Valuing the Blue Economy Using a Philippine Lens

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Abstract

The "blue economy" refers to an economic paradigm for more sustainable utilization of marine resources so as to contribute to economic development, improved human well-being, and social equity. The Philippine government defined blue economy as a term used to characterize the sustainable management of marine resources and the marine-linked sectors in the economy. In the Philippines, the blue economy—both the management of marine resources and its outcomes—represents an important source of income and resources for the vast majority of the population. This paper provides further evidence on the importance of the blue economy to development, outlining the economic contributions of this sector in the Philippines. Furthermore, this paper reviews some of the major Philippine marine ecosystem issues that need to be considered in relation to the country's pursuit of an approach in line with the concept of blue economy as part of its economic development framework/strategy. This paper reviews the Philippine coastal and marine ecosystems and Philippine fisheries sector, elaborating on the economic activities associated with oceans and the seas. It also draws on the literature in order to provide a rough guesstimate of the economic valuation of the blue economy. According to at least one study reviewed here, the total monetary value associated with coral reefs, seagrass, and mangroves using the minimum per hectare estimate of annual monetary value (for each marine ecosystem type) is estimated to be around USD 98.298 billion, or PHP 1.553 trillion (in 2007 prices). When the estimated total monetary value for continental shelf is included, the total monetary value jumps to USD 581.341 billion, or PHP 9.183 trillion (in 2007 prices). In light of the risks and threats—notably to sustainability—in the blue economy, this paper also discusses the current national initiatives of the Philippines and involvements in regional collaborations that aim to secure ocean health and benefits.

Keywords: Blue Economy, Marine Resources, Sustainable Development

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Introduction

Blue economy, as defined by APEC (2012), refers to an economic paradigm that pushes for a more sustainable and greener approach in the utilization of marine resources to attain desired development outcomes and "improve human well-being and social equity." The Philippine government defines blue economy as a term used to characterize the sustainable management of marine resources and the marine-linked sectors in the economy. This means going beyond profit-centricity, driven by few business model to a more sustainable environmental friendly business model, which can eventually lead to more benefits. Blue economy promotes equitable access to resources and distribution of benefits. The Philippine pursuit of a blue economy will require a perspective of promoting inclusive sustainable developments incorporating an archipelagic development framework (ArchDev 2004) for the country while engaging in strategic and pragmatic international cooperation that will enhance the benefits derived from marine natural resources within and in areas beyond national jurisdiction. Its expansion in the context of APEC should consider an ecosystem-based management approach that is harmonized with the Coral Triangle Initiative (CTI) goals as espoused in the Regional Plan of Action (RPOA) and National Plan of Action (NPOA).

The country has a total coastline of 37,008 km (see Table 1.1), which is longer than the coastlines of China (14,500 km), United States (19,924 km), and Japan (29,751 km).[3] A recent estimate puts the total coastal population of the Philippines (or those living within 10 km from the shore) at around 55.26 million or 60 percent of the total population,[4] while more than half of the municipalities (862 out of 1,495) and cities (74 out of 136) are considered as coastal (Virola et al. 2009).

Not surprisingly, the blue economy in the Philippines represents an important source of income and resources for the vast majority of the population. If we consider its entire breadth, encompassing fisheries, tourism, trade, and other economic activities, then it could be argued that it holds one of the keys to achieving inclusive growth and development in the country. However, for the past years, many countries have focused on harnessing the nontraditional sectors of the economy, intensively utilizing various natural resources (which include ocean and marine resources), which adversely impact the environment. In this regard, the Philippines, which has been experiencing successive quarters of respectable economic performance, needs to reflect and articulate its role in this apparent rise of activities and interest in "blue economy."

This paper provides further evidence on the importance of the blue economy to development, outlining the economic contributions of this sector in the Philippines. Furthermore, this paper reviews some of the major Philippine marine ecosystem issues that need to be considered in relation to the country's pursuit of an approach in line with the concept of blue economy as part of its economic development framework/strategy. In what follows, Sections 1 and 2 provide an overview of the Philippine coastal and marine ecosystems and Philippine fisheries sector, while Section 3 discusses

3 See CIA (2013).

4 See Philippine CTI NCC (2012).

the economic activities associated with oceans and the seas. Section 4, on the other hand, outlines a possible economic valuation of the blue economy. Section 5 describes some of the risks and threats—notably to sustainability—in the blue economy. Section 6 describes the current national initiatives of the Philippines and involvements in regional collaborations that aim to secure ocean health and benefits. Lastly, Section 7 discusses strategies to achieve a blue economy.

I. The Philippine Coastal and Marine Ecosystems

The Philippines is an archipelago of more than 7,107 islands. The Philippine aquatic resources are found in various coastal, marine, and inland water ecosystems considered as some of the most productive and biologically rich in the world. The highly productive and diverse habitats are found in the coastal areas, particularly the brackish water ponds, nipa and mangrove swamps, estuaries, estuarine rivers, sandy beaches, seagrass beds, algal flats, coral reefs, and other soft-bottom habitats (Junio-Meñez and Toribio 2010). The Philippines has also rich pelagic fisheries (small pelagics

Table 1.1. Physical attributes and extent of coastal habitats in the Philippines and other countries in the Coral Triangle region

Attributes	Indonesia	Malaysia	Papua New Guinea	Philippines	Solomon Islands	Timor-Leste
Total sea area (km^2)	5,800,000	614,159	3,120,000	2,000,000	1,340,000	...
Total coastline (km)	108,800	4,809	17,110	37,008	4,000	706
Total coral reef area (km^2)	51,000	3,600	13,840	26,000	3,591	146
Total mangrove area (km^2)	35,337	5,750	4,265	2,472*	650	18
Total seagrass area (km^2)	30,000	...	...	978	100	22

*Estimate is as of 2005; …= data not available.

Source: Country State of the Coral Triangle reports as cited in ADB (2014).

and tuna) as evident by the fact that the Philippines is one of the top tuna-producing countries in the world.

