing the structure of the ocean economy can be used to see how external events such as storms, climate change, and environmental change may impact the ocean economy. This is where detailed knowledge of the coastal economy is particularly useful. The devastating tsunami in Southeast Asia in 2004 had many impacts on the region's ocean and coastal economies. Many national and regional economies were deeply impacted by these events and a massive rebuilding program was required. There were few, if any studies of the previous ocean and coastal economies and thus impact assessment was much less comprehensive and future planning was a more difficult task.

The interrelationship of the ocean and coastal economy became clear during hurricane Katrina in the USA. Given there had been a coastal and ocean economy study, the information for the impacts on jobs and the region was produced within days, due to having the NOEP data available (Kildow and McIlgorm, 2009).

Third, having measured the marine economy, there are national investment reasons why government should monitor the changes in the ocean and coastal economy. In the USA, a federal mandate was added in the Oceans Act of 2000 that required an ocean budget to be prepared every two years by the President, with information on the amount of annual federal government civilian expenditure on the oceans. This gives a federal perspective on the coastal and ocean economies being managed in the US national government and is a mechanism to monitor the investment and net returns from ocean activities.

There are also other uses of the marine economy information. Total value of the ocean or coastal economy is sought initially, but additional valuations are required for decisionmaking, particularly in local or regional decisions. This requires marginal values, or the added values of goods and services created by the ocean, as well as the values of economic activities that take place in or near the ocean (Kildow and McIlgorm, 2009). Marginal valuation requires additional estimation and is generally site- and resource-specific. The values are used in planning and resource allocation processes, particularly when allocating land sites between alternative uses in the coastal area.

The marine economy valuation process also identifies other values. It has become clear globally that environmental and recreational assets have values outside of the marketplace and are too often ignored because they do not have prices attached to them directly. For example, estuaries, wetlands, mangroves, beaches, surfing, swimming, and other recreational and environmental assets all have values that economists have been estimating for at least 40 years, with increasing accuracy and legitimacy as methodologies become more sophisticated each year. Our case is not to devalue these, but to present a national accounts-based framework

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for valuing market-based values in the marine economy.

Economic vulnerability of the marine economy and the economic costs arising from impact on assets

The economic impact of uncertain processes and events such as climate change, sea level rise, and tsunamis need to be measured. For example, a scientific analysis of sea level rise risks may include the different value of land use along the coastline. This falls short of recognizing the economic contribution arising from such land and hence the vulnerability of the economy. Some coastal areas can be surrendered to the ocean at low cost, while other areas have power stations and petrochemical refineries in low-lying sites. Inundation by seawater would have a high economic impact well beyond the value of the immediate land lost. For example, a petrochemical refinery site would have a considerable amount of the nation's economic activity dependent on its fuel. The study of the marine economy enables the local economy around coastal capital assets to be identified and their vulnerability assessed, with options for mitigation by industry and government. Improved long-term planning can come from recognizing economic values and their vulnerability from climate threats.

Other impacts on the marine economy - implications of the global financial crisis

Recently, the world has experienced a significant economic downturn referred to as the global financial crisis (GFC). This has had the impact of removing several years of economic growth from the economy. The origins of the GFC were in poor bank lending practices, leaving economies in a depleted state.

In such a scenario, there are some interesting questions on the resilience of the marine economy. Has the marine economy fared better than the general economy? Or how have the different marine industry categories fared during the crisis? Much of the available evidence is from the US NOEP (Kildow et al., 2009).

An industry category such as "living resources" starts with a sector that has had fish resources in decline due to overfishing. In the US, the demand for expensive crustaceans lessened, though the demand for lower-cost Southeast Asian-produced shrimp has remained and increased, which would boost the living resources sector in several Southeast Asian economies. We might expect oil and gas value of production to decrease, but this would depend on prices. Private sector investment in the marine construction and supply industries for the oil industry may also be adversely impacted, though some recent liquefied natural gas projects may have softened the impacts. Where economies have an aggregate dredging industry, it is likely to be highly impacted by a reduction in large building projects.

Naval and large shipbuilding has also been negatively impacted by the GFC, though governments often delay contracts for new naval vessels rather than the cancellation of orders by the private sector. Recreational boat building is likely to be severely impacted as a large number of second-hand yachts

become available at reduced prices. Since the GFC, most marinas have had many vessels for sale and a lower rate of occupancy for vessel births.

Shipping and marine transportation have been impacted by the GFC. Exports from Asia to the US fell and demand in the US fell dramatically reducing the need for freight of goods. The Los Angeles Port saw a drop of one-third of inbound containers in the first two quarters of 2009 (Kildow et al., 2009). This would have impacted the need for transport in the general economy. Cruise liners have a range of products but have generally experienced reduced demand and have reduced cruise prices in response.

Marine tourism and recreation have been altered by the GFC with travellers examining the length of travel and their air and car travel expenditures. Anecdotal evidence suggested more travellers may be opting to stay at home for vacation, increasing the domestic tourism and reducing expenditures in tourist areas abroad.

The coastal economy in Australia has been impacted in the hotel and resort building industries in Far North Queensland due to a downturn related to both the GFC and a reduction in number of international tourists to Cairns. This illustrates that marine tourism is vulnerable to variables and is responsive to external impacts and perceptions.

Other significant impacts can be seen in the impacts of both the GFC and climate change on coastal housing prices.

Conclusion

As populations have increasingly moved to the coasts and as coastal industries have grown, the need to monitor this marine economic activity is gradually being recognized. In the Southeast Asian region, populations are large and the expectations of the coast and seas have been increasing.

We have examined how the ocean and coastal economies can be identified and measured in a consistent way. This includes market values, but does not include nonmarket values which is a further consideration.

The experience in the USA, Canada, and Australia is that knowledge of the marine economy is useful in informing and influencing policy and decisionmaking. The recent GFC and ongoing concerns about climate change means that both the government and the private sector need to have an accurate profile of the economic activities in the coasts and oceans. They also realize these goods, services, and assets are vulnerable to economic and environmental changes. Having specific data enables plans to be made to mitigate future impacts.

References

Allen Consulting. n.d. "The economic contribution of Australia's marine industries–1995-96 to 2002-03." A report prepared for the National Oceans Advisory Group. Australia: Allen Consulting Group Pty Ltd. p. 61.

Colgan, C.S. 2004. "Measurement of the ocean and coastal economy: theory and methods." National Ocean Economics Project, USA. www.OceanEconomics.org.

Colgan, C.S. 2008. "Estimating the economic value of the ocean in a national income accounting framework: preliminary estimates of gross product originating for 1997." National Ocean Economics Project, Wrigley Institute for Environmental Studies, University of Southern California Working Paper 1, July.

Kalaydjian, R., E. de Martin, F. Daurès, S. Girard, R. Mongruel, J. Perez, M. Planchaut and O. Thébaudet al. name all authors. 2008. French marine-related economic data, 2007. Marine Economics Department, IFREMER, Brest, France.

Kildow, J.T. and McIlgorm, A. 2009. "The importance of estimating the contribution of the oceans to national economies, marine policy." Accessed from Elsevier, doi:10.1016/j.marpol.2009.08.006

Kildow, J.T., Colgan, C.S., and Scorse, J. 2009. State of the U.S. ocean and coastal economies 2009. National Ocean Economics Project, USA.

McIlgorm, A. 2004. "Economic value of the marine sector across the APEC marine economies." Draft report to the APEC Marine Resource Conservation Working Group Project (05/2004), by the Centre for Marine Policy, University of Wollongong, Australia.

NOEP (National Ocean Economics Project). 2000. "The National Ocean Economics Project: the contribution of the coast and coastal ocean to the USA economy." Wrigley Institute, University of Southern California. Accessed from http://biology.usc.edu/NOEP.

NOEP (National Ocean Economics Project). 2008. "The National Ocean Economics Project – Research Strategy." Accessed from http://biology.usc.edu/NOEP/research.html.

NZ Stats. 2006. "New Zealand's marine economy, 1997 to 2002." An experimental series report by Statistics New Zealand.

Oceans Act of 2000. 2009. "PL 106-256. To establish a Commission on Ocean Policy in the United States." Retrieved on 21 May 2009 from http://oceancommission.gov/documents/oceanact.pdf .

Pugh, D. 2008. Socioeconomic indicators of marine-related activities in the UK economy. Crown Estate. 68 p.

Pugh, D. and Skinner, L. 1996. "An analysis of marine-related activities in the UK economy and supporting science and technology." Information Document No. 5. Southampton: Inter-Agency Committee for Marine Science and Technology, SOC. 52 p.

RASCL (Roger A. Stacey Consultants Ltd). 2003. "Canada's ocean industries: contribution to the economy 1988-2000." Prepared for the Economic and Policy Analysis Division, Department of Fisheries and Oceans, Ontario.

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Economic contribution of the marine sector to the Japanese Economy

Introduction

Japan is an ocean state, as it is geographically surrounded by oceans. Its economy and society have been maintained and supported by ocean-dependent activities.

Japan consists of about 6,800 islands with five major islands, namely Honshu, Hokkaido, Shikoku, Kyushu, and Okinawa. Thus, it can be said, that Japan is an archipelagic state, too. The archipelago is surrounded by the Sea of Okhotsk, the Sea of Japan, the East China Sea, and the Pacific Ocean. While Japan has only about 37.8 km^2 land territory, ranked 61st in the world, the length of its coastline reaches about 3.5 km, ranked sixth in the world. The area of 200 nautical mile zone, including territorial sea and exclusive economic zone, is about 4.47 million km^2, also ranked sixth-largest in the world.

Japan depends on maritime transport, about 99.8 percent of its trade volume and nearly 40 percent of domestic transportation. Fishery products supply 40 percent of animal protein for the people. Therefore, ocean-related industries, such as shipping, fisheries, shipbuilding, ship machineries, port and harbor logistics and distribution, and coastal construction and civil works,have been the bases for Japan's economic society and for the stability of its citizens. The sound development of ocean industries is indeed essential.
There have been several studies on Japan's ocean industries over the years.

Activity Area	Business Contents	Production Activity (Flow)		Production Activity (Stock)
		Goods	Service	Goods
Ocean	Resource exploration, Exploitation business	Type A (sectors)		
	Ocean space utilization Business			
	Ocean conservation and management Business			
Non-Ocean	Goods and service supply Business to Type A	Type B (sectors)		
	Business, converting output resource by Type A to another goods and service	Type C (sectors)		

Figure 1. Categorization of Ocean Industries (Research Report of the Survey on Activities of Ocean Industries, March 2009).

Efforts to evaluate Japan's ocean industries

The first effort to evaluate Japan's ocean industries was documented in a book in 1996, entitled For the Promotion of the Ocean Industry (published in Japanese by the Kyushu Bureau of International Trade and Industry). This book featured Kyushu and promoted its ocean and space industries, and estimated the size of the whole of Japan's ocean industries. It showed an estimate of a maximum case of 21.20 trillion yen and a minimum case of 15.13 trillion yen, summing up 71 different categories and items. It pictured a very challenging scenario then.

In 1996, the government issued a document featuring 15 promising industrial fields, with their market size and employment, in "Program for Economic Innovation and Creation." The document included ocean industries with figures of market size of 4 trillion yen and 590,000 in employment in 1993. The report suggested these figures would rise to 7 trillion yen and 800,000 in 2010. However, the government did not disclose the methodologies used for these quantitative estimates.

The third effort to evaluate was through a report called "Research on Creating New Business Activities for Ocean Industries," made by the Research Institute for Ocean Economics (RIOE) in 2000. This research was contracted by the Research Institute for International Economy, Trade and Industry, backed up by the relevant ministry. The research methodology used input-output table data and existing available data issued by related industrial organizations, combined with data from RIOE. The estimate for the size of ocean industries

was 3.4 trillion yen, based on 1995 data. This estimate was below that indicated in the government documents though, as around 3.4-4.0 trillion yen seemed to be the reasonable size of Japan's ocean industries at that time.

In 2006, the White Paper on Oceans, edited by the Ocean Policy Research Foundation, was published. The White Paper on Oceans series was created in 2004 and is commercially published for various sectors such as public, private, academe, and others. Although it is not a government-authorized paper, the White Paper has been widely accepted as a qualified document in ocean-related communities in Japan.

The 2006 edition of the White Paper on Oceans featured the value of the oceans, and a section entitled "Industrial activities of oceans" (Nakahara, 2006). The paper summarized the above-mentioned monumental but scarce documents, provided a clear definition of ocean industry, and made the latest quantitative estimate of Japanese ocean industries. The paper categorized ocean industries into three: conventional, innovative, and transitional and duplicated.

Conventional ocean industries include fisheries and shipping which have been growing from very ancient ages and also will keep their dominant position in the future.

Innovative ocean industries appeared upon drastic science and technology development in and after the 1960s when humankind reached the deepest bottom of the oceans as well as launched human spacecraft. Such trends stimulated new types of oceanic activities, such as large-scale artificial island construction, ocean drilling rigs and platforms as well as seabed pipelines for subsea oil and gas development, deep-sea mineral exploration and exploitation, ocean-renewable energy utilization, etc. So-called ocean development industries have been recognized and expected to open a new horizon in the industrial world.

An example of a transitional and duplicated type of industry is aquaculture, which can be upgraded to a certain scale of marine ranch in the open ocean in the future.

An estimate of the size of Japan's ocean industries was also presented in the White Paper, after examining surveys on industry statistics done by the government, official input-output tables, and published data by industrial associations. The result was 13.62 trillion yen, summing up 6.5 trillion of both international and domestic shipping; 3.3 trillion yen of fisheries food produce; 2.4 trillion yen of shipbuilding and ship machinery products; 1.3 trillion of coastal civil works and construction of port and harbor; and others.

Photo: Tetsuo Itou

Basic Act on Ocean Policy and the Basic Plan

The first government-authorized paper on ocean industries was the Basic Act on Ocean Policy which was enacted in April 2007), and entered into force on 20 July 2007. The act includes industry encouragement articles and describes six basic principles from Articles 2 to 7 in Chapter I - General Provisions, as shown below:

- Article 2: Harmonization of the Development and Use of the Oceans with the Conservation of Marine Environment
- Article 3: Securing the Safety and Security of the Oceans
- Article 4: Improvement of Scientific Knowledge of the Oceans
- Article 5: Sound Development of Ocean Industries
- Article 6: Comprehensive Governance of the Oceans
- Article 7: International Partnership with regard to the Oceans

Article 5 highlights the industrial perspective, and it is written as follows: "With regard to the industries bearing the development, use and conservation of the oceans (hereinafter referred to as 'Ocean Industries'), in consideration of the fact that they are the basis for the sound development of the economy and society of our State and of stabilization and improvement of the lives of the citizenry, their sound development shall be promoted."

Also Article 24 (Promotion of Ocean Industries and Strengthening the International Competitiveness) in Chapter III - Basic Measures, states with respect to the encouragement of ocean industry, the following: "The State, in

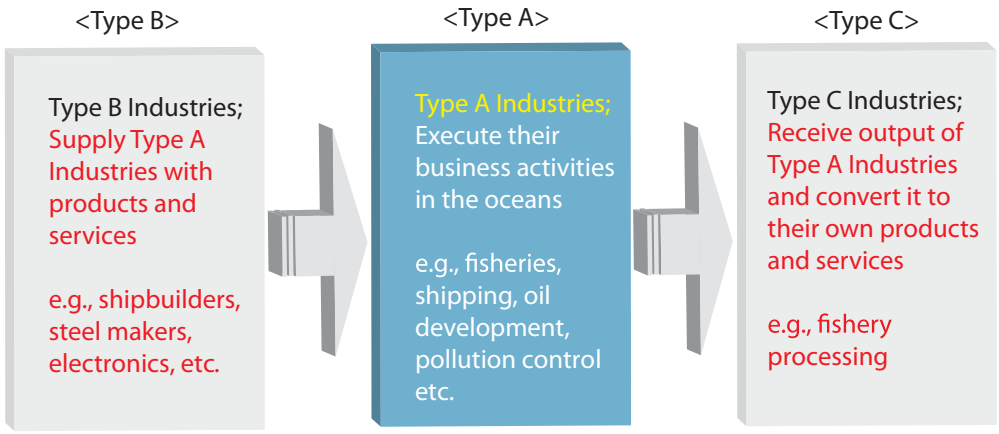

Figure 2. Categorization of Ocean Industries (Research Report of the Survey on Activities of Ocean Industries, March 2009).

order to promote the Ocean Industries and to strengthen the international competitiveness, shall take necessary measures with regard to the Ocean Industries, to promote the cutting-edge research and development, to upgrade the level of technology, to nurture and secure the human resources and to reinforce the management basis with the improvement of competitive conditions and others as well as to exploit new businesses and to execute others."

Since this Basic Act requires the government to formulate the Basic Plan, the Japanese Cabinet authorized the Basic Plan on Ocean Policy on 18 March 2008. Naturally, it includes related parts in Chapter II; Measures that the Government Should Take Comprehensively and Systematically with Regard to the Sea, reflecting the contents of the Basic Act as follows:

"8: Promotion of Marine Industries and Strengthening the International Competitiveness: (1) reinforcement of the management base; (2) creation of new marine industries; and (3) understanding of trends of marine industries."