Estimates put the total coral reef area of the Philippines at around 26,000[5] to 27,000[6] km^2, which is considered as the second largest in the Southeast Asian region (Philippine CTI NCC 2012, see Table 1.1). A report by Burke et al. (2011) has noted that the Philippines is the only country whose entire territorial water is part of the Coral Triangle region, which is considered as having one of the highest diversity of corals, fish, and other reef species (Roberts et al. 2002, Carpenter and Springer 2005). The Philippines is home to 500 species of stony corals, 12 of which are endemic to

5 See Philippine CTI NCC (2012).

6 See Fisheries Statistics of the Philippines 2009-2011.

the country (Tacio 2012), and around 3,053 species[7] of fish, of which about 2,724 are marine species (Philippine CTI NCC 2012). In this regard, the Philippines is considered as the global center of marine biodiversity (Roberts et al. 2002, Carpenter and Springer 2005).

Also, the Philippines, together with other countries in the Coral Triangle, is host to some of the most extensive and diverse areas of mangroves and seagrasses. Recent estimates put the total mangrove forest area at above 200,000 ha, with the Philippine Forestry Statistics 2011's estimate (citing 2003 data) at around 247,362 ha or approximately 3.45 percent of the total forest cover (see also Table 1.2), which is close to the figure cited in Table 1.1. Among the regions, Region 4-B has the largest mangrove area with 57,567 ha, while Palawan has the largest mangrove area among the provinces (at 58,678 ha) (The Philippine Forestry Statistics, 2011). A more recent validation (as of 2008) conducted by DENR (across 804 coastal cities/municipalities and 23,492 barangays) has recorded as estimated total mangrove area of around 210,497.62 ha (DENR-PAWB et al. 2009). It is estimated that there are 35 "true mangrove" species in the Philippines, which is larger than the number of mangrove species in North and Central America combined (10 species). In this case, only Indonesia, Malaysia, Australia, and Papua New Guinea have more mangrove species than the Philippines (at 43, 41, 37, and 37 species respectively), putting the latter on the list of the countries with the highest mangrove biodiversity (Long and Giri 2011).

On the other hand, the total area covered by the seagrasses in the Philippines is estimated to be around 978 km^2 (See Table 1.1). Out of the 20 seagrass species in East Asia, 16 are found in the Philippines (Fortes 1995). Furthermore, seaweeds in the Philippines are considered as highly diversified among the flora in Asia-Pacific region, with the total number of recorded seaweed[8] species in the country amounting to more than 800. The coral reef ecosystems connections are important since both mangroves and seagrass beds are known to support very high densities of a number of juvenile reef fish and enhance fish survivorship (Honda et al. 2013).

II. The Philippine Fisheries Sector

A wide array of benefits is associated with the diversity of the coastal and marine resources in the Philippines, as manifested in the consumption and production activities of the population. On average, more than half of total per capita consumption of meat, fish and poultry in the Philippines is accounted for by consumption of fish and related products. The same trend can be observed for majority of the regions, with almost 90 percent of average daily per capita meat, fish, and poultry consumption in ARMM accounted for by fish and related products and at least 70 percent for Bicol,

7 These include about 177 pelagic fish species, 2,351 demersal species (658 being reef associated and 693 being associated with other near-shore habitats) and 277 deep-sea fish species (Philippine CTI NCC, 2012).

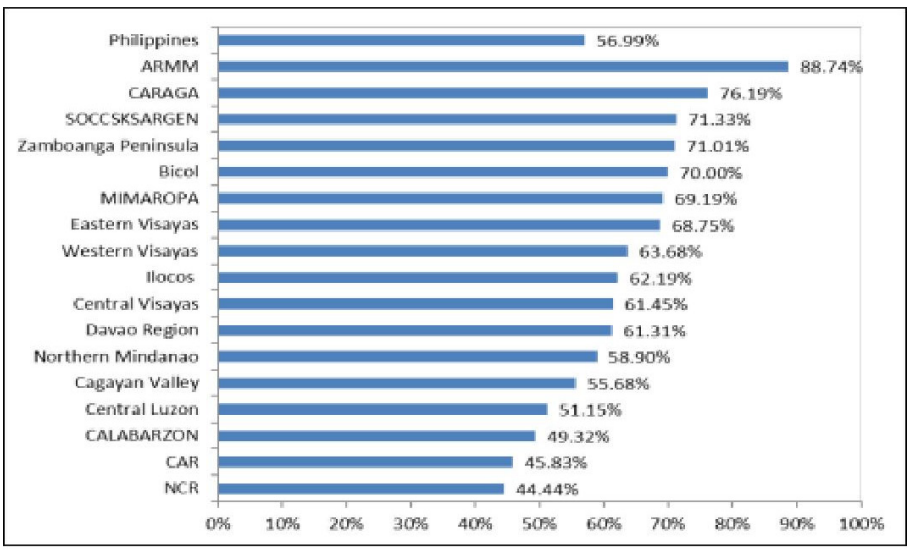
8 The major commercial seaweeds in the Philippines are Eucheuma, Kappaphycus, Gracilaria spp. and Caulerpa lentillifera. Other seaweeds with economic importance are Codium, Gelidiela acerosa, Halymenia, Porphyra, and Sargassum spp.

9 Source: The Philippine Forestry Statistics (2011).

Table 1.2. Mangrove forest cover of the Philippines: 2003[9]

Region/ Province	Mangrove Cover (in ha)	Region/ Province	Mangrove Cover (in ha)	Region/Province	Mangrove Cover (in ha)
Region 1	**151**	**Region 6**	**4600**	**Region 9**	**22279**
Pangasinan	151	Aklan	166	City of Isabela	608
Region 2	**8602**	Antique	293	Zamboanga Sibugay	5374
Cagayan	7334	Capiz	935	Zamboanga City	3940
Isabela	1268	Guimaras	406	Zamboanga del Norte	676
Region 3	**368**	Iloilo	1059	Zamboanga del Sur	11681
Aurora	368	Negros Occidental	1741	**Region 10**	**2492**
NCR	30			Lanao del Norte	722
Region 4A	**11346**	**Region 7**	**11770**	Misamis Occidental	1610
Batangas	286	Bohol	6463	Misamis Oriental	160
Cavite	298	Cebu	3402	**Region 11**	**2010**
Quezon	10668	Negros Oriental	1789	Compostela Valley	53
Rizal	94	Siquijor	116	Davao del Norte	55
Region 4B	**57567**			Davao del Sur	277
Marinduque	2165	**Region 8**	**38781**	Davao Oriental	1625
Mindoro Occidental	289	Biliran	108	**Region 12**	**1350**
Mindoro Oriental	57	Eastern Samar	6985	Cotabato City	914
Palawan	53678	Leyte	4683	Sarangani	139
Romblon	1378	Northern Samar	10718	Sultan Kudarat	297
Region 5	**13499**	Samar	16167	**CARAGA**	**26731**
Albay	683	Southern Leyte	120	Agusan del Norte	1333
Camarines Norte	5458			Surigao del Norte	16823
Camarines Sur	2340			Surigao del Sur	8575
Catanduanes	252			**ARMM**	**45786**
Masbate	2860			Basilan	6365
Sorsogon	1906			Lanao del Sur	149
				Maguindanao	136
				Sulu	24305
				Tawi-tawi	14831
Luzon Total	**91563**	**Visayas Total**	**55151**	**Mindanao Total**	**100648**
Philippines	**247362**				

Figure 2.1. Mean one-day per capita consumption of fish and fish products (as a percent of total consumption of fish, meat (and their respective products) and poultry), 2008



Source: Food and Nutrition Research Institute 2010.

Zamboanga Peninsula, SOCCSKSARGEN, and CARAGA regions (see Figure 2.1). A report by FAO (2010) shows that protein from fish accounts for around 42.5 percent of the total per capita daily animal protein intake in the Philippines as of 2009. These figures highlight the important role played by fish and other marine products with regard to satisfying the nutritional requirements (particularly the needed amount of protein) of the population. Clearly, the marine economy in the Philippines is critically linked to both human and economic development in the country.

Despite the Philippines being rich in fisheries resources and fish being rich in protein, evidence of protein deficiency still occurs locally. FAO indicated that for high quality proteins, the requirements for most people can be met by providing 8-10 percent of total energy as protein. For predominantly vegetable-based, mixed diets, which are common in developing country settings such as the Philippines, 10-12 percent is suggested to account for lower digestibility and increased incidence of diarrhea. In the case of the elderly, where energy intake is low, protein should represent 12-14 percent of total energy. The Philippines as well as Indonesia and Solomon Islands' protein consumption contribution to the dietary energy requirement (DER) falls below the recommended 10-12 percent protein contribution to the total DER (Table 2.1).

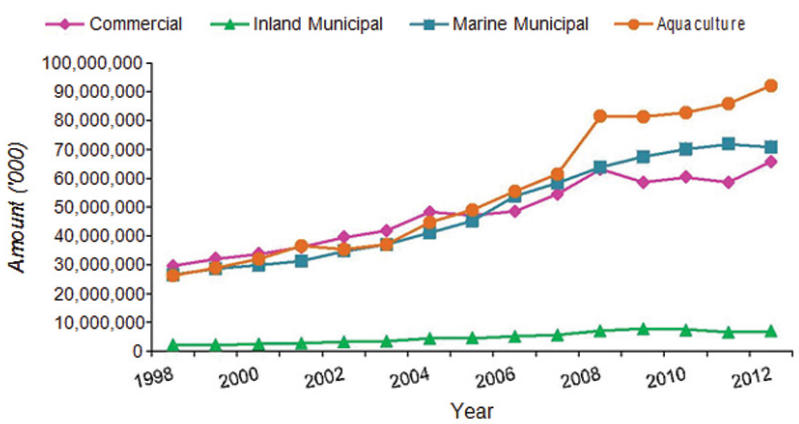
The Philippines registered a total production of 5.16 million tons of fish, crustaceans, and aquatic plants or approximately 3.06 percent of total world production in 2010, making it the fifth in the world in terms of marine production (BFAR 2011). While the Philippines ranked 11th in terms of capture fisheries (which includes fish, crustaceans, and mollusks) production, it ranked 10th in terms of aquaculture production of fish, crustaceans, and mollusks, which amounted to USD 1.563 billion in 2010 (FAO

Table 2.1. Macronutrients (carbohydrates, proteins, and fats) share in dietary energy consumption

Macronutrients share in total Dietary Energy Consumption (percent)					
Country	Macronutrients	1990-92	1995-97	2000-02	2005-07
Indonesia	Carbohydrates	75	75	75	73
	Proteins	8	9	9	9
	Fats	17	16	17	18
Malaysia	Carbohydrates	61	63	62	63
	Proteins	10	10	11	11
	Fats	29	26	27	26
Philippines	Carbohydrates	74	73	72	73
	Proteins	9	9	9	9
	Fats	17	17	18	18
Solomon Islands	Carbohydrates	71	71	74	73
	Proteins	10	9	9	9
	Fats	20	20	18	18
Timor-Leste	Carbohydrates	73	74	73	73
	Proteins	11	11	10	10
	Fats	16	15	16	17

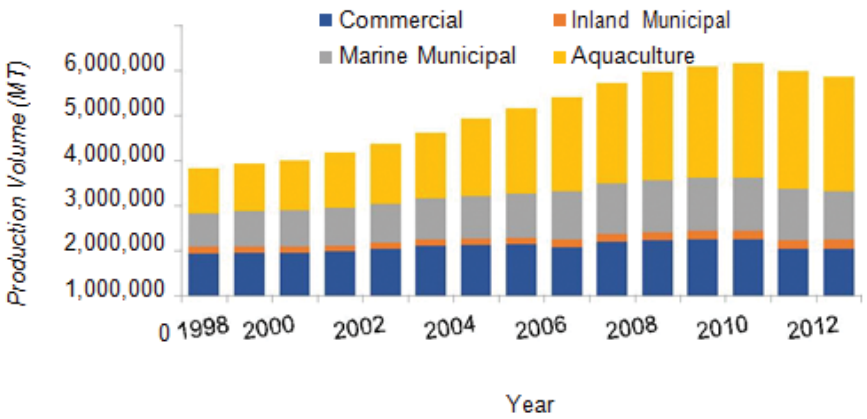
Data from Food and Agricultural Organization of the United Nations. Food security data and definitions, 2012. http://www.fao.org/economic/ess/ess-fs/fs-data/ess-fadata/en/, table taken from Cabral et al. (2013).