It also mentions that "Trial calculations have been made on market size and other matters concerning marine-related industries, but official surveys on trends have never been conducted. In order to take various measures appropriately for promoting marine industries in the future, it is important to correctly analyze and understand marine industries as defined by the Basic Act on Ocean Policy. For that purpose, it is required to survey, compile and organize basic information concerning marine industries."

It also highlights the importance of creating new industries by taking advantage of abundant marine resources and vast marine spaces surrounding Japan. The promotion of technological development would help facilitate use of the sea by various industries and marine-related technologies. The formulation of an innovation system under industry-academe-government collaboration and the promotion of rational planning for these sectors is needed to establish clear goals; conduct surveys, research, and development; and put results into practical use.

It is likewise important to maintain and strengthen the international competitiveness of Japan's marine industries by introducing new technologies, promoting advance research and development, and fostering human resources.

In section 3 "Understanding of trends of marine industries," this is stated: "For grasping the effects of various measures implemented for marine industries and reviewing them, surveys should be conducted to understand the current conditions and trends of marine industries, with regard to indicators such as the size of industry and the number of employees."

To implement this, a survey was done and a research committee, with scholars and eight specialists, was organized to analyze the input-output table results. Several committee meetings were held to have intensive discussions on the draft paper prepared by the Nomura Research Institute which was contracted by the Headquarters on Ocean Policy of Cabinet Secretariat. The report was published in March 2009. [The author, who has been engaged in studies on ocean industry in Japan for more than 35 years, was appointed member of the survey committee.- ed.]

Official report of the survey

Ocean industries are defined by the Basic Act on Ocean Policy as "industries bearing the development, use and conservation of the oceans". According to the Official Report of the Survey on Activities of the Ocean Industry, there are three types (A-C) which represent the meaning of "bearing" among ocean industries (Figures 1 and 2):

- Type A industries: these execute their business activities in the ocean, e.g., fisheries, shipping, towing, minerals, oil, and gas development, pollution control, marine construction, etc. Activities occur not only on the surface but also in water column, on seabed and subsoil of the ocean.

- Type B industries: these supply Type A industries with products and services, e.g., shipbuilders, steelmaker s, electronics, etc. Activities are not necessarily in the ocean but also on land, from coast to inland.

Table 1. Breakdown of estimate of domestic production of ocean industry in Japan (in 2000 basis).

Category	Sector Name	Domestic Production (Million Yen)	Employment (person)	Added Value (Million Yen)
Type A Industries (Business activities in the ocean)	Coastal fisheries	576,449	165,223	417,661
	Offshore fisheries	445,580	40,126	280,779
	Distant fisheries	212,700	10,512	122,710
	Marine culture	564,228	70,391	277,526
	Salt	53,931	1,268	24,476
	Ocean transport	1,866,130	7,120	217,569
	Harbor transport service	1,392,854	106,157	843,922
	Port and water traffic control	119,645	6,348	77,896
	Service relating to water transport	90,537	10,135	74,932
	Gravel quarrying	92,506	4,379	40,888
	Crude petroleum and natural gas Crude petroleum 22.4% Natural gas 12.9%	12,319	266	7,774
	Public construction of rivers, drainage and others Coastline: 242,411 million Yen Port and fishery port: 1,094,240	1,336,651	113,206	644,770
	Coastal and inland water transport Freight: 100% Passengers: 98.0%	948,539	44,878	464,710
	Fixed telecommunication	216,864	5,952	135,511
	General rental and leasing (except car rental) Sports goods recreation goods	1,268	33	835
	Civil engineering and construction services: 0.36%	14,838	1,663	10,951
	Other business services: 0.07%	9,830	1,241	6,731
	Stadium and companies of bicycle, horse, motorcar and motorboat races: 9.83%	176,495	7,893	125,908
	Other amusement and recreation services: 46.7%	518,189	45,220	406,294
	Places for private lessons: 1.76%	59,956	12,164	46,783
	Type A Total	8,709,511	654,576	4,228,626
Type C Industries (Receiver of type A)	Frozen fish and shellfish*	1,608,275	54,484	499,590
	Salted, dried or smoked seafood	651,306	33,240	244,600
	Bottled or canned seafood	144,970	5,360	50,686
	Other processed seafood	1,046,267	49,202	298,546
	Wholesale trade (fresh fish, shellfish and seaweed)	1,733,878	143,137	1,213,630
	Type C Total	5,184,696	285,423	2,307,052
Type B Industries (Supplier of type A)	Frozen fish and shellfish*	1,608,275	54,484	499, 590
	Manufactured ice	59,096	3,493	30,619
	Ropes and nets	85,156	7,855	34,215
	Heavy Oil A	702,295	1,176	298,188
	Steel ships	1,369,505	37,350	386,512
	Ships (except steel ships)	54,720	4,545	21,087
	Repair of ships	229,725	9,533	90,656
	Other services relating to communication	63,498	10,609	43,724
	Type B Total	4,172,270	129,045	1,404,591
Grand total of ocean industries market prize		**16,458,202**	**1,014,560**	**7,440,679**

* Frozen fish and shellfish is calculated only once because of duplication.
(Source: Research Report of the Survey on Activities of Ocean Industries, March 2009).

- Type C industries: these receive output of Type A industries and convert this to their own products and services, e.g., fishery food processing, petrochemicals, etc. These industries purchase and receive products and services from Type A industries and convert them to their own outputs.

The Official Report also intensively investigated the contents of the input-output table and estimated the results, as follows (**Table 1**): (1) domestic production was at 16.5 trillion yen; (2) the number of employees was at 1.01 million; and (3) added value of ocean industries was 7.4 trillion yen, which meant about 1.48 percent of the GDP in year 2000.

These results are to be updated when a new table is issued officially in the next two years. The previous report dealt only with domestic production. The next report should include export activities as well.

There was an attempt to compare Japan with other other advanced ocean states and neighbors in Asia, but the research committee found this difficult to do since available data were calculated using different methodologies and categorization of ocean industries.

European ocean industries

With regard to the contribution to the national economy by ocean industries, the French Research Institute for Exploitation of the Sea (IFREMER), provided useful data in the case of Europe (Figure 3). Although based on 1997 data, the fundamental characteristics of ocean industries in each country in Europe have been symbolized. For example, the British ocean industry had top added value but it contributed less than one percent only to the national economy. On the contrary, Norway had its ocean industry ranked within the top five on added value and the ratio to GDP exceeded five percent, owing to their shipping and fishery industries by tradition, and North Sea oil production as a newcomer.

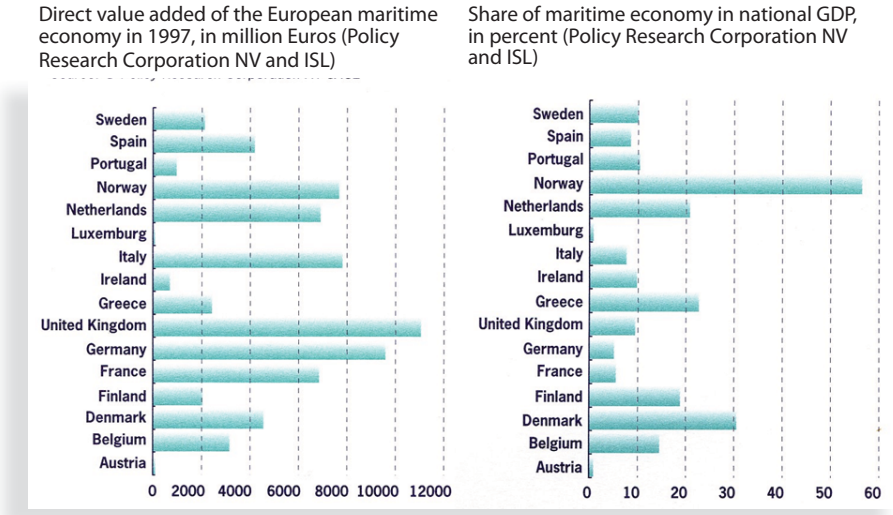

Figure 3. Maritime Economy in Europe.

Conclusion

It seems difficult to make quantitative estimates on ocean industries because those consist of cross-sectoral configurations. There are no official statistics. Searching for appropriate information and making discussions on equitable standards both in domestic and international arena are not easy to do. Making definitions of and categorizing ocean industries are also difficult since each nation has its own industrial structure. But exchange of experiences to execute such efforts is worthwhile in order to develop common recognition on grasping the status quo of ocean industries, at least on categorization.

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References

Kyushu Bureau of International Trade and Industry. 1996. For the promotion of the ocean industry. Kyushu Bureau of International Trade and Industry (In Japanese).

Nakahara, H. 2006. Umi no sangyo katsudo (Activities of ocean industry), Section 1, chapter 1, Kaiyo-Hakusho 2006 (White Paper on Oceans 2006). Ocean Policy Research Foundation. p.8-17. (In Japanese).

NSO (National Statistical Office). 2000. Accessed from http://service.nso.go.th/nso/nso.go.th_center/ project/table/ files/S-mf/2543/000/00_S-mf_2543_000_010000_00102.xls (In Thai).

Prime Minister of Japan and his Cabinet website. Unofficial English translation of the Basic Act on Ocean Policy. Accessed September 2009 at http://www.kantei.go.jp/jp/singi/kaiyou/konkyo5.pdf; http://www.kantei.go.jp/jp/singi/kaiyou/kihonkeikaku/080318kihonkeikaku_E.pdf; and http://www.kantei.go.jp/jp/singi/kaiyou/chousa/kaiyousangyou.html.

Program for Economic Innovation and Creation. 1996. Keizai-Kozo no Kaikaku Puroguramu (Program for Economic Innovation and Creation). Government of Japan. (In Japanese).

Research Institute for Ocean Economics. 2000. Kaiyo-kanren-sangyo niokeru shinki jigyou souchutsu ni kansuru chosa kenkyu (Research on creating new business activities for ocean industries). (In Japanese).

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The Contribution of the Marine Economic Sectors to the Indonesian National Economy

Introduction

Physically, Indonesia is blessed with 17,508 islands and with the second-longest coastal line in the whole world – estimated to be 81,000 km in length. As an archipelagic state, 70 percent of its surface is solely covered by oceans – around 5.8 million km^2 (Dahuri, 2001). With such vast potential, if optimally used, the marine and fisheries sectors would surely be the leading prime movers for Indonesian economic growth. Ironically, the awareness of the strategic roles of the comparatively advantageous primary sectors of the nation was very low, until recently.

During the old administration, before the Reformed Administration (New Order era, 1966-1998), the developmental strategy did not really put enough attention to most of the primary sectors – especially marine and fisheries sectors. This is because the old administration set the "ugly-duckling" primary sectors aside and blindly chased after the "golden-egg-laying" industrial sectors for the sake of growth. This was demonstrated by the high conversion rate of farming land in Java, which is vulnerable to volcanic eruptions and has extremely suitable soils for farming, being used for factories and other purposes during the New Order (Hasan Basri, 2007).

Unfortunately, this industrialization – even though necessary for growth – was seemingly done without any connection whatsoever between the industrial sectors and the other sectors, including primary ones. It seemed that during the New Order era, both primary and industrial sectors were moving separately from each other. Thus, it created an export-oriented bubble economy which was heavily dependent on imports for its production inputs. It was not surprising that the industrial sectors were the ones most impacted by the Asian crisis which brought with it a sharp currency devaluation that caused them to halt production and spiral downwards.

The proof of how formidable Indonesian marine and fisheries sectors can be was recorded in the period 1997-1998 during the Asian economic crisis. While the industrial sectors were contracting and suffering from the free-falling devaluation, the primary sectors, such as marine and fisheries sectors, broke through the barricade of the looming crisis, led the way, and dragged the gasping, almost-drowning Indonesian economy to the surface and to safety. The fisheries sectors alone recorded a sky-rocket leap in a US$2.5-billion worth of export during that unfortunate episode (Damanhuri, 2000).

At the beginning of that episode, the government, having been too preoccupied by currency-stabilizing efforts through frequent reserves-draining market interventions, was left with no choice but to leave the fate of the exchange rate to the invisible hands of the market. The private sector also battled with the steeply rising price of inputs, which unsurprisingly were mostly imported, by cutting down on their production levels. Furthermore, the private sectors were forced to cut loose some burdens to survive the downward-pull of the crisis, letting their labor go. By this time, Indonesia was truly whipped by the economic recession. On one side of the market, the aggregate demand was weakening – caused by the lowering income and rising unemployment – on the other side, the aggregate supply was also caught in a somewhat similar situation – caused by the inability to produce. At the same time, the government – the very last line of defense – which supposedly had the ability to intervene, was also occupied in trying to find financial aid for its depleted budget.

Finally, help came in the form of currency devaluation which began boosting the demand for Indonesian commodities the cost of which were going lower. Demand particularly affected the primary sectors which were independent from imported inputs and

factors of production. Thus, primary sectors, such as agriculture, marine and fisheries resources, and forestry, emerged as saviors providing profits for the private sector and currency reserves for the government.

By the time the Asian economic crisis subsided, it had somehow awakened Indonesia's awareness of the primary sectors' (especially marine and fisheries resources) potential contributions through a primary-commodities-export-led economy. No longer were they regarded as too insignificant to consider. They were hailed as the new prima donnas. The culmination of all these newly received recognition was the historical founding of the Ministry of Marine Exploration during the Abdurrahman Wahid administration in the late 1990s. This was the very seed of the Ministry of Marine and Fisheries Affairs (MMFA). Along with that came the announcement of a revitalization program for every primary sector. Thus, the primary sectors turned from an ugly duckling, into a beautiful white swan

Research on fisheries and the impact of the Asian Crisis

In 2007, Rikrik Rahadian attempted to measure the strength of linkages between fisheries and industrial sectors, through the development of a simultaneous econometric model using time-series data that covered no less than 26 years (1980-2005). Surprisingly, the estimation resulted in some troubling findings. The model indicated that despite the fact that the growth of fisheries sector was positively contributing to the growth of the national GDP, for the consumptive goods manufacturing sector, the contribution was negative. Intuitively, the growth of production in the fisheries sector is supposedly inducing the growth of consumptive goods manufacturing sector, especially the fisheries produce food manufacturing sectors. This means the availability of input to produce is increasing or the price of input is decreasing. A negative contribution means that the growth of the fisheries sector does not induce production growth to the consumptive goods manufacturing sector as was expected; instead it caused a production contraction to it. This is actually an indication of how unlinked the two sectors were during the period; they were in a state of decoupling from each other. Furthermore, the model also demonstrated that the one thing that can seem to negate the effect of the contraction caused by the gaping link was imports of raw fisheries products. This result contradicted what most people thought. How could a large maritime country such as Indonesia ever dare to consider importing raw fisheries products?

The main culprit of Rikrik's (2007) troubling result was discovered by Tajerin (2007) in his study of the sources of growth for the fisheries sectors for 1990-1995 and 1995-2000, using a general equilibrium model. It turned out that during 1990-1995, the dominant source of growth for the fisheries sector was domestic demand, which means that most of the producers of the sectors were absorbed domestically for households consumption, intermediate inputs, private stock investments, and government spending. As for 1995-2000, the dominant source shifted to export expansion.

This domestic demand for export expansion shift had caused all of the best of fisheries' produce, mostly raw or live fish, to be allocated to meet foreign instead of domestic demand. So excessive was the push for export, that it caused the domestic market to be left with nothing but leftover produce that was unlikely to meet international standards. In the end, the consumptive goods manufacturing sector (especially fisheries food products) had a hard time sourcing high-quality inputs for their products.

These findings were reinforced by the results of a survey conducted by the Center for Marine and Fisheries Social Economic Research (CMFSER) in 2008, covering a major number of fisheries sector businesses in East Java. A significant number of the surveyed businesses were surviving the post-Asian crisis by turning from fisheries produce manufacturing into fresh fish exporting or packing for export. The rest were forced to quit or to allow their business to go to other entrepreneurs, most of whom were fresh fish exporters.

The analysis of Tajerin also revealed that the multiplier acquired from the model

Table 1. Contribution of marine and fisheries sector to the national economy in GVA and labor usage, 2005 (CMFSER, 2009).

Economic Categories	Gross Value Added (million IDR)	Labor Usage (person)
Fisheries	59,484,544.26	1,461,092
Oil and Gas	219,820,547.36	311,753
Manufacturing	49,724,516.72	407,963
Transportation	18,943,879.03	755,282
Tourism	99,715,383.06	2,275,370
Construction	2,492,698.44	72,380
Services	122,865,282.90	5,584,171
Non-marine and Fisheries	2,303,844,784.84	84,595,841
Total Marine and Fisheries	**573,046,851.76**	**10,868,011**
Total National Economy	**2,876,891,636.60**	**95,463,852**
Marine and Fisheries percentage to National Economy	**19.92%**	**11.38%**

constructed for both fisheries and fisheries produce manufacturing sectors had positive, but diminutive effects on the growth of the national economy. There had been structural changes from primary fisheries sector to fisheries produce manufacturing sector, but this industrialization process was somehow incomplete and abruptly diminished.

The contribution of the marine economy

Even with the above two studies, further research still needed to be done. Rikrik's model was too aggregate, while Tajerin's model was only able to categorize the industrial sectors into two. Both models were incomplete and unable to measure the contributions of the marine and fisheries sector in detail. In 2009, the CMFSER conducted a more thorough research about the contribution of the marine and fisheries sector to the national economy, by constructing an I-O model. The model was much more thorough than the models previously constructed. It included 127 marine and fisheries sectors which aggregately can be categorized as such: fisheries, oil and gas, manufacturing, transportation, tourism, construction, and services.

The industry category in this model is similar to the one adopted by the APEC economies, with a slight difference. APEC considered shipbuilding and transportation under shipping, while CMFSER put shipbuilding under manufacturing and transportation. Unfortunately, the latest data available from the Bureau of Statistics were only for 2005. Nevertheless, from this new model, the contribution of marine and fisheries sectors to the national economy, in terms of their share of gross value added (GVA) and labor usage, was shown (**Table 1**).

In terms of GVA, the marine and fisheries sectors contributed as much as an average of IDR 88,863,835.97 million, from a total of IDR 573,046,851.76 million to the national economy or nearly 20 percent of the national GVA. The highest value-added contributing sector was oil and gas and the lowest was construction. The other top three most-value-added-contributing sectors were oil and gas, services, and tourism.

In terms of labor usage, the marine and fisheries sectors absorbed 11.5 percent of the total national labor usage, an average of 1,552,573 labor per sector. The highest labor-absorbing sector was services while the lowest was construction. It is fair to say that the marine and fisheries sectors contribute

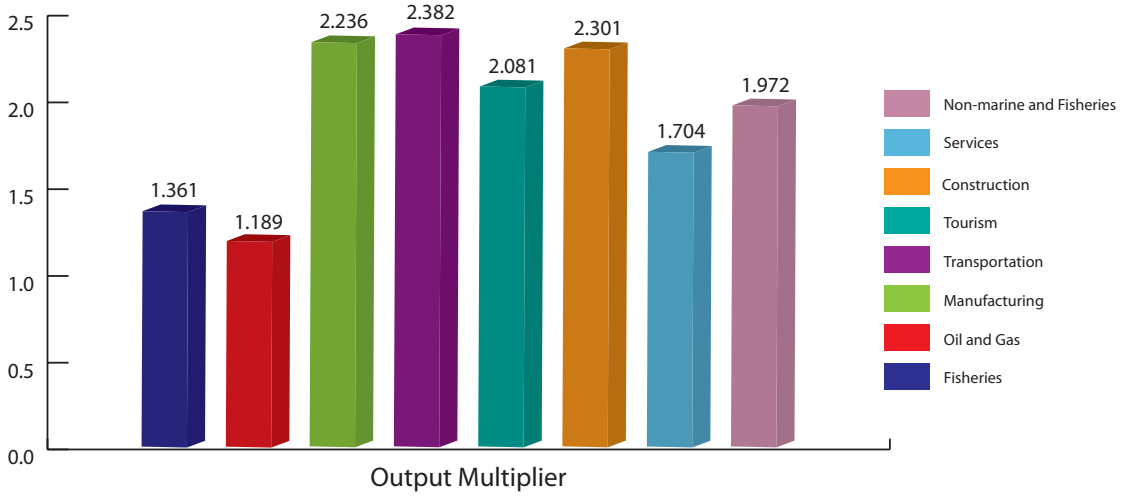

Figure 1. The output multipliers of the marine and fisheries sectors, 2005 (CMFSER, 2009).

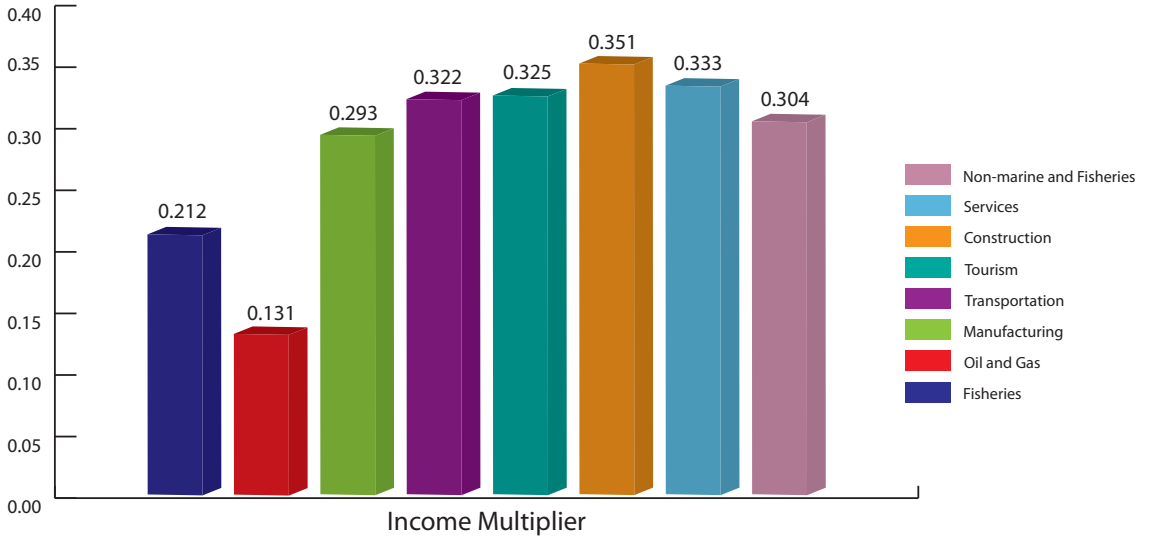

Figure 2. The income multipliers of marine and fisheries sectors, 2005 (CMFSER, 2009).

more in GVA (19.92 percent) than in labor absorption (11.38 percent).

Multipliers in the Indonesian Marine Economy

Using the newly constructed I-O model in analysis revealed the contributions of marine and fisheries sectors in terms of output, income, and labor multipliers to national economy, as well as the strategic information about the state of each category in the sectors.

The numbers of output multipliers (**Figure 1**) indicate the value of new outputs that all sectors in the economy will create when there is an increased demand of a certain sector's output by 1. An output multiplier is considered good when it exceeds 1, which means that an increased demand for a particular sector will result in an increasing output of the whole economy which is larger than the initial effect (the increasing demand). This could happen because the increased demand for outputs of a certain sector would require more inputs from the other sectors; therefore the increased demand would make whole sectors in the economy produce more of their outputs to provide inputs for the extra new demand.

It is clear that in general, the marine and fisheries sectors' output multipliers were good, since none of them was less than 1, with an average of 1.907590. The four most output-inducing sectors were transportation, manufacturing, construction and tourism, with outstanding multipliers, all exceeding 2. This means that an increasing demand for any of these four sectors will cause the other sectors to produce an output with a total of twice the size of the initial effect. The lowest output-inducing sector was oil and gas, with an output multiplier of 1.189.

Another result from the I-O model, was the contribution of the marine and fisheries sectors in terms of income multipliers (Figure 2). The number of income multipliers indicates the amount of new income received by the whole economy due to an increase in the demand of an output of a particular sector by the amount of 1. Quite different from the output multipliers, the income multipliers don't multiply more than 1, since the new income received doesn't necessarily go higher than the initial effect. The increasing demand for an output of a certain sector will require more inputs from the other sectors, so in order to produce the extra outputs the other sectors will also need additional labor, thus creating new income for the people in the whole economy. An income multiplier value of 0.5 for a certain sector means that an increased demand of output of the particular sector by US$ 1 will create new income for the whole economy by as much as US$ 0.5.

The average income multiplier for the marine and fisheries sectors was 0.280972, with construction as the highest income-inducing sector with an income multiplier of 0.351, and the lowest income-inducing sector was oil and gas with an income multiplier of 0.131. The other highest income-inducing categories were services, tourism, and transportation (**Figure 2**).

The I-O analysis also provided the labor multipliers, which showed the number of new labor absorbed in the whole economy whenever new demands for outputs of a particular sector arise (**Figure 3**).

Instead of showing numbers in terms of money value, the labor multipliers show numbers in terms of labor

Figure 3. The labor multipliers of marine and fisheries sector, 2005 (CMFSER, 2009).

(people), the amount of new labor absorbed in the whole economy due to an increased demand for outputs of a certain sector. Thus, a labor multiplier of 0.5 for a certain sector means that whenever there is an increased demand for outputs of that sector, as much as US$ 2 will require the other sectors in the economy to absorb one new labor. The analysis showed that the average labor multiplier for the marine and fisheries sectors was 0.026453, with services as the highest labor-inducing sector, with a labor multiplier value of 0.041, and oil and gas, 0.002, as the lowest. The other most labor-inducing sectors were transportation, construction, and tourism.

Forward and backward dispersions

The last useful analysis results of the I-O model was the power of dispersion of each marine and fisheries sector. Basically, the power of dispersion consists of two types: forward and backward. The forward dispersion measures the share of input multiplier of each sector to the national average, which simply means the share of new inputs provided by whole sectors in the economy due to an increase of a certain sector's GVA to the national average. The backward dispersion measures the share of output multipliers of each sector to the national average, which simply means the share of new outputs produced by the whole sectors in the economy due to an increase in demand of outputs of a certain sector to the national average. The value of both types is good when it exceeds 1, and bad if it is less than 1.

Thus each sector will have two dispersion values which if paired together can show the state of a sector. Sectors are categorized into four: leading, potential, underdeveloped, and mature. A leading sector will have both types of dispersion value that exceeds 1; a potential sector will have a backward dispersion value that exceeds 1, but a forward dispersion value of less than 1; an underdeveloped sector will have both types of dispersion value that is less than 1; and a mature sector will have a forward dispersion value that exceeds 1, but a backward dispersion value of less than 1.

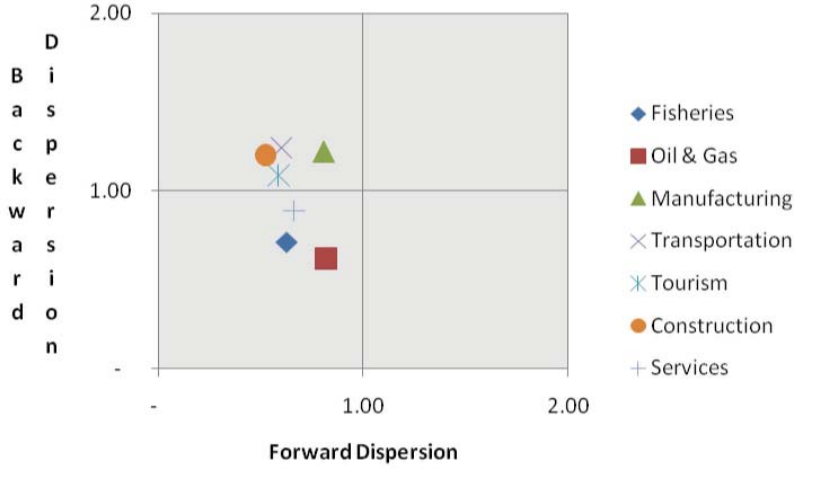

Figure 4. The position of each marine and fisheries sector in the national economy, 2005 (CMFSER, 2009).

Figure 4 shows the position of each aggregate marine and fisheries sector in the national economy. Unfortunately, in this aggregate model, none of the sectors was positioned as a leading sector. Actually four of the sectors

were positioned as potential sectors – which meant that these can be pushed forward to become leading sectors. These four were construction, tourism, manufacturing, and transportation. Three sectors – fisheries, services, and oil and gas – were positioned as underdeveloped.

From a more thorough analysis where the sectors were disaggregately categorized using the 128 sectors, four were positioned as leading sectors – fish-based food and other fat industry, boatmaking industry, internal combustion for ship industry, and manufactured fish feed and other water biota industry. However, three sectors were positioned as mature – oil and gas (oil), oil and gas (non-LNG gas), and surprisingly, fish produce export trade. The rest of the marine and fisheries sectors were positioned either as underdeveloped (51.97 percent) or potential (41.73 percent).

Conclusion

The profile of the marine economy shows that the fisheries sector has been contributing greatly through the export-expansion-led economic growth for national economy. However, this kind of contribution cannot last for long, as fisheries have limits on their sustainability.

Putting too much pressure on the fisheries sector as a prime mover in an export-expansion-led economic growth tends to create a gap, decoupling the fisheries and the consumptive goods manufacturing sectors, which impedes the marine and fisheries manufacturing sectors from reaching full potential. It is time to turn the attention of the people to other nonfisheries sectors that are full of potential for development. These include manufacturing, transportation, construction, and tourism. Indonesia should invest in these, which can be leading sectors, as indicated by their reasonably high output, income and labor multipliers. This means that an increase in the demand of one or all of these sectors would be rewarded by higher output growth, income creation, and labor absorption than in other sectors of the marine economy. Potentially, the development of these sectors would help improve the underdeveloped sectors.

References

ADB (Asian Development Bank). 2004. Fisheries: policies and strategies. Mandaluyong City: ADB.

Aji, H.P. 2006. Analisis kinerja ekspor perikanan Indonesia ke jepang dan Amerika serikat tahun 1984-2003. Tidak dipublikasikan. Depok: MPKP-FEUI.

Arndt, H.W. 1984. The Indonesian economy (collected papers). Singapore: Chopmen Publishers.

Badan Pusat Statistik (BPS). 1980-1987. Statistik perikanan. , Badan Pusat Statistik, Jakarta.

BPS . 1980-1990. Neraca arus dana Indonesia triwulanan Badan Pusat Statistik.1980-2005. Statistik Indonesia. Jakarta: BPS.

BPS . 1988-1996. Indikator industri. Badan Pusat Statistik, Jakarta.

BPS Badan Pusat Statistik. 1988-2004. Statistik perusahaan perikanan. Badan Pusat Statistik, Jakarta BPS (Badan Pusat Statistik). 1993-2004. Perkembangan indeks produksi triwulanan industri Besar & Sedang Badan Pusat Statistik, Jakarta, Chyper, JM. and Dietz, J.L. 1997. The process of economic development. London: Routledge.

Chyper, J. M., and J.L. Dietz. 1997. The Process of Economic Development. Routledge, London.

CMFSER. 2009. 2008 Survey covering a major number of fisheries sector businesses in East Java. Center for Marine and Fisheries Social Economic Research.

Dahuri. 2001. Pendayagunaan sumberdaya kelautan untuk kesejahteraan rakyat. Lembaga Informasi dan Studi Pembangunan Indonesia.

Dahuri, R., Rais, J., Ginting, S.P. & M.J. Sitepu. 2001. Pengelolaan Sumberdaya Wilayah Pesisir dan Lautan Secara Terpadu (Integrated coastal and ocean resources development). Second edition. Jakarta, Pradnya Paramita Publishers. 328 pp.

Dornbusch, R. and Fischer, S. 1994. Macroeconomics. 6th ed. McGraw-Hill, Inc, Saturday.

Fauzi, A. 2005. Kebijakan perikanan dan kelautan: isu, sintesis, dan gagasan, Gramedia Pustaka Utama, al at.

Fauzi, A. and Anna, S. 2005. Pemodelan sumberdaya perikanan dan kelautan untuk analisis kebijakan. PT, Jakarta Gramedia Pustaka Utama.

Gujarati, D. 2000. Basic econometrics. McGraw Hill Book Compan, New York, USA.

Hasan Basri 2000

Kotler, P. and Kartajaya, H. 2000. Repositioning Asia (from bubble to sustainable economy. Singapore: John Wiley and Sons (Asia) Pte Ltd.

Manurung, M. 2000. Perekonomian Indonesia (analisis New Keynesian economics). Tidak dipublikasikan. Depok: Program Pascasarjana FEUI.

Palfreman, A. Insull, D. 1994. "Guide to fisheries sector studies." FAO Fisheries Technical Paper No. 342. FAO.

Pindyck, R.S. and D.L. Rubinfeld 1998. Econometric models and economic forecasts. 4th ed. Singapore: Irwin/ McGraw-Hill.

Rangarajan, C. 1982. "Agricultural growth and industrial performance in India." Research Report 33. Washington, DC: International Food Policy Research Institute.

Rustandi, S. 2002. Peranan sektor pertanian terhadap perekonomian propinsi NTB: analisis dengan menggunakan model ekonometrika persamaan simultan. Tidak dipublikasikan. Depok: MPKP FE UI, Depok.

Sfer-Younis, A. and Donaldson, G. 1982. Fishery sector policy paper. Washington DC: International Bank for Reconstruction and Development/World Bank.

Sihombing, G.G. 2004. Pengembangan sektor perikanan di DKI Jakarta. Tidak dipublikasikan. Depok: Pasca Sarjana FE UI.

Simbolon, R. 1990. Analisa keterkaitan pertumbuhan sektor pertanian dan tampilan sektor industri pada pendapatan nasional dengan mempergunakan model makro ekonomi. Tidak dipublikasikan. Bogor: IPB.

Soemokaryo, S. 2001. Model ekonometrika perikanan Indonesia: analisis & simulasi kebijakan pada era liberalisasi perdagangan. Malang: Agritek.

Susanti, H. 1995. Indikator-indikator makroekonomi edisi kedua. Jakarta: Lembaga Penerbit FEUI.

The World Bank. 1993. A World Bank policy research report: the East Asian miracle (economic growth and public policy). New York: Oxford University Press. Inc.

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Measuring the Contribution of the Maritime Sector to the Philippine Economy

Introduction

The Philippines, composed of about 7,100 islands (300,000 km^2 of land), is an archipelago located a little above the equator bounded by the Pacific Ocean, China Sea and Celebes Sea. The total length of its coastline is about 17,460 km, with a territorial water area (including exclusive economic zone) of about 2,200,200 km^2 of which 266,000 km^2 are coastal waters and 1,394,000 km^2 are oceanic. The Philippine shelf area (depth of 200 m) is about 184,600 km^2 while the coral reef area is 27,000 km^2, within the 10-20 fathoms where reef fisheries occur (BFAR, 2009).