Figure 2.2a. Value of fisheries production at current prices (in thousand pesos)



Source: Bureau of Agricultural Statistics, BFAR (2010) and BFAR (2011).

Figure 2.2b. Volume of fisheries production (in thousand metric tons)



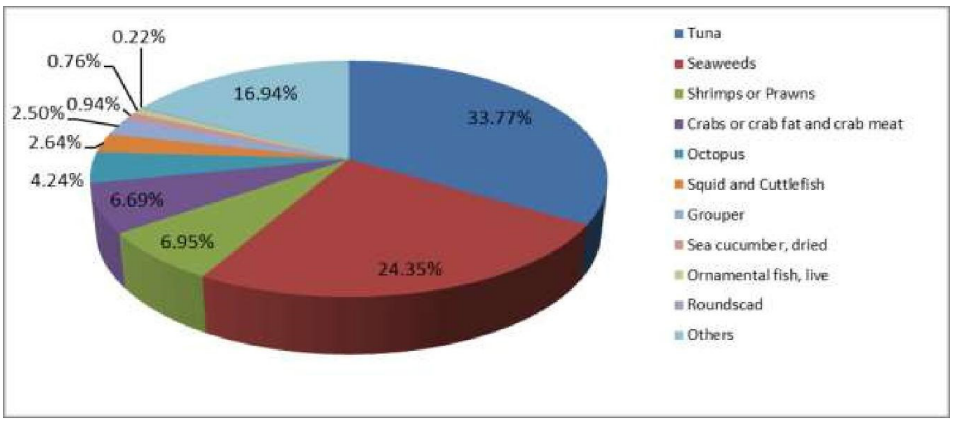
Source: Bureau of Agricultural Statistics.

2010). During the same year, the Philippines produced 1.8 million metric tons of aquatic plants (including seaweed), which is equal to 9.48 percent of the total world production, making it the third largest producer of aquatic plants next to China and Indonesia (BFAR 2011).

Figures 2.2a and 2.2b show the trend among different fisheries subsectors in the Philippines from 1998 to 2012. Fisheries production has significantly increased between 1998 (at 2.829 million metric tons) and 2011 (at 4.974 million metric tons valued at more than PHP 223 billion). Over the same period, the volume of aquaculture production has increased by more than 160 percent, from 997.841 metric tons in 1998 to 2.608 million metric tons in 2011. In this case, more than half of total fish production (at 52 percent) in 2011 is accounted for by aquaculture. Total fisheries production in 2012 is at 4.858 million metric tons (or a slight decline from the previous period's production volume) valued at PHP 236.21 billion. Fisheries production from aquaculture and municipal sector slightly decreased by 2.5 percent and 4.9 percent in 2012, respectively, as compared to 2011, while commercial fisheries production slightly increased by less than 1 percent. The decrease in the production from aquaculture and municipal sector was due to the decline in seaweed production and the evident decline of fish catch from municipal waters, respectively. On the other hand, the increased production in commercial production was attributed to the lifting of tuna fishing ban in 2012.

Data from BFAR (2011) show that the total value of Philippine fishery exports in 2011 amounts to PHP 37.522 billion, with tuna and seaweed products accounting for more than half of the total fishery export value at PHP 2.670 billion and PHP 9.138 billion, respectively (see Figure 2.3). Tuna fisheries have been one of the largest and most valuable fisheries in the Philippines since the mid-1970s. In 2006, the Philippines ranked fourth in the world in terms of tuna production, reaching 500,000 tons, or some 8 percent of the global total, while it only ranked seventh in 2008, with the

Figure 2.3. Share of different fishery exports to total Philippine fishery export value, 2011



Source: BFAR (2011).

industry experiencing a slide of 22 percent in its production. Among the possible reasons cited behind the observed decline include high operation costs[10] and global warming, as indicated by continuing migration of tuna species into cooler parts of the oceans at that time. In 2010, Philippine tuna exports[11] (in general) have rebounded, with an observed increase of around 2 percent in terms of volume and 3 percent in terms of value (Lu 2012).

On the other hand, the Philippines is considered as one of the top producers of seaweeds in the world (Ask and Azanza 2002). Seaweeds are exported either in raw (fresh or dried seaweeds) or processed forms (semirefined chips/carrageenan and refined carrageenan). Seaweeds contributed 13.34 percent to total fisheries production and 68.89 percent to total aquaculture fisheries production in 2012 (BAS 2013). Furthermore, seaweed production has been a source of livelihood for many coastal families in Visayas and Mindanao areas for the past two decades, and that the dried Kappaphycus and Eucheuma species serve as the top seaweed exports of the country (SIAP 2013).

Among the top 10 destination countries of fishery exports (in terms of quantity), five are APEC economies and these include the United States, Japan, Hong Kong, Canada, and China. Aggregate fishery exports to these countries amount to PHP 18.726 billion, or around half (or 49.91 percent) of the total fishery export value (BFAR 2011).