Out of the 1,495 municipalities, 136 cities, and 81 provinces of the Philippines (as of December 2008), the Coastal and Marine Management Office of the Department of Environment and Natural Resources (DENR) considers 862 municipalities, 74 cities, and 92 provinces as coastal.

From the point-of-view of economics and the military, the Philippines is strategically located, serving as the hub of Asia-Pacific navigational and shipping routes. The current Philippine register of merchant ships, ranked 13th in the world, is approximately 12.3 million gross registered tons (GRT) (DOTC, 2009).

The Philippines is considered as a major supplier of seafarers of all ranks to the merchant shipping fleet of the world, being able to supply 40 percent of the world seafarers, out of 1.2 million seafarers worldwide (Adenekan, 2008). In fact, the number of seafarers being trained in maritime training institutes in the Philippines is close to 1.5 times the combined number of PR China, India, Republic of Korea, Singapore, Malaysia, Thailand, Sri Lanka, Myanmar, Hongkong, Vietnam, and Bangladesh (Karandawala, 2009).

In a speech keynoting the opening of the Philippines-Japan Manning Cooperative Forum 2008 on 28 February, Pres. Gloria Macapagal-Arroyo said that the Philippines

Table 1. Deployment of sea-based overseas Filipino workers, 1984-2007 (POEA, 2009).

Year	Sea-based Workers	Growth Rate
1984	50,604	-
1985	52,290	3.33
1986	54,697	4.60
1987	67,042	22.57
1988	85,913	28.15
1989	103,280	20.21
1990	111,212	7.68
1991	125,759	13.08
1992	136,806	8.78
1993	145,758	6.54
1994	154,376	5.91
1995	165,401	7.14
1996	175,469	6.09
1997	188,469	7.41
1998	193,300	2.56
1999	196,689	1.75
2000	198,324	0.83
2001r	204,951	3.30
2002	209,593	2.30
2003	216,031	3.1
2004	229,002	6.0
2005	247,983	8.3
2006	274,497	10.7
2007	266,553	-2.8

supplied 28 percent of the international maritime industry's total workforce. Based on the Philippine Overseas Employment Administration records, 266,553 sea-based overseas Filipino workers were deployed in 2007 compared to 50,604 in 1984 (**Table 1**). Estimates of the National Statistical Coordination Board (NSCB) showed that sea-based overseas Filipino workers received compensation amounting to US$2.6 billion in 2007 and US$3.3 billion in 2008. According to the ASEAN Secretariat, five ASEAN countries, namely, Indonesia, Malaysia, Philippines, Singapore and Thailand are among the 35 most important maritime nations and in 1997, these five countries had a total of 2,143 vessels (of 1,000 GRT and above) with a combined tonnage of 32.7 million deadweight tonnage (DWT), or about 7.7 percent and 4.6 percent of the worldwide fleet, respectively (Vitasa and Soeprapto, 1999).

In addition, the country lies in the global epicenter of marine biodiversity that contains the richest assemblage of marine ecosystem and habitats and associated life forms on earth. Productive coastal ecosystems and habitats include at least 25,000 km^2 of coral reef, seagrass, and algal beds; 248,813 ha (2003 satellite imageries, NAMRIA) of mangrove; many beaches and varied coastlines of value for tourism and other development. Although not all are quantified in economic terms, it is currently estimated that coral reefs alone contribute at least US$1.064 billion annually to the economy (DENR, 2006). The 2008 fishery production, from commercial and marine municipal fishing alone, was estimated at 2,376.4 thousand metric tons (BAS, 2009).

Clearly, the maritime sector is an important sector of the Philippine economy. It is necessary to exert efforts towards a reliable measurement of its contribution. The importance of the maritime sector "extends way beyond maritime production and the transport and traffic sectors, including all branches involved in the waterborne transport of goods and people and all those directly and indirectly involved in maritime production and services, i.e., shipyards, suppliers, shipping companies, transshipment companies, import and export companies, freight forwarding companies, brokers, shipping banks and credit institutions, companies involved in mining maritime resources and energy carriers, government maritime offices, and research facilities" (Executive Committee, EMF, 2009).

The maritime sector encompasses a wide range of economic activities, from shipbuilding to shipping and ports, to fisheries and aquaculture, to recreational activities and tourism, to offshore energy exploration and extraction, and to a large number of related economic services. Statistical data on these economic activities are generally incomplete and untimely, if not unavailable. Thus, measuring the economic value of maritime sector is difficult, but is necessary to making informed decisions on the management and sustainable development of the sector.

The objective of this paper is to provide some insights on the maritime sector of the Philippines through the presentation of a proposed conceptual accounting framework on how to capture and account for the different economic activities in the maritime sector of the country. The framework would then serve as basis for estimating the economic contribution of the sector to the total economy.

Review of Literature

Webster defines maritime as "on, near or living near the sea; of or relating to sea navigation, shipping, etc.; and, characteristics of sailors", while the Oxford online dictionary defines it as "relating to shipping or other activity taking place at sea and living or found in or near the sea".

Countries have tried to conceptualize and develop their own definitions of the maritime sector. They also ventured on measuring the economic importance of maritime sector in their respective economies. The commonalities and differences of definitions among countries are illustrated in **Figure 1.**

Framework to Measure the Philippine Maritime Sector

As an archipelago, maritime economic activities are intrinsic to the Filipino people. Thus, the maritime sector is a vital component in achieving

Photo: Kara Santos

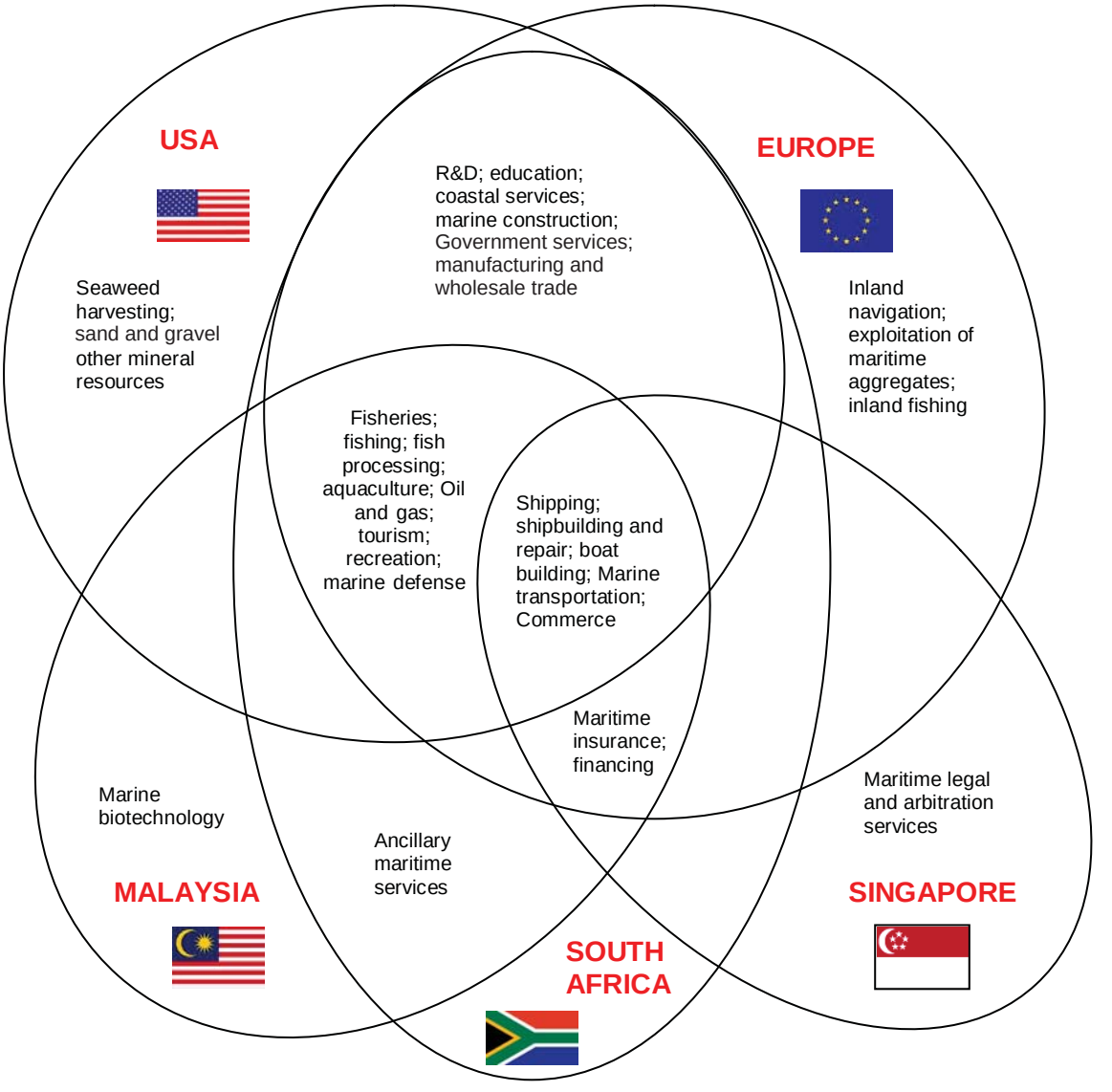

Figure 1. Commonalities and differences of definitions of maritime sector among and between different economies.

socioeconomic progress.

In the Philippines, water transport is still the cheapest way to hop and transport goods from one island to another. According to Garcia (2005), the domestic fleet in the Philippines mainly consists of cargo vessels (28.6 percent) and passenger cargo vessels (26.3 percent) with average ages of 15 and 11 years, respectively (**Table 2**).

Garcia claimed that the country's ageing interisland fleet consists of secondhand vessels imported mostly from Japan. He added that importation of secondhand vessels has contributed to the country's poor maritime safety record.

In the framework of the Philippine System of National Accounts (PSNA), the NSCB (2009) estimated the contribution of the water transport subsector for 2008 at 5,022 million pesos, in 1985 prices, with a growth rate of 4.1 percent.

Philippine and foreign vessels dock primarily in 23 base ports and 66 terminal ports most of which can be found in the Visayas with six base ports and 27 terminal ports. There are also 222 private ports in the Philippines (**Table 3**).

In 2008, the Philippine Ports registered a total of 310,701 ship calls with 301,069 domestic vessels and 9,632 foreign vessels. Cargo throughput totaled 144.6 million metric tons, with foreign vessels having a slight advantage of 72.8 million metric tons compared with domestic vessels of 71.8 million

[1] US$ 1 = PhP 44.477, average Bangko Sentral ng Pilipinas (BSP) buying and selling rate for 2008.

metric tons. Container traffic, on one hand, totaled 4,062,447 twenty-foot equivalent unit (TEU) with 1,538,832 TEU coming from domestic vessels and 2,523,615 TEUs coming from foreign vessels. Passenger traffic, meanwhile, totaled 43.9 million passengers with 21.5 million passengers disembarking and 22.3 million embarking (**Table 4**).

The Philippine seas are also rich in energy resource. Garcia reported that the Philippine natural gas resources discovered are estimated to have recoverable reserves of 2.5 trillion cu ft of gas and some 85 million barrels of condensate. The natural gas deposits in the Camago-Malampaya fields were estimated to be capable of supporting 3,000 MW gas-fired power plants over a period of more than 20 years.

The deposit of natural gas will surely reduce the Philippine dependence on imported oil, which is about 74,185 thousand barrels or 99.7 percent of the total crude oil supply in 2007 (NSCB, 2008). As net oil importer, the Philippines is vulnerable to the fluctuations in the world oil market price as experienced during the 2008 oil crisis.

The Philippine seas are also a rich source of food production. In 2008, commercial fishery produced 1,225.18 thousand metric tons of fish, municipal fishing accounted for 1,332.88 thousand metric tons while aquaculture accounted for 2,407.69 thousand metric tons (BAS, 2009). Per NSCB's estimates, the gross value added of the fishery subsector was PhP61.778 billion[1], at constant prices, with a growth of 5.5 percent in 2008 (NSCB, 2009).

As in other countries, the maritime sector of the Philippines has linkages with other sectors/industries. Tourism income is generated by the provinces of Sorsogon (encounter with whale sharks), Palawan (diving in Tubbataha reef), and La Union (surfing), to name a few. The activities in the resorts

Table 2. Domestic shipping fleet, Philippines, 2000 (MARINA, as found in Garcia, 2005).

Type of Service	No. of Vessels	Percent (%)	Total GRT	Average GRT	Average Age
Passenger Ferry	283	5.70	14,480	51.17	11.04
Passenger Cargo	1,297	26.30	446,109	344.22	9.48
General Cargo	1,409	28.30	523,391	371.99	14.56
Container	27	0.50	71,896	2,662.82	22.24
Liquid Cargo/ Lighterage	31	0.60	12,725	410.50	18.26
Barging	153	3.10	84,890	554.84	17.24
Tanker	198	4.00	176,951	893.69	16.54
Towing/ Salvage	437	8.90	36,449	83.60	19.90
Pleasure	90	1.80	2,032	22.59	8.62
Pilotage	9	0.20	126	14.03	30.25
Others	996	20.20	40,797	41.16	7.42
No Information	1	-	14	14.50	10.00
Totals	**4,931**	**100**	**1,409,864**	**286.85**	**12.89**

Table 3. Number of ports by district office, type of port, and area of operation in the Philippines, 2003-2006 (PPA, 2009).

	Total	Port District Office				
		Manila/ Northern Luzon	Southern Luzon	Visayas	Northern Mindanao	Southern Mindanao
2003						
Base Port	22	4	4	5	5	4
Terminal Port	66	4	19	25	9	9
Other National/ Municipal Port	97	8	21	30	24	14
Private Port	219	20	50	68	40	41
2004						
Base Port	22	4	4	5	5	4
Terminal Port	64	4	19	24	9	8
Other National/ Municipal Port	93	7	19	31	25	11
Private Port	218	23	49	6	36	44
2005						
Base Port	23	4	4	6	5	4
Terminal Port	61	4	19	23	9	6
Other National/ Municipal Port	108	6	20	35	32	15
Private Port	222	23	50	68	37	47
2006						
Base Port	23	4	4	6	5	4
Terminal Port	65	4	19	27	9	6
Other National/ Municipal Port	-	…	…	…	…	…
Private Port	-	…	…	…	…	…

of Boracay or Caramoan beaches in Camarines Sur are also part of the maritime sector. However, the economic contribution of these activities cannot yet be accurately measured due to data limitations.

Other features of the Philippine maritime sector can be found in **Annex 1**.

Issues and Challenges in Measuring the Philippine Maritime Sector

At present, measuring the economic contribution of the maritime sector is clearly still at its formative stage. Toward this end, many issues and challenges need to be addressed.

- ***Need for a clear-cut definition applicable to the Philippine setting.*** While there is large overlap in the various definitions of the maritime sector in different countries/regions, there are gray areas that need to be resolved. Should the sector be limited only to economic activities in, on,

Annex 1. Selected indicators for identified maritime industries, 1999 (NSO, 2004).

	Number of Establishments	Revenue/ Sales ('000 PhP)	Cost ('000 PhP)	Total Employment			Capital Expenditure ('000 PhP)
				Total	Male	Female	
TOTAL							
Maritime Industries	6,506	83,538,893	37,037,248	187,510	138,299	49,211	3,408,489
All Sectors (A to O)[1/]	719,090	5,041,360,804	3,771,605,161	5,606,773	3,137,448	2,469,325	280,180,398
Ratio (%)	0.90	1.66	0.98	3.34	4.41	1.99	1.22
a. Fishing (B)							
Maritime Industries[2/]	1,031	5,631,006	3,751,704	26,294	24,423	1,871	296,987
Total Sector B	1,114	6,743,537	4,501,404	30,803	28,378	2,425	347,946
Ratio (%)	92.55	83.50	83.35	85.36	86.06	77.15	85.35
b. Mining and Quarrying (C)							
Maritime Industries[3/]	106	86,148	450,374	146	103	43	322,028
Total Sector C	364	14,376,168	9,057,700	16,414	14,953	1,461	2,915,809
Ratio (%)	29.12	0.60	4.97	0.89	0.69	2.94	11.04
c. Manufacturing (D)							
Maritime Industries[4/]	1,334	29,281,641	6,098,053	36,573	20,863	15,710	772,927
Total Sector D	124,790	1,842,070,409	1,326,157,518	1,559,750	881,100	678,650	108,740,417
Ratio (%)	1.07	1.59	0.46	2.34	2.37	2.31	0.71
d. Transportation and Storage (I)							
Maritime Industries[5/]	2,033	39,081,866	22,525,803	72,151	63,228	8,923	1,755,548
Total Sector I	10,054	243,279,434	144,536,192	246,828	188,641	58,187	63,671,940
Ratio (%)	20.22	16.06	15.58	29.23	33.52	15.34	2.76
e. Real Estate, Renting & Business Activities (K)							
Maritime Industries[6/]	2,002	9,458,232	4,211,314	52,346	29,682	22,664	260,999
Total Sector K	37,087	177,012,583	95,847,153	400,022	267,670	132,352	11,222,607
Ratio (%)	5.40	5.34	4.39	13.09	11.09	17.12	2.33

Source: Census of Philippine Business and Industries (CPBI), 1999, National Statistics Office (NSO)

[1] Includes all sectors covered by the 2000 CPBI (NSO, 2004): agriculture, hunting and forestry, fishing, mining and quarrying, manufacturing, construction, electricity, gas and water, transportation, communication, and storage, trade, financial intermediation, hotels and restaurants, real estate, and other business activities, private education, health and social works , and other community and personal services.