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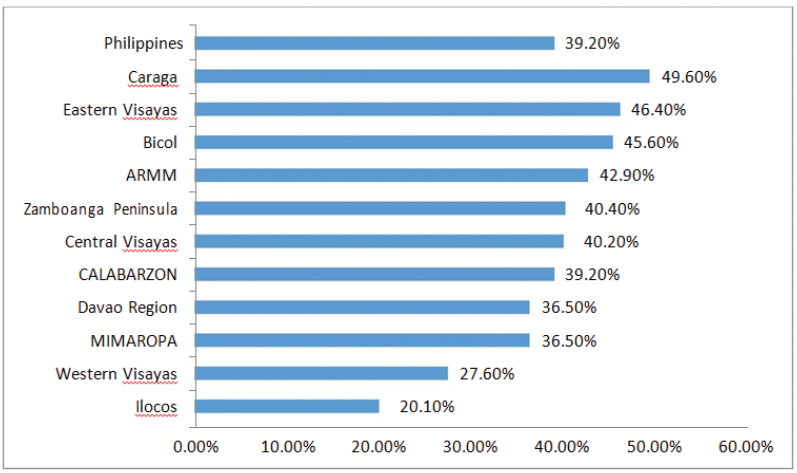
10 It was reported that some fishermen were spending USD 3,850–9,600 per trip in their oil and fuel expenses (Lu 2012).

11 As Lu (2012) noted, the major markets for this commodity include the United States, UK, and Germany.

12 Some of the other basic sectors considered by the National Statistical Coordinating Board (NSCB) include women (poverty incidence of 25.6 percent), youth (poverty incidence of 22.3 percent), children (poverty incidence of 35.2 percent), senior citizens (poverty incidence of 16.2 percent), and farmers (poverty incidence of 38.3 percent).

Figure 2.4. Poverty incidence among fishermen across different regions, 2012



Note: Poverty incidence figures for fishermen in some regions were not included due to low level of precision (coefficient of variation greater than 50 percent) or small sample size (less than 50).

Source: PSA-NSCB (2014b) 2012 Official Poverty Statistics for the Basic Sectors.

In 2012, the fisheries sector in the Philippines accounted for 1.432 million jobs. This constitutes 3.81 percent of the total labor force (BLES 2013). Poverty incidence among fishermen is high relative to other basic sectors,[12] with 39.2 percent of all fishermen having income below the poverty line in 2012 (PSA-NSCB 2014a). Regions with poverty incidence among fishermen greater than or equal to 40 percent are all in Visayas or Mindanao except for the Bicol region. Interestingly, poverty incidence among fishermen in the CALABARZON region is at 39.2 percent (See Figure 2.4). Other studies lend support to the high incidence of poverty among the fisherfolk. In 2012, poverty incidence for the fisherfolk is Among the fishermen surveyed in the Lingayen Gulf area, Cruz-Trinidad et al. (2011) found most of them having annual income that is less than or equal to USD 267 (PHP 12,015). While many of them would engage in other jobs (such as farming, carpentry and employment in the government) during the lean season or when opportunities arise, the additional income from such activities (amounting to USD 1.25-10 per day) is still not sufficient for their households to have income higher than the poverty threshold.

III. Contribution of Oceans and Seas to National Economies

Measurement of the Economic Contribution of Oceans and Seas in Some APEC Economies

A workshop sponsored by APEC in 2004 has led to the release of proposed industries that can be included as part of the marine economy. These include (a) Oil and Gas (i.e., minerals), (b) Fisheries/Aquaculture (living resources that include sea plants), (c)

Table 3.1. Estimated contribution of marine sector to the economy of some APEC economies

Study	Country	Year	Marine sectors considered	Marine sector contribution to the economy
Nakahara (2009)	Japan	2000	• Type A: Industries whose main activities are done in the ocean (e.g., Fisheries including offshore and distant, crude petroleum and natural gas, coastal and inland water transport,public construction of rivers, drainage, etc) • Industries that supply goods and services to Type A industries (e.g., shipbuilding, steelmaking, water transport, fixed telecommunication) • Industries that use Type A's outputs as intermediate inputs (e.g., processed seafood, wholesale trade of seaweeds, fresh fish, etc.)	USD 68.7 billion (1.48 percent of GDP)
Statistics New Zealand (2003)	New Zealand	2002	Offshore minerals, fisheries and aquaculture, Shipping, Government defense, Marine tourism and recreation, Marine services (i.e., services to water transport), Research and education, Manufacturing, Marine construction	USD 3.3 billion (almost 3 percent of GDP)
The Allen Consulting Group (2004)	Australia	2003	Marine tourism, Offshore Oil and Gas, Ship and boat building, Shipping, Fisheries and seafood, Port-based activities	USD 26.3 billion (3.6 percent of total value-added)
Rahadian, Tajerin and Purnomo (2009)	Indonesia	2005	Fisheries, Oil and Gas, Manufacturing, Transportation, Tourism, Construction Services	USD 59.05 billion (19.92 percent of total value-added)
Kildow et al. (2014)	United States	2010	Marine-related construction, Living resources (e.g., fish hatcheries and aquaculture, seafood processing), Minerals (oil and gas, sand and gravel), Ship and boat-building, Tourism and recreation (e.g., boat dealers, marinas, scenic water tours), Marine transportation (including warehousing)	USD 258 billion (2.7 percent of GDP)
Khalid (2012)	Malaysia	2008	Maritime transport, fisheries and aquaculture; Offshore oil and gas and renewable energy; Marine and coastal tourism	USD 44.31 billion (22 percent of GDP)
Ding, Ge and Casey (2014)	China	2011	• Primary industry (marine fishery) • Secondary industry (marine oil and gas, oceanic mining, marine salt, marine chemistry, marine biological pharmaceutical, marine power, seawater utilization, marine shipbuilding, marine engineering construction) • Tertiary industry (marine transportation, coastal tourism, marine scientific research education, social services, etc.)	USD 711.153 billion (9.7 percent of GDP)

Shipping (particularly transportation and shipbuilding); (d) Defense/Government; (e) Marine Construction, which includes coastal defences and restoration; (f) Marine Tourism; (g) Manufacturing (such as equipment, medicines, etc.); (h) Marine Services such as mapping, surveying, and consulting; and (i) Marine Research and Education (McIlgorm 2009). The proposed industries are based on previous studies (particularly those conducted in the 1990s) to gauge the contribution of the marine sector to the economy of some developed countries (such as Canada, United States, and Australia). These endeavours stemmed from the realization of the governments of such countries of the need to obtain information that can aid them in crafting ocean policy initiatives (Kildow and McIlgorm 2010). For the past years, different studies have been conducted in different APEC member-economies to gauge the economic importance of the marine sector and in this case, Table 3.1 contains information on some of these studies.

Oceans and seas play a pivotal role with regard to the international trade performance of many of these countries. In Japan and Malaysia, 99.8 and 95 percent, respectively, of international trade is seaborne (Nakahara 2009 and Khalid 2012). In addition, in Malaysia (in which the oil and gas sector is considered as a major revenue source), all of the hydrocarbon resources are derived from offshore fields (Khalid 2012). Some sectors are included in all of the studies, particularly those related to fisheries and aquaculture, offshore oil and gas and minerals extraction, shipbuilding, marine transportation and marine tourism. Other sectors were included in a subset of the documented studies, such as the marine-related government defense, which was included in the calculation made by Statistics New Zealand (2003) and was estimated to account for more than one-fifth of the marine sector output contribution in 2002. In the case of China, included in its annual estimate of the economic contribution of marine sector are science and technology related industries such as marine chemistry and marine biological and pharmaceutical industries. In this case, some coastal provinces have plans to invest further on these emerging marine industries, as in the case of the Fujian province, which plans to invest USD 163.5 million in its marine biological industry, and Guangdong province, which intends to invest USD 6.05 billion in marine emerging industries and marine science and technology development (Ding, Ge, and Casey 2014).

There are differences with regard to the leading industries for each country in terms of contribution to the total estimated value of economic activities in the marine sector. In the case of Australia, marine tourism and offshore oil and gas industries account for more than 80 percent of the estimated value-added of the marine sector, and more than three-fourths of total employment in the marine sector is accounted for by marine tourism (The Allen Consulting Group 2004). In Indonesia, the top three contributor of output in the marine sector are the oil and gas, services and tourism sectors while fisheries, tourism and services sectors account for more than 85 percent of the estimated 10.87 million people employed in the marine sector. Also, coastal tourism is the largest sector in terms of output in China's marine economy in 2011 (Ding, Ge, and Casey 2014), while the tourism and recreation sector is the largest sector in the United States' ocean economy, contributing USD 89 billion worth of output and 1.9 million jobs in 2010 (Kildow et al. 2014).

Among the studies documented, the estimated contribution of marine sector varies, ranging from 1.48 percent of GDP (as in the case of Japan) to 22 percent of GDP

(as in the case of Malaysia). Presumably, part of the variation can be attributed to the differences with regard to the industries included and the definitions used in the calculation of the documented studies. Also, many of the studies cited consider only the direct contribution of the marine industries to the economy and in this case, the figures above more likely underestimate the overall contribution of the sector to the economy. While the oceans sector is estimated to contribute USD 258 billion (or 2.7 percent of GDP) and 2.77 million jobs (or 1.99 percent of total salary and

Table 3.2. World top 20 ports in terms of cargo volume (1000 TEU)

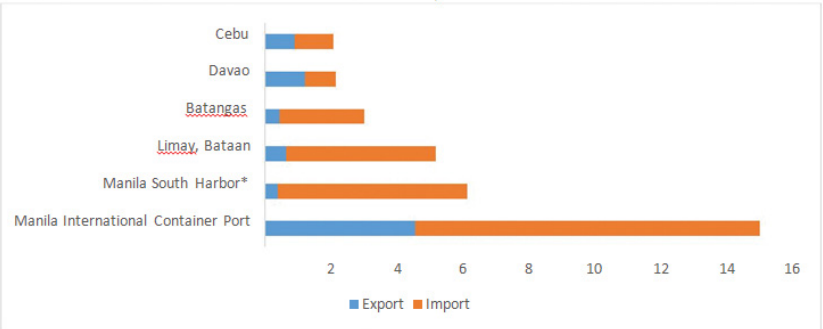
Rank	Ports		2008	2009	2010	2011	2012
1	Shanghai	China	27,980	25,002	29,069	31,739	32,529
2	Singapore	Singapore	29,918	25,866	28,431	29,937	31,649
3	Hong Kong	China (SAR HK)	24,494	21,040	23,699	24,384	23,117
4	Shenzhen	China	21,414	18,250	22,509	22,570	22,940
5	Busan	Korea	13,452	11,980	14,194	16,184	17,046
6	Ningbo	China	11,226	10,502	13,144	14,510	15,670
7	Guangzhou	China	11,001	11,190	12,550	14,260	14,743
8	Qingdao	China	10,320	10,260	12,012	13,020	14,503
9	Dubai	UAE	11,827	11,100	11,600	13,000	13,270
10	Tianjin	China	8,500	8,700	10,080	11,580	12,300
11	Rotterdam	Netherlands	10,800	9,743	11,145	11,876	11,865
12	Port Klang	Malaysia	7,970	7,309	8,870	9,603	10,000
13	Kaohsiung	China(Taiwan)	9,677	8,581	9,181	9,636	9,781
14	Hamburg	Germany	9,737	7,007	7,900	9,014	8,863
15	Antwerp	Belgium	8,664	7,309	8,468	8,664	8,633
16	Los Angeles	USA	7,850	7,261	7,831	7,940	8,077
17	Dalian	China	4,503	4,552	5,242	6,400	8,060
18	Tanjung Pelepas	Malaysia	5,600	6,016	6,530	7,520	7,700
19	Xiamen	China	5,034	4,680	5,820	6,450	7,201
20	Tanjung Priok	Indonesia	3,984	3,804	4,714	5,649	6,200
S.Total			243,951	220,152	252,989	273,936	284,147
Share among Total (%)			47.9%	46.6%	46.8%	47.2%	47.2%
World Total			509,440	472,273	540,816	580,022	601,772

Source: International Association of Ports and Harbors.

wage employment) in 2010 in the United States, the sector's indirect effect (which includes economic activity and employment induced by purchases made by firms and employees in the oceans[13] sector) is estimated to be significantly larger, amounting to value-added of USD 375 billion and 2.6 million jobs. Overall, the oceans sector contributed USD 633 billion (or 4.4 percent of GDP) in 2010, 59 percent of which are accounted for by the indirect effect (Kildow et al. 2014). In the case of Australia, the indirect effect of marine sector (defined as the amount of needed value-added from other sectors of the economy to produce a given amount of value-added in the marine sector) during the same period is estimated to be around USD 46 billion, or 1.7 times the contribution of the sector in 2003, more than 60 percent of which is associated with the marine tourism sector. The marine sector is also indirectly associated with

13 Ocean economy in this case refers to the portion of the economy that relies on the on the ocean as an input to the production process, or which, by virtue of geographic location, takes place on or under the ocean (Kildow and McIlgorm 2010).