[2] These include ocean commercial fishing, coastal municipal fishing, fish corral fishing, operation of fish breeding farms and nurseries, pearl culture, and seaweeds farming.

[3] These include oil and gas exploration and extraction activities on contract basis.

[4] These include processing and preserving of fish and fish products and other seafoods, manufacture of engines and turbines for marine propulsion, manufacture of marine capstans, pulleys, tackle, etc., building and repairing of ships and boats and building and repairing of pleasure and sporting boats. These figures still include those that are not considered as maritime such as processing and preserving of fish and fish products and other seafoods not done in the sea/ocean, manufacture of engines and turbine other than for marine propulsion and manufacture of capstans, pulleys, tackle, etc., that are not for marine use. However, due to data limitation, the figures cannot be disaggregated further.

[5] These include sea and coastal water transport, renting of ship with operator, auxiliary activities to water transport, and customs brokerage of ships. Due to data limitation, the figures cited still include customs brokerage of aircraft which is not part of maritime.

[6] These include renting of water transport, water sports, and recreational equipment; maritime research and development; and sea-based labor recruitment and provision of personnel. Due to data limitation, the figures cited still include renting of sports and recreational equipment other than those in water, other research and experiment in natural sciences and land-based recruitment and provision of personnel.

found near or relating to the sea? Or should it include, as is the case with the definition of the European Commission, economic transactions in or related to inland waters? Do we include hotels located near the seas? Just as in tourism where the concept of the usual environment has a distance dimension that is generally limited to within 1 km from residence, "near" has to be quantified.

- ***Need for a Philippine maritime sector statistical framework.*** In order to quantify the contribution of the maritime sector, more specifically, to capture the sector in PSNA, there is a need to identify the scope and coverage of economic activities in the sector, i.e., to define its transaction boundaries in operational terms. To do this, a statistical framework is needed. It will serve as a guide in the classification of all economic activities, compilation and analysis of data, and planning the management and development of the maritime sector.

- ***Need to harmonize statistical terms and concepts in the maritime sector.*** To facilitate the generation, compilation, and utilization of data by stakeholders within the maritime sector, terms and concepts have to be standardized or harmonized. Official terms and concepts that are acceptable and recognized by stakeholders both at the national and international levels contribute to the accuracy and comparability of data collected.

- ***Data concerns***
  - Data sourcing - Due to the fact that economic activities in the maritime sector are spread out in different sectors as defined in the Philippine Standard Industrial Classification (PSIC) system, there is a need to identify which agencies of the government are generating the data to be used in the compilation of the maritime sector account. An example would be on water infrastructure and transportation wherein ports data are generated by several agencies depending on their area of jurisdiction. The Philippine Ports Authority generates statistical data on public and private ports but excluding fishing ports. The Philippine Fisheries Development Authority generates local fishing ports data. Other sources of statistics are the Maritime Industry Authority (MARINA), Department of Transportation and Communication, for foreign-assisted feeder fishing port, the Philippine Coast Guard, and associations of shipping companies. The regular generation of data by these sources is key to sustained measurement of the economic contribution of maritime sector.

  - Data disaggregation and gaps - The aggregation of data in the industrial classification system makes it difficult to identify and quantify the maritime component in some of the industries that have significant "land-related" operations (e.g., how to isolate the coastal component of tourism).

In the manufacturing sector, the data available in some subsectors are up to the three-digit level of the PSIC only. An example is data on engine and turbine manufacturing, which are on a three-digit level of manufacturing activity. To cover the whole range of this level, data should be specific to marine propulsion.

Table 4. Philippine shipping statistics, 2006-2008 (PPA, 2009).

PARTICULARS	TOTAL 2006	TOTAL 2007	TOTAL 2008	Growth Rates	
				2006-2007	2007-2008
1. Ship calls	306,107	314,501	310,701	2.74	(1.21)
Domestic	296,347	304,219	301,069	2.66	(1.04)
Foreign	9,760	10,282	9,632	5.35	(6.32)
2. Cargo Throughput (m.t.)	154,340,778	157,437,721	144,594,797	2.01	(8.16)
Domestic	72,840,475	74,591,278	71,758,150	2.40	(3.80)
Inward	36,910,291	37,777,600	36,100,577	2.35	(4.44)
Outward	35,930,184	36,813,679	35,657,573	2.46	(3.14)
Foreign	81,500,303	82,846,443	72,836,647	1.65	(12.08)
Import	52,331,804	49,459,867	46,727,363	(5.49)	(5.52)
Export	29,168,499	33,386,575	26,109,284	14.46	(21.80)
3. Container Traffic (in TEU)	3,785,363	3,998,419	4,062,447	5.63	1.60
Domestic	1,670,804	1,613,431	1,538,832	(3.43)	(4.62)
Inward	828,233	805,734	764,629	(2.72)	(5.10)
Outward	842,571	807,697	774,203	(4.14)	(4.15)
Foreign	2,114,559	2,384,988	2,523,615	12.79	5.81
Import	1,066,964	1,209,447	1,253,051	13.35	3.61
Export	1,047,595	1,175,541	1,270,564	12.21	8.08
4. Passenger Traffic	42,556,005	44,468,927	43,870,914	4.50	(1.34)
Disembarked	21,252,337	21,943,930	21,516,761	3.25	(1.95)
Embarked	21,303,668	22,524,997	22,354,153	5.73	(0.76)

- ***Need for an appropriate estimation methodology.*** In PSNA, the estimation of the gross value added (GVA) of economic sectors requires the use of some parameters, e.g., GVA ratios, undercoverage ratios, and weights. The reliability and validity of some of these parameters are affected by data constraints. For the maritime sector, it is necessary to develop an estimation methodology that can be operationalized taking into consideration the existing capability and limitations of the Philippine Statistical System (PSS).

- ***Coordination.*** In any statistical system where data are generated by different actors, statistical coordination is a must. While NSCB has considerable experience and proven track record in coordinating the PSS, however, coordinating the various stakeholders in the sector has not received sufficient attention and needs to be strengthened.

Proposed Conceptual Framework

Measuring the contribution of the maritime sector in the context of macroeconomic accounts poses a problem to national accountants considering that the sector is not one of the economic sectors explicitly covered in the compilation of the national accounts. It is not a sector that is clearly identified and classified under PSIC. A wide range of economic activities related to the maritime sector are embedded in the different economic sectors as classified in PSIC. Therefore, coming up with comprehensive information on the maritime sector that would facilitate its analysis in the context of macroeconomic accounts will require identification and accounting of economic activities embedded in economic sectors.

Industries in the maritime sector. In the Philippine context, as an industry, the maritime sector may refer to economic activities, such as production, distribution, and consumption of goods and services, related to or conducted in, near, or found in the seas. It includes other transactions linked to these activities. However, contrary to the European definition, it is proposed that for the time being, inland water activities be excluded from the marine sector of the Philippines. Unlike Europe, the economic activities related to inland waters in the Philippines are deemed not to be of great significance as to influence the trend or characteristics of the maritime sector.

Annex 2 presents the groupings, with their corresponding levels and codes, of all economic activities that may be considered in the Philippine maritime sector as found in PSIC, which is a classification of all economic activities in the country. It was developed to classify establishments according to the type of economic activity they are

In accordance with the 1994 PSIC (as amended), the following broad industries may be identified as economic activities of the maritime sector:

Fishery and forestry: fisheries harvesting and processing, to include municipal and commercial fishing; fry harvesting; catching and culturing ornamental (aquarium) fishes; aquaculture, particularly, mariculture to cover oyster and mussel production, pearl culture and pearl shell gathering, seaweed production, culture of marine crustaceans; service activities incidental to fishing; and forestry, logging, and related service activities (harvesting of mangrove)..

Construction: construction of piers and wharves, dredging, and beach reconstruction.

Manufacturing: processing and preservation of fish and other seafoods such as crustaceans and mollusks (activities of vessels engaged in these); manufacture of marine-related machinery and equipment (engines and turbines for marine propulsion as well as communications and electronic equipment); and building and repairing of ships and boats.

Transport, communication and storage: sea and coastal water transport; renting of ship with operator; towing and pushing services; auxiliary activities to water transport; storage and warehousing (on ports and piers and when such is offered as an independent service); activities of other transport agencies (customs brokerage and freight forwarding services when done using marine transport).

Trade: Trading at sea

Mining and quarrying: ooffshore oil/gas production and exploitation of marine aggregates.

Finance: maritime insurance

Services: maritime education; recreation and tourism (to include recreational fishing, coastal tourism); business services (renting of water transport equipment, pleasure boats and related docking facilities, sport and recreational equipment); brokerage; research and experimental development in natural sciences and engineering (private and government); maritime business consulting services; and labor recruitment and provision personnel (sea-based). Government services include defense, rescue operations, and maritime research and development

Annex 2. PSIC Listing of Industries where the Maritime Sector can be Extracted.

PSIC CODE		INDUSTRY DESCRIPTION	REMARKS
Group	Sub-class		
		FISHING	
0611	06110	Ocean fishing, commercial (using vessels over 3 tons)	
0612	06120	Coastal fishing, municipal (using vessels of less than 3 tons	
0613	06130	Fish coral fishing	
0643	06430	Operation of fish breeding farms and nurseries	
0651	06510	Oyster and mussel farm operation	
0659	06590	Other mollusc and crustacean farm operations, n.e.c.	
0661	06610	Pearl culture	
0662	06620	Pearl shell gathering	
0670	06700	Seaweeds farming	
0680	06800	Service activities incidental to fishing	
0691	06910	Gathering of laver and other edible seaweeds	
0692	06920	Catching and culturing ornamental (aquarium) fishes	
0693	06930	Gathering fry	
0699	06990	Other fishing activities, n.e.c.	
		FORESTRY	
		Harvesting of mangroves	Not explicitly stated in PSIC
		MINING AND QUARRYING	
1120	11200p	Extraction and production of crude petroleum and natural gas	When done on ocean/sea
		MANUFACTURING	
1513	15131 - 15139p	Processing and preserving of fish and fish products and other seafoods	Involved in maritime are only those activities of vessels engaged in processing and preserving fish, crustacean and mollusks.
2911	29112	Manufacture of engines and turbines for marine propulsion	
2915	29153	Manufacture of marine capstans, pulleys, tackle, etc.	
3511	35111 - 35115	Building and repairing of ships and boats	
3512	35121 - 35122	Building and repairing of pleasure and sporting boats	
		CONSTRUCTION	
		Construction of piers, wharves, dredging, beach reconstruction	Not explicitly stated in PSIC
		TRADE	
		Trading at sea	Not explicitly stated in PSIC

Annex 2 continued in the next page...

engaged in and was patterned after the International Standard Industrial Classification system. It is intended to serve as a framework in the collection, compilation and analysis of data on economic activities to secure uniformity and comparability of statistics presented by various government or private agencies.

Measuring the contribution of the maritime sector. The sector has widespread economic impact in terms of employment, foreign exchange earnings, investments and linkages with other sectors. Growth and development of the shipping industry will induce investments in port construction/facilities and services associated with it, manufacturing of maritime-related products, etc. Growth and development of the sector will exert influence on industries using maritime products and services. Likewise, income generated by the maritime sector will stimulate demand for consumer goods and services.

In measuring the sector's economic contribution, economic analysis has to be conducted within the framework of PSNA to achieve coherence and consistency with other macroeconomic indicators as well as international comparability. The contribution of the maritime sector will be measured through its GVA, as a component of the country's GDP.

Annex 2 (continued)…

PSIC CODE		INDUSTRY DESCRIPTION	REMARKS
Group	Sub-class		
		TRANSPORT, STORAGE AND COMMUNICATION	
6110			
	61101	Ocean passenger transport	
	61102	Ocean freight transport	
	61103	Interisland water passenger transport	
	61104	Interisland water freight transport	
6130	61300	Renting of ship with operator	
6141	61410	Towing and pushing services on coastal and transoceanic waters	
6320	63200p	Supporting and auxiliary activities to water transport	Cargo handling, storage of freight, harbor operations and other activities such as docking, pilotage, lighterage and vessel salvage operations
6391	63910p	Customs brokerage (ship and aircraft)	Customs brokerage of aircraft not included
		FINANCIAL INTERMEDIATION	
6701	67010p	Life insurance	Passenger travel insurance
6703	67030p	Non-life insurance	Vehicle (ship) insurance
		BUSINESS ACTIVITIES	
7112	71120	Renting of water transport equipment	Renting of pleasure-boats and related docking facilities
7130	71305p	Renting of sports and recreational equipment	Equipment which are specific for ocean/sea use
7311	73110p	Research and experimental development in natural sciences	Maritime research and development
7491	74911-74912p	Labor recruitment and provision of personnel	Only those recruitment agencies for seabased workers
7494	74946p	Underwater photography	
		PUBLIC ADMINISTRATION (GOVERNMENT SERVICES)	
7522	75220p	Defense activities	Services of coast guard and navy such as rescue operations in the sea
		EDUCATION	
8030	80300p	Public technical and vocational post-secondary non-degree education	Pertains to maritime education and trainings
8040	80400p	Public higher education	
8130	81300p	Private technical and vocational post-secondary non-degree education	
8140	81400p	Private higher education	
		RECREATIONAL ACTIVITIES	
9249	92490p	Other recreational activities	Recreational fishing

Source: Philippine Standard Industrial Classification
[1] The listing of industries is based on the Philippine Standard Industrial Classification (PSIC) as amended
p - part of
n.e.c – not elsewhere classified

In accordance with international guidelines on the compilation of national accounts, PSNA defines GVA as the difference between gross output and intermediate inputs. Gross output of a production unit during a given period is equal to the gross value of the goods and services produced during the period and recorded at the moment they are produced, regardless of whether or not there is a change of ownership. Intermediate inputs refer to the value of goods and services used in the production process during the accounting period. Through GVA, the industrial structure of the maritime sector as well as the performance of its industry segments can be determined.

In addition to GVA, the sector can also be assessed through other indicators such as employment, revenue/

sales, gross fixed capital formation (investments), and nonmonetary indicators such as number of establishments, ports, and ships; and water transport passenger traffic, among others. These indicators will support and validate the sector performance within the economy.

Considering that the sector has widespread impact on other sectors, the Philippine maritime sector can also be analyzed on the basis of its backward and forward linkages, taking note that its growth and development will induce investment and employment in other sectors. This, in turn, provides inputs to maritime and other sectors, and income generated by the maritime sector will stimulate demand for consumer goods and services.

Preliminary estimates (**Annex 1**) show that the maritime sector in the country covers establishments representing less than 1 percent, with sales share of 1.7 percent and employment share of 3.3 percent of the formal/organized sector. Employment of men is almost three times that of women.

The Way Forward

Given the issues and challenges that have been presented in measuring the economic contribution of maritime sector along with the proposed framework, clear-cut strategies have to be planned and implemented.

Operationalization of the Proposed Framework

To fully appreciate the validity and integrity of the proposed framework in measuring the economic contribution of maritime sector, it is imperative that it be operationalized. Trying to fill in the numbers on the statistical framework will determine whether the: (1) data are available from government agencies or other organizations; (2) data of the different economic activities sufficiently cover the scope of the maritime accounts; (3) estimation methodology, including needed parameters to be adopted, are appropriate; (4) data gaps have to be addressed; and (5) proposed framework is suitable to the Philippine setting.

Conduct of users' forum. The NSCB and the PSS in general have long recognized the importance of conducting a users' forum to provide stakeholders with a venue to: assess the validity of statistical methodologies and approaches used by the PSS, especially for developmental statistical activities; evaluate the conceptual and statistical framework, estimation methodology and data sources, among others; and better appreciate how the sector fares in contrast with the other economic sectors. The forum can also provide information on what economic activities contribute most to the maritime sector and which sectors should be developed.

Development of an indicator system. In addition to the overall vision to compute the contribution of the maritime sector in the context of the PSNA, an indicator system needs to be developed. The system can serve as a tool for economic analysis and policy formulation in the maritime sector while waiting for its full articulation in the PSNA when the required data have become available.

Addressing data requirements through existing surveys and administrative data. Data requirements should be incorporated in surveys. Similarly, administrative reporting forms need to be reviewed, revised, or enhanced to incorporate data needed in the indicator system or in the estimation of the economic importance of the sector. A database of relevant data should be developed and institutionalized.

Addressing the environmental aspect. The uncontrolled use of sea or ocean resources causes environmental problems. Economic activities in the ocean (e.g., shipping, offshore drilling, etc.) also cause environmental degradation. Thus, conducting an environmental accounting in the sector should be pursued to ensure sustainable development.

Institutionalization of measurement of contribution to the economy. Continuing improvement of the framework should be done to come up with better estimates. Institutional linkages with data-producing agencies, government and private, should be established to facilitate compilation. Most importantly, the

institutional framework under which the compilation will be undertaken should be formulated and agreed upon.

Continuing advocacy for investments in statistics. When resources become tight, it is unfortunate that statistical activities become outprioritized by other expenditure items. For the Philippines to remain competitive with the knowledge-based economies of the Third Millennium, it is imperative that both government and private sector recognize the need to invest in statistics. In order to gain statistical capacity to measure the contribution of the maritime sector to the Philippine economy, financial and human resources must be provided to PSS in general and to NSCB in particular.

References

Adenekan, S. 2008. "Seafaring: a gold mine yearning for exploitation." Accessed on 11 March 2009 from http://www.punchng.com/Articl.aspx?theartic=Art200809210232762

BAS (Bureau of Agricultural Statistics). 2009. "Performance of Philippine agriculture," Accessed on 20 March 2009 from http://www.bas.gov.ph/perflastyear.php.

BFAR (Bureau of Fisheries and Aquatic Resources). 2009. "Fishery resources." Accessed on 4 May 2009 from http://www.bfar.da.gov.ph/styles/Publications03/f_resources(07).htm.

CESOI (Centre for Economic Studies and Ocean Industries), Maritime Institute of Malaysia. 2009. "The future of Malaysia's maritime economy." Malaysian Management Review. Accessed on 10 March 2009 from http://mgv.mim.edu.my/MMR/9812/981204.htm.

Colgan, C.S. 2003. "The changing ocean and coastal economy of the United States." Prepared for the National Governors Association Center for Best Practices, 22 October 2003. Accessed on 23 March 2009 from http://www.nga.org/cda/files/102203WavesColgan.pdf.

DENR (Department of Environment and Natural Resources). 2006. 2006 Compendium of Basic ENR Statistics for Operations and Management (2000-2005). Quezon City: DENR.

DFO (Fisheries and Oceans Canada). 2003. "Canada's ocean industries: contribution to the economy, 1988-2000." Accessed on 18 March 2009 from http://www.dfo-mpo.gc.ca/communic/Statistics/oceans/economy/index_e.htm.

DOTC (Department of Transportation and Communication). 2009. "Project on Omnibus Merchant Shipping Act of the Republic of the Philippines." Accessed on 11 March 2009 from http://www.maritimecode.com.ph/about_us.php.

EC (European Commission), Directorate-General for Maritime Affairs and Fisheries. 2009. "The role of maritime clusters to enhance the strength and development of maritime sectors." Accessed on 25 March 2009 from http://ec.europa.eu/maritimeaffairs/clusters_en.html.

Executive Committee, EMP (European Metalworker's Federation). 2005. "The future of the maritime industry In Europe: the sea is the future." Accessed on 11 March 2009 from http://www.mareforum.com/NewEurMaritPolicy_FEM.pdf.

Garcia, M. 2005. "Progress in the implementation of the Philippine national marine policy: issues and options." Accessed on 18 March 2009 from http://www.un.org/depts/los/nippon/unnff_programme_home/fellows_pages/fellows_papers/garcia_0506_philippines.pdf.

Karandawala, G. 2009. "Maritime training in the ESCAP region." Accessed on 10 March 2009 from http://www.unescap.org/ttdw/Publications/TFS_pubs/Pub_2079/Pub_2079_Tech4.pdf.

Khalid, N. 2005. "Maritime economic ativities: planning towards sustainable development." Accessed on 10 March 2009 from http://www.mima.gov.my/mima/htmls/papers/pdf/nazery/LESTARI-paper%20_Feb16.pdf.

McIlgorm, A. 2004. "Economic value of the marine sector across the APEC marine economies." Report to the APEC Marine Resource Conservation Working Group Project (05/2004). Centre for Marine Policy, University of Wollongong, Australia.

Neufeldt, V., editor. 1996. Webster's New World College Dictionary. Macmillan, Inc., USA.

NSCB (National Statistical Coordination Board). 2008. 2008 Philippine Statistical Yearbook. NSCB, Makati City, Philippines. p. 14-8 to 14-9.

NSCB (National Statistical Coordination Board). 2009. National accounts of the Philippines. CY 2006 to CY 2008 (base year: 1985). NSCB, Makati City, Philippines.

National Statistics Office. 2004. 2000 Census of Philippine Business and Industry. Manila, Philippines.

Oxford Dictionary. Accessed on 11 March 2009 from http://www.askoxford.com/concise_oed/maritime?view=uk.

POEA (Philippine Overseas Employment Administration). 2009. "Overseas employment statistics." Accessed on 11 March 2009 from http://www.poea.gov.ph/html/statistics.html.

PPA (Philippine Ports Authority). 2009. "Ports statistics." Accessed on 20 March 2009 from http://www.ppa.com.ph/.

SAN (South African Navy). 2009. "Maritime doctrine for the navy. Chapter 2. The maritime environment." Accessed on 4 May 2009 from http://www.navy.mil.za/SANGP100/SANGP100_CH02.pdf.

SEDB (Singapore Economic Development Board). 2009. "Facts and figure. Marine and offshore engineering." Accessed on 4 May 2009 from http://www.edb.gov.sg/edb/sg/en_uk/index/industry_sectors/marine___offshore/facts_and_figures.html.

Vitasa, H.R. and Soeprapto, N. 1999. "Maritime sector development in ASEAN." ASEAN Secretariat. Paper presented at the Maritime Policy Seminar organized by the United Nations Conference on Trade and Development and the Ministry of Communications of Indonesia, 11-13 October 1999, Jakarta, Indonesia. Accessed on 10 March 2009 from http://www.aseansec.org/2825.htm.

WPT (Workplace Performance Technologies) (Pty) Ltd. 2009. "The development of the maritime transport industry: black empowerment strategy. Accessed on 4 May 2009 from http://www.workinfo.com/BEE/maritime.htm

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An Analysis on the Contribution of Ocean Economy to the National Economic Development of China

What is ocean economy? It is integrated, with all kinds of industrial and related activities. For coastal nations around the world, the ocean economy is one of the important components of national economy. It has become a new area of economic growth for countries and the region since the end of the last century.

For the past 30 years since the implementation of China's open-door policy, and during the process of constant economic growth, the development of the ocean economy has gone from a preliminary state of rapid economic growth pushed by the government, to extensive expansion towards transition to an enterprise-based operation, in which intensive manufacturing, high efficiency, and the market are dominant. The development of the ocean economy of China has evolved from a minor role played by traditional industries to becoming an important component of the national economy. It has made historical contributions to the modernization process of coastal areas, and it will maintain an uptrend momentum in terms of expansion and strength.

History and Status of Ocean Economy Development

Evolution of the concept

Whether in content or scope, the ocean economy in China develops and changes with the ocean development process.

Since the 1990s, the statistical rules for the ocean economy in China have been gradually developing. In the past 30 years, this aspect of economic growth in national economy and coastal areas of China has been increasingly recognized. However, there is a big gap in the statistics of various industries.

In 2003, the State Council of China promulgated the "National Ocean Economy Development Program". For the first time, the concept of ocean economy was defined in an official document by the most supreme authority of the nation. It was defined as an integrated whole of various industries for the development and utilization of the ocean and the relevant economic activities. The economic activities cover basic work such as: ocean investigation, ocean mapping, prospecting, and exploration of marine resources, etc.; research and development of marine science and technology, including basic technology; protection of the environment and its resources, marine environmental monitoring, marine ecology, harnessing of regional marine pollution, etc.

Around the turn of the present century, there have been calls to extend the scope of ocean economy statistics and to include the coastal area (**Figure 1**). The ocean economy covers two parts: ocean industries and ocean-related industries.

Ocean industries include the production and service activities carried out in the process of developing, using, and protecting the ocean. These are marine fishery, marine oil and gas, marine salt, marine chemistry, marine biomedicine, marine power, seawater use, ship building, ocean engineering and construction, marine transportation and shipping, coastal tourism, as well as marine research, education, management and service industries.

Marine research, education, management and service industries include marine information services, marine environmental monitoring services, marine insurance and social welfare, marine science research, ocean technology services, marine geology prospecting and exploration services, marine environmental protection services, marine education, marine management, and marine societies and international organizations, among others.

Ocean-related industries also cover upstream and downstream industries, which serve as the linkage of various inputs and outputs, constituting together with the main marine industries, technical and economic relations, relating to ocean agriforestry, ocean equipment manufacturing, ocean-related products and materials manufacturing, ocean-related construction and decoration, ocean wholesale and retail, ocean-related services, etc.

Status

In 2008, the ocean economy of China continued to keep its high growth

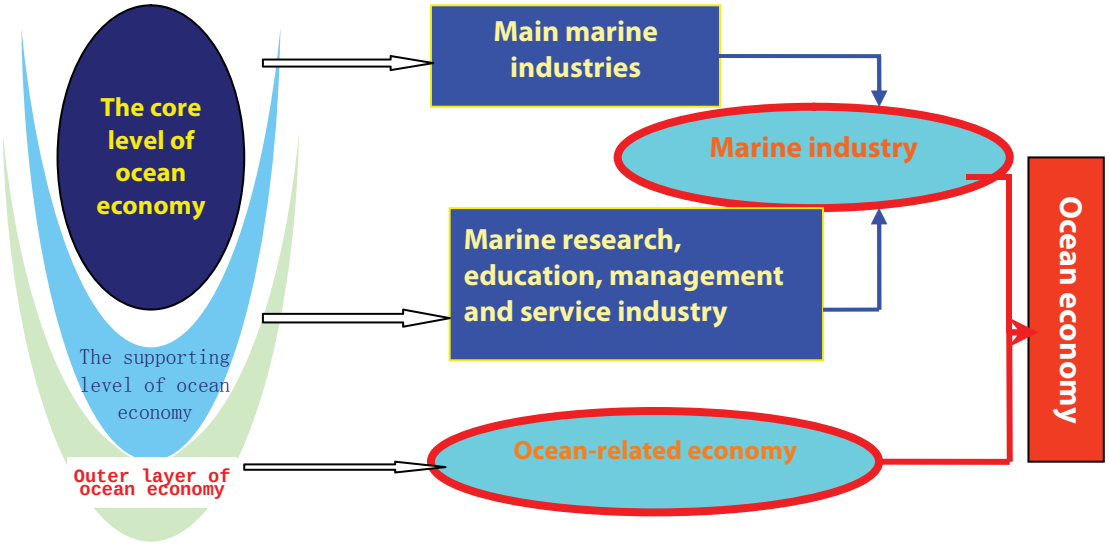


Figure 1. The concept of the statistics system for the ocean economy of China.

rate, even higher than that of the average national economy. The national ocean gross domestic product (GDP) was Chinese yuan 2,966.2 billion, an 11 percent increase over 2007, and it accounted for 9.87 percent of the national GDP, a 0.13 percent increase over 2007. The ocean GDP accounted for 15.8 percent of GDP of the coastal area of China.

In comparison, the growth rate of marine GDP was 0.87 percent higher than that of the national GDP. The ocean industries' structure was in the order of 3-2-1, while the national structure was 2-3-1. In terms of contribution to employment by economic development, the newly added employment from marine sector accounted for 13.67 percent of total national newly added employment, thus the contribution from marine sector was comparatively larger (**Table 1**) .

History of development

The growth rate of annual average GDP of ocean economy is higher than that of the national and coastal economies. In 2001-2008, the national GDP increased from RMB 10.9655 trillion to 30.067 trillion, and its annual average growth rate was 15.45 percent. The coastal GDP increased from RMB 6.0778 trillion to 18.8108 trillion, and its annual average growth rate was 17.5 percent. The national ocean GDP increased from RMB 951.84 billion to 2,966.2 billion, and its annual average growth rate was 17.63 percent. These figures show that the ocean economy has developed faster than the national economy and coastal economy (**Figure 2**).

The ocean economy GDP has maintained a two-digit growth rate for many years. It was only in 2003, when this two-digit growth was not maintained, due to the outbreak of the severe acute respiratory syndrome, causing coastal tourism to slide on a large scale. This resulted in the lowest growth rate of ocean GDP in history. The national ocean GDP in 2002 increased 19.8 percent higher than in 2001. After the regression in 2003, a growth rate of 16 percent was maintained for the next three years. With the impact of global financial crisis, the development of the main marine industries slowed down from 2007 to 2008 (with a growth rate of 11 percent) (**Figure 3**).

Implementation of adjustment for a better industrial structure of the ocean economy. For the past 30 years, the three industrial structures of the national

Table 1. Basic information of national economy and national ocean economy of 2008 (SSA, 2008 and SOA, 2008).

Index	National economy	National ocean economy	Ocean/nation
GDP (billion)	30,067.0	2,966.2	0.987
Annual growth rate of GDP (%) over 2007	0.9	0.987	+0.87
Added value of 1st industry (billion)	3,400.0	160.8	0.473
Added value of 2nd industry (billion)	14,618.3	1,402.6	0.96
Added value of 3rd industry (billion)	12,048.7	1,402.8	1.164
Structure of three industries	11 : 49 : 40	5 : 47 : 48	321/231
Number of employment at yearend (10,000)	77,480	3,218	4.15%
Newly added employment (10,000)	490	67	13.67

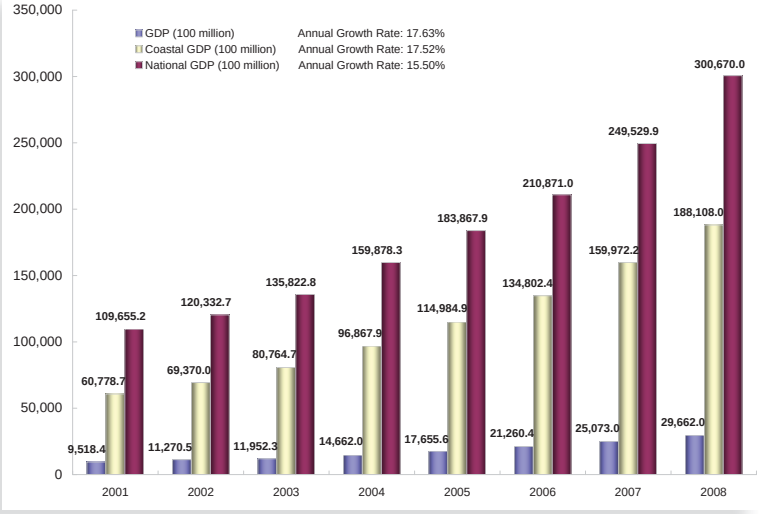


Figure 2. GDPs of national, coastal, and ocean economies, 2001-2008

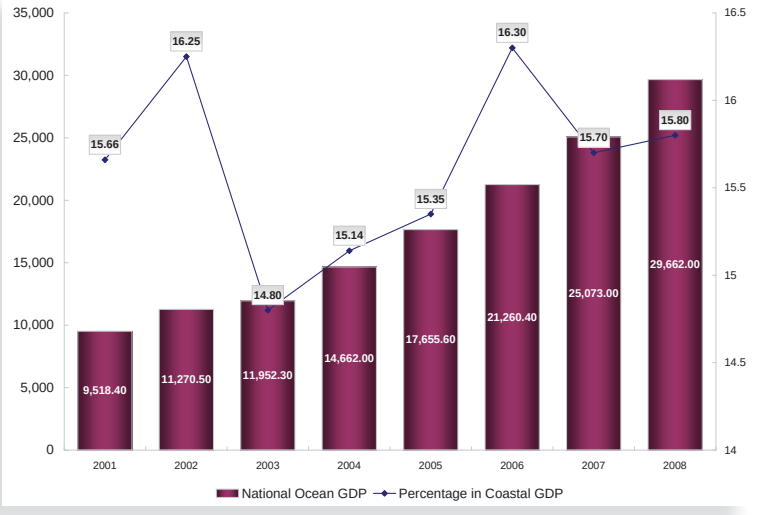


Figure 3. National GDP and growth rate, 2001-2008 .

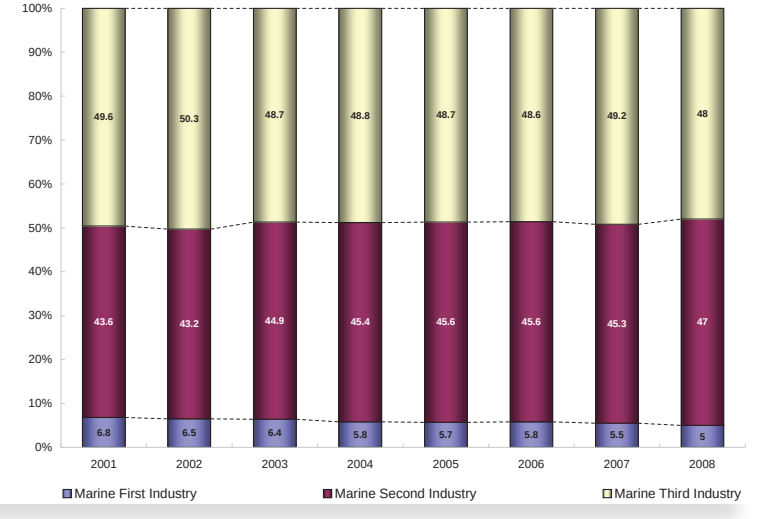


Figure 4. The national ocean GDP of the three industries, 2001-2008.

ocean economy have experienced a transition from 1-2-3 to 1-3-2, then to 3-2-1. The evolution of the three industrial structures of ocean GDP was a comparatively slow process. In 2001, the ratios' order of the 3-2-1 (first) industries was 6.8:43.6:49.6. In 2004, it became 5.8:45.4:48.8, the first time, the industry went down to a six percent growth rate. In 2008, the rate further went down to 5 percent; a 1.8 percent decrease over eight years. The second industry's growth rates were 43.6 percent in 2001 and 47 percent in 2008, a 3.4 percent increase. The rates for the third industry were 49.6 percent in 2001, 50.3 percent in 2002, and 48 percent in 2008. These changes reflected the industrial process of ocean economy of China (**Figure 4**).