Figure 3.1. Foreign trade value associated with selected ports in the Philippines (FOB trade value in USD billion), 2011



*Manila South Harbor includes figures for Pier 3, Manila and Pier 9, Manila Source: 2011 Foreign Trade Statistics of the Philippines.

employment of 690,890 workers, which is larger than the number of people directly employed (253,130) by the sector (The Allen Consulting Group 2004).

Measurement of the Contribution of Oceans and Seas to the Philippine Economy

The Fisheries sector's Gross Value Added (at current prices) in the Philippines in 2011 and 2012 amount to PHP 183.086 billion and PHP 193.162 billion, respectively. These constitute approximately 1.89 and 1.83 percent of the GDP (NSCB 2013). However, the economic importance of the seas extends to other areas, as in the case of maritime trade. It is estimated that seaborne trade accounts for 75 percent of the total world trade volume (Mandryk 2009). Maritime trade also plays an important role in the economies of APEC member-economies, with 16 out of 20 top ports in the world located in the region (see Table 3.1). Many of these 10 ports have seen a remarkable increase in container traffic and account for more than 40 percent of the world total in 2012 (see Table 3.2).

Maritime trade also plays an important role in the Philippines given its archipelagic nature. Manila is included in the top 50 ports (ranked 36th) and has seen more than 24 percent increase in container traffic between 2008 and 2012 (from 2.978 million TEU to 3.705 million TEU) (International Association of Ports and Harbors). Also, an overwhelming volume of domestic trade (total and per product category) is conducted via water, accounting for 99.8 percent of total domestic trade volume (21.532 million tons out of 21.568 million tons) and 99.5 percent of total domestic trade value (PHP 575.923 billion out of PHP 578.206 billion) in 2012 (NSO). Figure 3.1, on the other hand, shows the FOB value of total foreign trade associated with some of the main ports in the country, which ranges from USD 2.07 billion (in Cebu City port) to approximately USD 15 billion (in the case of Manila International Container Port). These ports alone account for USD 33.56 billion (or more than 30 percent) of the total foreign trade value in the Philippines in 2011.

Table 3.3 Estimated gross value-added of the maritime sector in the Philippines across industries

Industry	Levels			% Distribution		
	2003	**2005**	**2006**	**2003**	**2005**	**2006**
Fishing	100,035	119,208	130,096	53.3	46.8	49.0
Mining and Quarrying	2,260	22,944	24,926	1.2	9.0	9.4
Manufacturing	8,284	9,215	8,460	4.4	3.6	3.2
Transportation, Communication and Storage	24,098	36,449	47,785	12.8	14.3	18.0
Financial Intermediation	2,939	2,900	3,519	1.6	1.1	1.3
Business Activities	13,136	21,666	19,660	7.0	8.5	7.4
Public Administration	7,533	7,952	8,615	4.0	3.1	3.2
Private Education	1,144	1,196	1,364	0.6	0.5	0.5
Recreational Activities	28,345	33,144	21,139	15.1	13.0	8.0
Total maritime	187,773	254,673	265,563	100.0	100.0	100.0
Total GDP	4,316,402	5,444,039	6,031,164			
Share to GDP	4.4%	4.7%	4.4%			

Source: Virola et al. (2010: 21).

Virola et al. (2010) made a preliminary estimate of the value of the different economic activities associated with oceans and seas by measuring the economic contribution of the maritime sector, which refers to "…economic activities, such as the production, distribution and consumption of goods and services, related to or conducted in, near or found in the seas" (p. 6). Inland water transactions were also included by the authors in their estimates. Estimates generated by the said study put Gross Value Added (GVA) of the maritime sector at around PHP 187.8 billion in 2003, PHP 254.7 billion in 2005, and PHP 265.6 billion in 2006. The said amounts are equivalent to above 4 percent of the nominal GDP of the country over the same periods.

Value-added of fishing activities comprised the largest share of the estimated total value-added of the maritime sector (ranging from 46.8 percent in 2005 to 53.3 percent in 2003), followed by maritime activities in the transportation, communication and storage subsector (ranging from 12.8 percent in 2003 to 18 percent in 2006) and recreational activities (from 8 percent in 2006 to 15.1 percent in 2003). Mining and quarrying (particularly offshore extraction and production of crude petroleum and natural gas) contributed 9 and 9.4 percent of the estimated GVA of the maritime sector in 2005 and 2006. On the other hand, the maritime sector was estimated to have employed around 1.58 million people in 2003, 1.73 million in 2005, and 1.65 million in 2006, or a contribution of around 5 to 5.3 percent of total employment, more than 80 percent of which is accounted for by the fishing sector (see Table 3.3).

Table 3.4 presents a more recent estimate of the contribution of the maritime sector to the Philippine economy, drawing on the sectors used by Virola et al. (2010) in which sufficient disaggregation of information is available. In this case, subsectors from the manufacturing and transport, storage and communication sectors that are related to the fisheries sector and whose operations are found within or near the seas are considered and the main source of data is the 2009 Annual Survey of Philippine Business and Industry (ASPBI) conducted by the National Statistics Office (NSO). The aggregate GVA of these subsectors amount to PHP 40.06 billion in 2009.