Contribution of ocean economy to national economy

The added values of marine and ocean-related industries constitute the ocean GDP and the integration of statistical items in relation to national GDP. In view of this, the following discussion about the contribution of ocean economy to national economy shall be defined based on the relation of ocean GDP with national GDP.

In 2001-2008, it could be concluded that the contribution of ocean economy to national economic development was huge and in an upward trend. **Figure 5** shows that the contribution rate increased from 8.68 percent (2001) to 9.87 percent (2008). The increase of 1.37 percent proved that ocean economy is an important component of China's national economy.

Figures 6 and 7 show that the contribution rate of ocean economy to coastal economy increased from 15.66 percent (2001) to 15.80 (2008). The increase of 0.14 percent shows that the contribution to coastal economy was lower in relation to national economy.

Marine industries and their contribution to national economy

The main marine industries are the core components of the ocean economy, representing about 40 percent of the marine industry added value. Based on **Table 2**, the scope and output of these industries have been gradually increasing year by year.

The development and use of the ocean in China have resulted in an expanded and value-added marine industries group. The economic statistics could be divided into three stages: (1) 1982-1991 – when there were only six main marine industries: marine fisheries, marine salt, beach sand and minerals, port and shipping, international coastal tourism, and offshore oil and gas; (2) 1992-2001 – aside from the six industries, coastal ship building and repairing were added; (3) 2002 – the industries increased to 12; marine chemistry, marine biomedicine, ocean power, sea water use, and ocean engineering and construction industries were added (**Table 3**).

During 1998 and 2008, there was a significant increase in the added value from national main marine industries – RMB 126.63 billion in 1998 to almost 10 times more in 2008, at RMB 1,224.3 billion (**Figure 8)**.

The marine biomedicine industry had the fastest growth rate between 2001 and 2008, followed by ocean mineral and marine chemistry. The others were, in order: sea water use, ocean ship industry, ocean oil and gas, ocean power, ocean engineering and construction, coastal tourism, ocean shipping and transportation, marine fishery, and marine salt (**Figure 9**). Marine biomedicine grew 4.3 times faster than marine salt industry.

Figure 10 shows an uptrend among ocean mineral, marine biomedicine, ocean power, and sea water use and

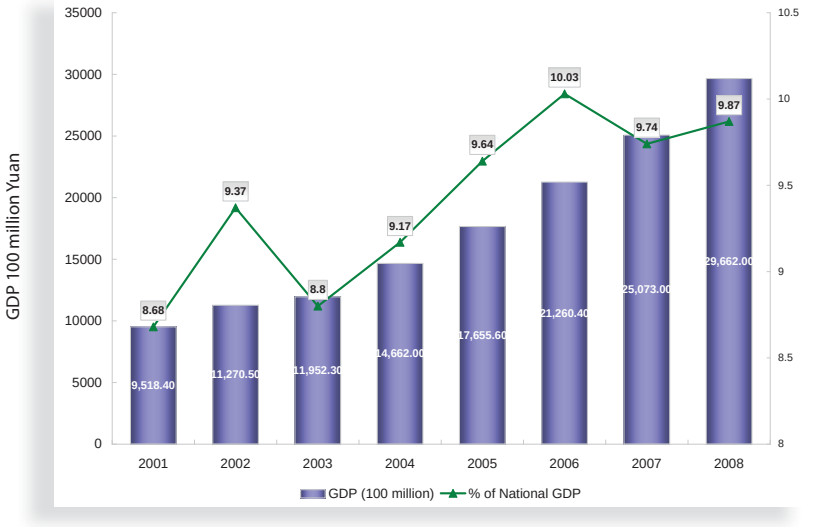


Figure 5. National ocean GDP and its percentage in national GDP, 2001-2008.

a downtrend among marine fishery, marine oil and gas, and coastal tourism. Based on these statistics, marine biomedicine, ocean power, and sea water use have good potential to be developed into new types of marine industries. Also, the impact of macroeconomic changes on ocean ship industry and transportation is big, which shows that these industries are closely related to national economy.

Traditional marine industries remain dominant

The major development goal recently of marine fishery is to increase the income of fishers and to realize sustainable development. In general, marine fishery's growth has been stable, under the guidance of the industrial policy. In 2008, there was a continuous control of fishing effort along the coastal provinces, and efforts were made to adjust the industrial structure of the marine fishery. An annual value of RMB 221.6 billion was added and a growth rate of 3.3 percent was obtained, accounting for 18.1 percent of total added value of national main marine industries.

Ocean shipping and transportation have continuously developed at a rapid speed. The number of ports with more than 100 million ton capacity reached 14 nationally. The loading and unloading

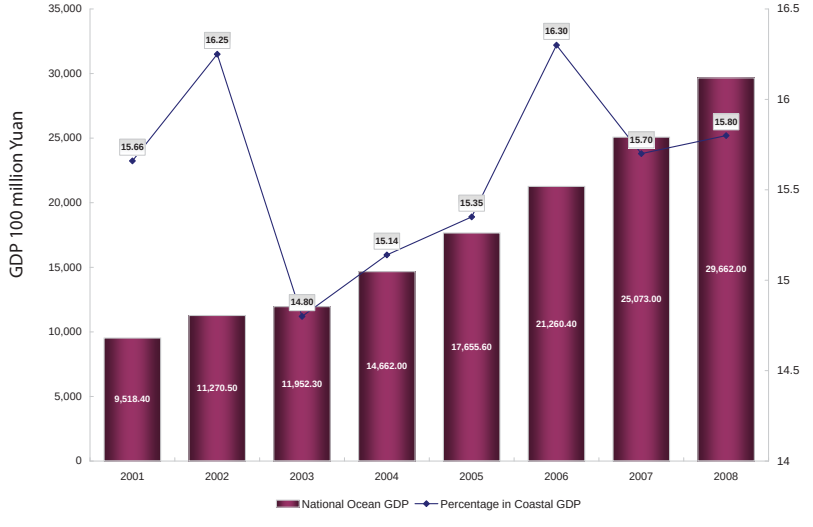


Figure 6. National ocean GDP and its percentage in coastal GDP, 2001-2008.

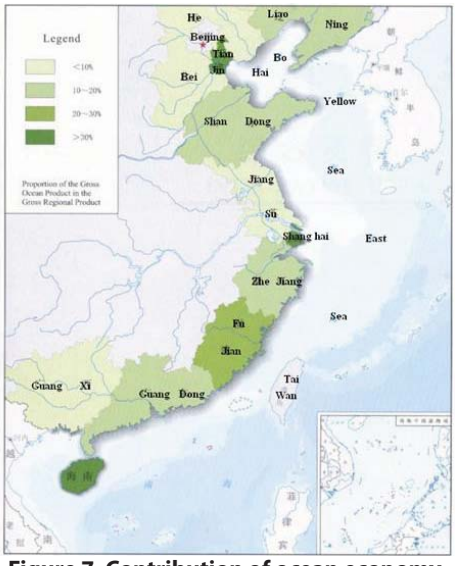


Figure 7. Contribution of ocean economy to coastal economy, 2007.

capacity of these ports, including that of containers, occupied first place in the world for five consecutive years. By the end of 2007, there were a total of 35,947 active berths in the operating ports. Among the total, the number of deep water ports with capacities greater than 10,000 ton reached 1,337, which was 134 more than in 2006. During the first half of 2008, ocean shipping and transportation developed rapidly. But this was reduced with the impact of the global financial crisis. The added value for 2008 was RMB 385.8 billion, an increase of 16.1 percent over 2007. The growth rate was -2.9 percent. The two industries accounted for 31.51 percent of the total added value of the gross product of national main marine industries.

In 2008, with the impacts of freezing rain and snow and the global financial crisis, the development of coastal tourism kept a similar pace with that in 2007. The added value was RMB 343.8 billion, a 0.2 percent increase over 2007 amount. The growth rate was 18.5 percent, a decrease over 2007's rate. Coastal tourism accounted for 28.08 percent of total added value of national main marine industries.

The demand for sea salt has been increasing because of the need for it by people and the rapid development of the industry. In 2007, the production output of sea salt was 32.04 million tons, 86 tons more than that in 2006, and this level of production occupied first place in the world. Shandong is the top sea salt producer in China, The overall production output of sea salt chemical product reached 788,000 tons, among which the output of industrial brine was 13,000 tons. In 2008, when efforts were taken to address the impact of the rain and snow crisis, and when production cost was increased, the production of sea salt and operation of its industry became stable. An added value of RMB 5.9 billion was realized and an 11.2 percent increase in growth rate was achieved over the 2007 amount.

In 2008, the total added value of the above traditional industries accounted for 78.17 percent of the national main marine industries.

Heavy marine industry group is expanding

After almost 30 years of rapid development, the ship building industry of China has been drawing worldwide attention. In 2007, the industry took up 23 percent of the world market, and for the first time, it surpassed 20 percent, gaining a 4 percent increase over the 2006 rate. The output has surpassed that of Japan. This was another opportunity for China to increase its quotas. For 13 consecutive years, China has been occupying third place in terms of output product. It has also been ranked first, overtaking the Republic of Korea, in getting some of the biggest contracts. China is second in the world in terms of signed contracts, surpassing total quotas of Japan, Europe, and other countries.

The ship building industry of China can also be said to be dominating the world mainstream ship market. In terms of bulk cargo ships, oil tankers, and containers, China for the first time took the place of Japan as first in the world in obtaining contract orders for bulk cargo ships. China is second to RO Korea in terms of oil tankers and container ships. In terms of signed contract orders for an individual enterprise, Chuanbozhonggong of Dalian, Waigaoqiao of Shanghai, and Jiangnanchangxing have entered the top 10 world ship building powers. Another seven enterprises entered the top 20 powers. In 2008, with the

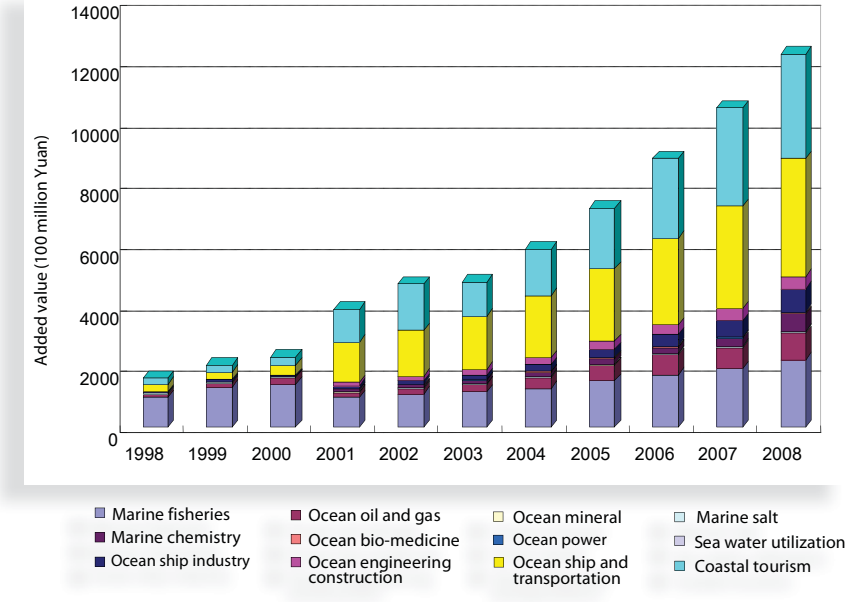


Figure 8. The added values of national main marine industries, 1998-2008.

Table 2. The formation of added value of ocean and its related industries.

Tear	Gross ocean product	Marine industries	12 main marine industries	Ocean science education management services	Ocean-related industries
2001	100.0	60.2	40.5	19.7	39.8
2002	100.0	60.2	41.7	18.5	39.8
2003	100.0	59.7	39.8	19.9	40.3
2004	100.0	59.4	39.7	19.7	40.6
2005	100.0	59.7	40.7	19.0	40.3
2006	100.0	59.4	41.5	17.9	40.6
2007	100.0	59.4	41.7	17.7	40.6
2008	100.0	58.5	41.3	17.2	41.5

impact of the global financial crisis, the industry received less new contract orders, but overall it still kept growing at a comparatively rapid speed. The added value in 2007 reached RMB 76.2 billion, a 36.4 percent increase over 2006 amount and accounted for 6.22 percent of the total added value of national main marine industries.

Under the policy of improving the capability of prospecting, exploration, and exploitation, the marine oil and gas industry of China has made major progress and might provide the basis to guarantee the domestic output production of crude oil up to 50 million tons by 2010. In 2007, 18 findings on potential commercial production were discovered. A major achievement in geological research in the nearshore area of China has been made – from shallow layer to deep layer and from shallow water to deep water. Satisfactory progress has also been made in obtaining new rights for oil, such as increasing the holding rights of the Canadian MEG oil sands project up to 14.57 percent; winning the Australian bid for No.W06-1 zone at sea; signing a benefit sharing contract with Cambodia for F zone; and others. In 2007, an added value of RMB 87.4 billion was realized, which was 1.1 percent less than 2006 amount and accounted for 7.14 percent of the total added value of national main marine industries.

Table 3. Scope of main marine industries in China.

Number	1982-1991	1992-2001	2002 to present
1.	Marine fishery	Marine fishery	Marine fishery
2.	Marine salt	Marine salt	Marine oil and gas
3.	Sand and minerals	Sand and minerals	Sand and minerals
4.	Sea port and communication and transportation	Marine oil and gas	Marine salt
5.	Coastal tourism	Marine transportation and shipping	Marine chemistry
6.	Marine oil and gas	Coastal tourism	Marine biomedicine
7.		Ocean ship building and repairing	Ocean power
8.			Seawater use
9.			Ocean ship building
10.			Ocean engineering and construction
11.			Marine transportation and shipping
12.			Coastal tourism

The ocean power industry of China has also grown rapidly. The wind power at sea has made a substantial breakthrough. The tide power is gradually progressing and the wave power is expected to have a breakthrough. The sea area of China is rich in ocean energy, with a total stock capacity of over 800 million kw. The ocean power industry had a 16 percent annual growth rate during the 10th five-year period of added value. In 2008, the added value of the industry reached Yuan 800 million in 2007, a 51.6 percent increase over 2006 amount and accounted for 0.06 percent of the total added value of national main marine industries.

In 2007, the country began to implement measures prohibiting the export of natural sand. Instead, the local sea sand mining industry was strengthened. The added value of this industry amounted to RMB 500 million, a 24.2 percent decrease over 2006 amount. In 2008, China continued effective control of non-metal mining and expansion of metal production. This resulted in further adjustment of the industrial structure of ocean mining. The added value in 2008 was RMB 900 million, a 21.3 percent increase over 2007 amount. It accounted for 0.08 percent of the total added value of national main marine industries.

Manufacturing instruments and equipment with adaptive capability to marine features is the core business of the ocean engineering construction industry. With the pace of exploitation of deep sea oil and gas resources being expedited continuously, mining technology and equipment should be able to cope. The industry has become market-oriented. In 2008, the added value of the industry reached RMB 41.1 billion, 9 percent less than 2007 and accounted for 3.36 percent of the total added value of national main marine industries.

In 2008, the total added value of the above industries accounted for 17 percent of the total added value of national main marine industries.

Prospects for ocean high-technology industry

The technical breakthroughs and decreasing economic costs in sea water circulation cooling technology and desalination technology have provided the basis for industrial development of sea water use in China. In 2008, the industry further accelerated. The added value was RMB 800 million, a 22.7 percent increase over 2007 amount. It accounted for 0.06 percent of the total added value of national main marine industries.

Facing the ever increasing shortage of land-based bioactive substance resources, while improving knowledge of marine living resources as a source of new medicines, China's marine biopharmaceutical industry has developed rapidly. At present, there are seven marine medicines for approval for production by the government. There are another 15 for approval by the provincial authorities. There are more than 20 enterprises for manufacturing marine medicine. Research is developing fast, too. There are 1,000 kinds of marine organisms known for pharmaceutical use, among which several hundreds of natural products have been obtained from separation, making over 20 unilateral drugs and almost 200 multilateral Chinese medicine products. There are more than 300 types of marine health foods already in production. In 2008, the industry had an added value of RMB 5.8 billion, a 28.3 percent increase over 2007 amount and accounted for 0.48 percent of the total added value of national main marine industries.

China has a stored capacity for wind power at sea of about 750 million kw. With the capacity of wind generators on land becoming full, wind power at sea is the focus for future development. In 2007, the field of energy is considered an important one by the national science and technology supporting program and a research and demonstration project on high-power wind generator was initiated for implementation. In that year, the first wind power-generating field at sea verified by the State Development and Reform Commission – Shanghai Eastern Sea Bridge – was under construction. Its operation began in 2009. At present, there are 18 wind power-generating fields along the coastal regions of China.

China has made good progress in deep sea technology, including research and development of deep sea equipment. It does various kinds of preparatory work which will become part of the preliminary deep sea industry by 2020. According to estimates, if the total investment for deep sea industry is about US$1.4 billion-1.9 billion, the recovery period is expected to be 7-12 years and the profit may reach US$4-5 billion. By 2050, with the breakthroughs in a series of key deep sea technology and the conversion of the achievements, the deep sea high-technology industry

Table 4. Total employment of each main marine industry (unit:10,000).

Main marine industry	2001	2005	2006	2007
Total	719.1	949.2	1006.7	1075.2
Marine fishery and related industry	348.3	459.8	487.6	520.8
Marine oil and gas	12.4	16.4	17.4	18.5
Coastal minerals	1	1.3	1.4	1.5
Marine salt	15	19.9	21	22.4
Marine chemistry	16.1	21.3	22.5	24.1
Marine biomedical industry	0.6	0.8	0.8	0.9
Ocean power and seawater use	0.7	0.9	1	1
Marine ship industry	20.6	27.2	28.8	30.8
Ocean engineering construction	38.8	51.2	54.3	58
Ocean shipping and transportation	50.8	67.1	71.1	76
Coastal tourism	78.3	103.4	109.6	117.1
Other ocean-related industries	136.5	180	191.2	204.1

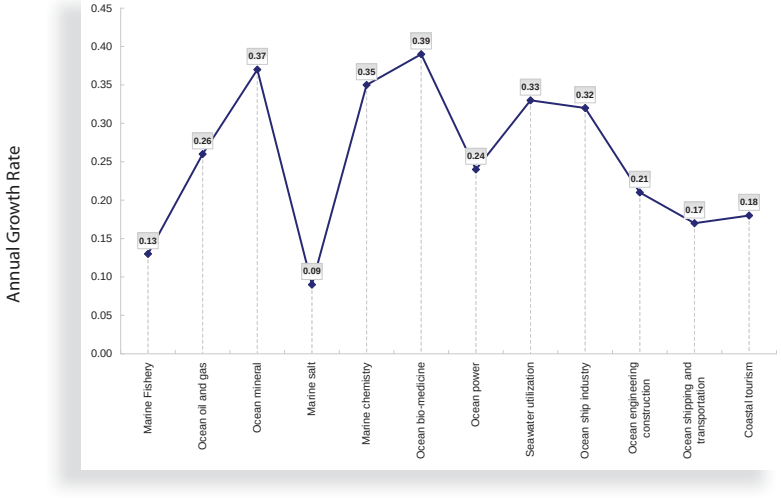


Figure 9. Annual growth rate of national main marine industries, 2001-2008.

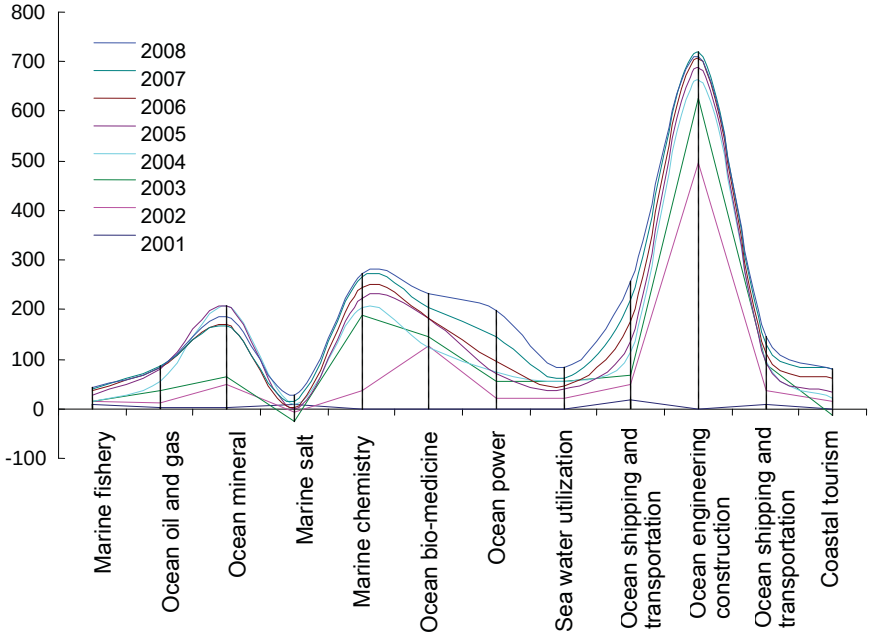


Figure 10. Variation of the growth scale of the added value of national main marine industries, 2001-2008.

group could enter the commercial development stage simultaneous with other developed countries.

Contributions to coastal population growth and ocean-related employment

Accompanying the open reform of China for the past 30 years, the continuous and rapid development of the economy in the coastal regions has attracted more people and has accelerated the urbanization process.

In end 1978, the total population of the country was 962.59 million, in which the population in the coastal region (meaning 11 provinces, municipalities, and autonomous regions) was 384.65 million, accounting for 39.96 percent of the whole population of the country. At the end of 1990s, the national population was 1,143.33 million, with a coastal population of 460.82 million (40.31 percent). In 2007, the national population was 1,321.29 million, with a coastal population of 549.09 million (41.56 percent). Over the past 30 years, the percentage of coastal population to national population has increased by 1.6 percent.

Regarding employment, the national number of employees in 1978 was 401.52 million, in which the coastal number was 168.426 million (41.95 percent). In 1990, the national number was 639.09 million, in which the coastal number was 244.869 million (38.32 percent). In 2007, the national number was 769.00 million, in which the coastal number was 304.847 (39.60 percent). By end of 2008, the national number was 774.80 million, a 4.9 million increase over 2007 figure. Employees in ocean-related industries numbered 32.18 million, with 670,000 new employees added (accounting for 13.67 percent of the national number).

Based on the statistical analysis of 2001-2007 data for employment in each main marine industry, the number of direct employees of national main marine industries, in 2001, was 7.191 million. Until 2005, 2.3 million were added and another 572,000 in 2006. In 2007, the total number of employees of national main marine industries was 10.752 million, with 3.561 million employees added for the past six years.

As mentioned previously, the added value of main marine industries accounted for 40 percent or so of that of the gross ocean product. Thus, it may be concluded that the percentage contribution of the ocean economy to the national economy, in terms of employment, is greater than that of the main marine industry, as presented in **Table 4**.

Based on the data of main marine industries for many years, employment of marine fishery and related industries has always been ranked first (about 5 million and accounting for 50 percent of the total ocean-related workers). This was followed by coastal tourism (1 million; 10 percent and over) and the other industries were, in order: ocean shipping and transportation, ocean engineering construction, ocean ship building, sea salt, and marine chemicals (**Table 5** and **Figure 11**).

Conclusion

This paper defined what ocean economy and marine industry are and their scope. From the vertical timeframe of historical process of development and the horizontal frame of space and field development of regional and industrial economies, the contributions and functions of ocean economy to national economy were explored. Following are the results of the study:

1. The gross ocean product and GDP constitute a uniform relationship for statistical analysis. This is the most comprehensive and appropriate way that statistical data may reflect the contribution, on a broadest scope, of ocean economy to national economy. In 2008, the percentage of gross ocean product to national GDP reached its highest point, at 10.11 percent.
2. The contribution of the ocean

economy to the coastal region is more prominent. In 2008, the total coastal GRP was RMB 18,810.8 billion and it contributed 62.56 percent to national GDP. Ocean GDP was 15.8 percent of coastal GDP. From 2001 to 2008, the ocean economy's contribution to coastal economy increased by 0.5 point.

3. The contribution of main marine industries to national economy is large. They are the core components of ocean economy During the past 30 years, in the process of ocean development and use, a group of marine industries with growth of added value has been formed. Their number increased from 7 industries to 12 industries. Their added value was raised from 1.65 percent of GNP to 5.0 percent of GNP. The rates of added value of the main marine industries to national GDP increased from 1.9 percent to 3.5 percent and coastal GRP from 4 percent to 7 percent.
4. The growth trend of each main marine industry varied, and the difference in contribution to national and regional economies was large. In terms of gross product, the contribution of traditional industries (like fishery) was huge and provided support to the continuous growth of the ocean economy. In recent years, the development of the marine chemical industry was prominent, as illustrated in the expansion of industrial types, increase in output value, and rapid development. The marine high-technology industry is expected to enter a rapid growth period in the areas of seawater use, marine biomedicine, and wind power at sea, among others.
5. The contribution of the ocean economy to employment grew relative to the rising trend of the country's population, the number of permanent residents in the coastal areas, and the number of ocean-related employees. The coastal population accounted for over 40 percent of national population while the coastal employee population accounted for about 40 percent of national population. The total number of direct employees of national main marine industries was from 7.191 million (2001) to 10.752 million (2007), with 3.561 million employees added for the past six years. The growth rate was higher than that of the national average. In the industrial level, employment from marine fishery and related industries has always been ranked first, followed by coastal tourism.

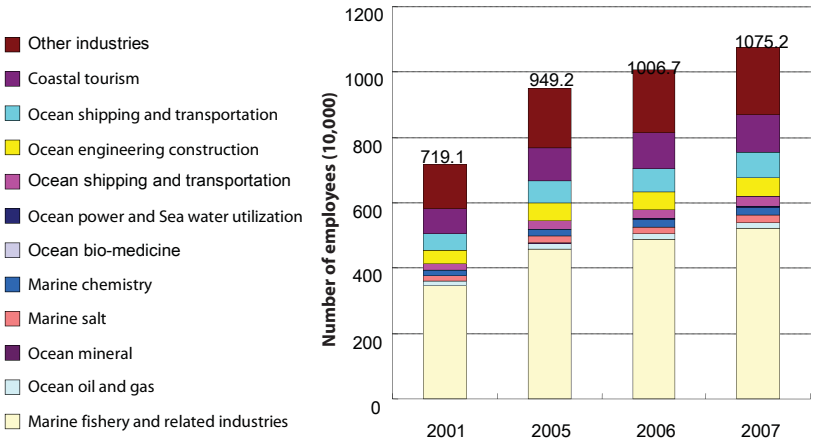


Figure 11. Total number of employees of main marine industries.

In a capsule, the contribution of ocean economy to national economy could be reflected in aspects such as regional economy, industrial economy, and employment. Further analysis of the contribution of ocean economy to national economy needs to be done from a multidisciplinary perspective.

References

SSA, 2008
State Oceanic Administration. 2008. Unpublished documents.

Table 5. Employment allocation (percentage) of each main marine industry.

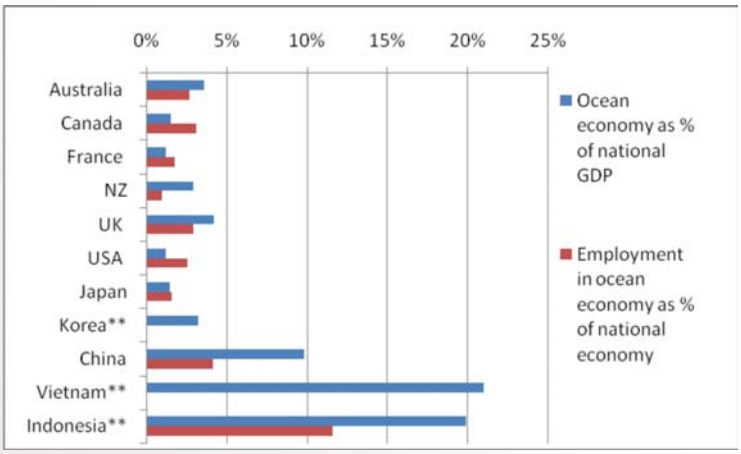
	2001	2005	2006	2007	Annual average
Marine fishery and related industry	48.44	48.44	48.44	48.44	48.44
Marine oil and gas	1.72	1.73	1.73	1.72	1.73
Coastal minerals	0.14	0.14	0.14	0.14	0.14
Marine salt	2.09	2.10	2.09	2.08	2.09
Marine chemistry	2.24	2.24	2.24	2.24	2.24
Marine bio-medicine	0.08	0.08	0.08	0.08	0.08
Ocean power and seawater use	0.10	0.09	0.10	0.09	0.10
Ocean ship industry	2.86	2.87	2.86	2.86	2.86
Ocean engineering and construction	5.40	5.39	5.39	5.39	5.39
Ocean shipping and transportation	7.06	7.07	7.06	7.07	7.07
Coastal tourism	10.89	10.89	10.89	10.89	10.89
Other ocean industries	18.98	18.96	18.99	18.98	18.98
Total	100	100	100	100	100

The economic contribution of the marine economy: Southeast Asia leads the way!

In the 1970-1980s over 100 nations came to together in the United Nations to negotiate the UN Convention on the Law of the Sea (UNCLOS). This led to the development of sovereign maritime rights and to nations adopting a 200 nautical mile- Exclusive Economic Zone (EEZ) to exploit their marine resources. These developments enabled nations to capture their economic contribution from their marine sector in an orderly fashion, thus minimizing international maritime disputes. With this increase in sovereign empowerment in the EEZ came the right to manage offshore industrial activities and the promise of new economic income streams through offshore oil production, growth of marine transport and services and a sustainable marine seafood catch.

For a variety of reasons, there has not been an economic valuation framework put in place to monitor the achievement of these economic aspirations for the marine sector. A number of academic and research projects have gradually addressed how we should measure the contribution of the marine economy in a way that is implementable with the marine sector and using Gross Domestic Product (GDP) measures that are currently being used for the general economy. The research that started in the United States, Canada, United Kingdom and Australia showed that the marine economy was less than four percent of total national GDP. An Asia-Pacific Economic Cooperation (APEC) review study in 2004 reviewed the marine economies as a percentage of their total GDP. Until the recent PEMSEA initiative, the range of contribution to the Asian marine economies was not available. Figure 1 reports the contribution of the marine economy to the total national economy as a percentage of GDP and marine sector employment as a percentage of total national employment in a range of industrial economies and in the East Asian Seas region.

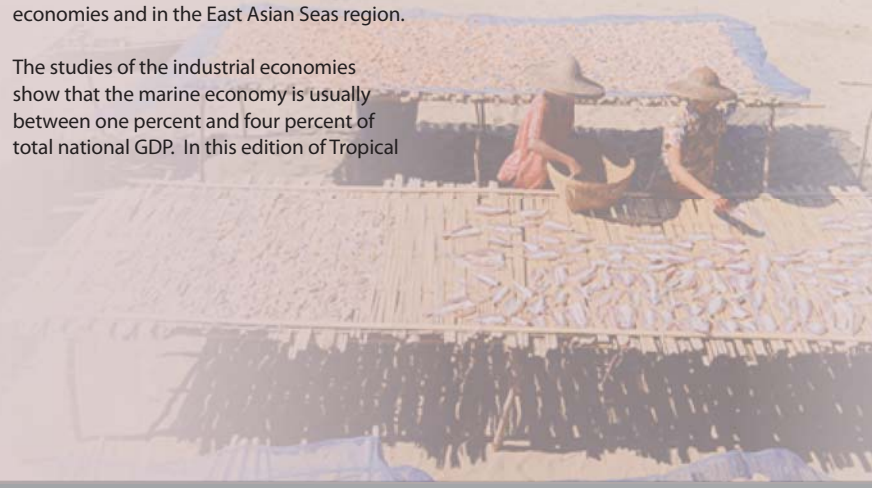
The studies of the industrial economies show that the marine economy is usually between one percent and four percent of total national GDP. In this edition of Tropical Coasts we present new findings that for several nations in the East Asian Seas region, the contribution of the marine economy to the national economy is in excess of 5 percent and may reach 20 percent in two preliminary estimates.



** Denotes preliminary result; n.b. employment estimates for Vietnam and RO Korea not available.

Figure 1. The contribution of the marine economy as percentage of total GDP and total persons employed in the marine economy for industrial and Southeast Asian economies.

The data for employment also shows the role of the marine economy in supporting jobs in the East Asian Seas region. PR China has 4.15 percent of total employment in the ocean economy, whereas Australia and New Zealand have less than 2.5 and 1 percent of total employment in the marine sector. We would also expect a difference in the GDP generated per job as the economies in the East Asian Seas region would have more fisherfolk, and coastal-resource based communities, whereas developed economies may have a greater number of technology-based jobs. These relationships require further research as the East Asian economies have high-technology marine employment also.



These are preliminary data for East Asia and the project is moving to provide a common framework for measurement of the marine economy. Moreover, economic and environmental sustainability and the depreciation of coastal and marine resources in some of the economies (due to overexploitation, pollution, climate change and other causes) have to be considered given the socioeconomic contribution and likely losses that may be incurred.

Why is the marine economy a higher proportion of national GDP in the East Asian Seas region?

In the marine economy studies of highly industrialized economies, it is not surprising that the marine economy is a small percentage of total economic activity. It has been generally assumed that the marine economy may be a higher percentage of national GDP in developing economies, and archipelagic or small island states, with abundant marine resources.

This edition of *Tropical Coasts* presents the initial results of marine economy case studies organized by PEMSEA. Future research requires a more uniform way of gathering marine economic information to confirm that marine sector studies of the economic contribution conform to the guidelines developed by economies in the APEC format. Preliminary data suggest that the marine economy is a significantly larger percentage of GDP than in developed countries. The extent and nature of these contributions is the subject of current and future research in the East Asian Seas region through PEMSEA.