Table 3.4. Preliminary estimates of the contribution of the maritime sector to the Philippine economy, 2009

SECTOR	Value Added (million pesos)	Total Employed
FISHING	170,330	1,461,000
MANUFACTURING	14,069.162	34,328
Processing and preserving of fish and fish products and other seafoods	6,359.367	27,938
Building and repairing of ships and boats	7,709.795	6,390
TRANSPORT, STORAGE AND COMMUNICATION	25,991.136	30,384
Ocean passenger transport	4,302.751	1,248
Ocean freight transport		
Interisland water passenger transport	5,100.088	8,388
Interisland water freight transport	4,627.895	4,630
Supporting and auxiliary activities to water transport	11,960.402	16,118
TOTAL	210,390.298	1,525,712
GROSS DOMESTIC PRODUCT	8,026,143	
TOTAL LABOR FORCE		35,061,000
% OF GDP/% of Labor Force	2.62%	4.35%

Source: NSCB, NSO (2010), NSO (2012) and Bureau of Labor Employment and Statistics (2012).

Table 3.5 Value added and employment in other relevant sectors of the economy, 2009

SECTOR	Value Added (million pesos)	Total Employed
MINING AND QUARRYING	15,997.563	463
Extraction and production of crude petroleum and natural gas	15,997.563	463
REAL ESTATE, RENTING AND BUSINESS ACTIVITIES	22,713.338	111,848
Renting of sports and recreational equipment	121.892	147
Research and experimental development in natural sciences	85.729	221
Labor recruitment and provision of personnel, local	11,573.726	79,440
Labor recruitment and provision of personnel, overseas	10,931.99	32,040
HOTELS AND RESTAURANT	46,009.540	175,635
Hotels and Motels	17,582.648	46,989
Restaurants, cafes and fastfood centers	28,426.892	128,646
TOTAL	84,720.441	287,946

Source: NSCB, NSO (2010), NSO (2012).

Overall, the estimated contribution of the maritime sector (which includes the whole Fishing industry) is equal to around PHP 210.39 billion in 2009, which accounts for 2.62 percent of GDP. This figure is higher than the GVA of the mining and quarrying sector amounting to PHP 106.40 billion (1.33 percent of GDP) during the same period (BSP 2013). The maritime sector is estimated to have employed around 1.53 million people (4.35 percent of all employed) in 2009. This is higher than the total employment of sectors such as mining and quarrying, and electricity, gas and water supply sectors which both employed less than 1 percent of the total employment in 2009, and financial intermediation sector whose employment amounted to 369,000 (around 1.05 percent of total employment) in 2009 (BLES 2012).

It is important to consider that these figures are likely to underestimate the true contribution of the blue economy to the Philippines, given that there are other subsectors[14] in other industries that are not included in the computation due to lack of further disaggregation of data. In this case, Table 3.5 presents the GVA of and employment in some sectors in which a part of the economic activities can be classified under the maritime sector. One of these is the extraction and production of crude petroleum and natural gas whose estimated value-added in 2009 amounts to PHP 15.998 billion. The said figure does not distinguish between onshore and offshore extraction and production activities. However, in the recent years, a significant part of the country's total oil and natural gas production is accounted for by offshore operations.

For instance, Galoc Oil Field located off the northeast coast of Palawan produced 1.48 million barrels of oil in 2012, accounting for 90 percent of the total domestic oil production (1.64 million barrels of oil) in the said year, while the Malampaya natural gas field located also in offshore Palawan produced 135.5 billion standard cubic feet (scf) of natural gas, equivalent to 99.9 percent of total domestic output for the said year (Oxford Business Group 2014). Currently, the other oil producing fields can also be found in offshore Palawan (Matinloc, North Matinloc, and Nido fields) and as of 2008, The Oil and Gas Journal estimated the country's natural gas reserves to be around 3.5 trillion cubic feet, most of which are in the Malampaya gas field (ADB 2014). As further noted in the country's most recent State of the Coral Triangle report, a large part of the natural gas output of the Malampaya plant is used by three power plants in Batangas, made possible by the use of a 504 km pipeline that connects the natural gas field in offshore Palawan to the said power plants.

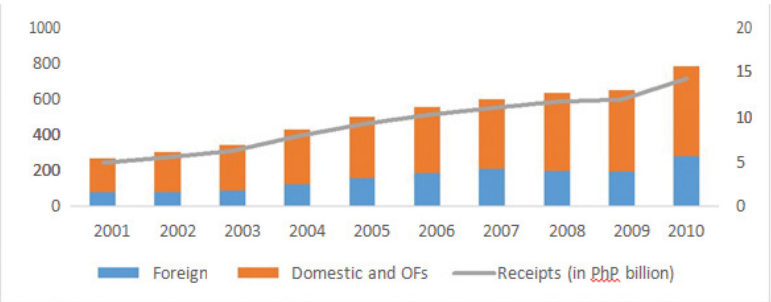
Other relevant industries include research activities in the natural sciences (which include research activities conducted in the field of marine science) whose GVA in 2009 amounts to PHP 85.729 million, and rental of sports and recreational equipment (which includes renting of pleasure boats and docking facilities) whose GVA in the same year is approximately equal to PHP 122 million. As per Virola et al. (2010), included in the relevant sectors are industries involved in recruitment of workers for both domestic and overseas markets as some of the firms in the said industries are also involved in recruitment of sea-based workers (such as overseas seafarers or seamen). The said industries' value-added in 2009 are PHP 11.574 billion (for recruiters of

14 The other subsectors considered by Virola et al. (2010) include harvesting of mangroves (under forestry sector), construction of piers, wharves, dredging, beach reconstruction (under construction sector), passenger travel, and vehicle (ship) insurance, among others. The complete list of all the subsectors can be found in Virola et al. (2010): 18-20.

workers for domestic labor market) and PHP 10.932 billion (for recruiters of workers for overseas labor market), making each of them almost at par with the extraction and production of crude petroleum and natural gas with regard to their contribution to the overall economy in 2009. The labor recruitment industries however employed a significantly larger part of the labor force (at more than 111,000 workers combined) relative to the oil and natural gas sector.

Included in the relevant sector as well are the selected subsectors of the Hotel and Restaurant industry which contributed PHP 46.013 billion of value-added and employed more than 175,000 workers. The inclusion of the said industry points to the

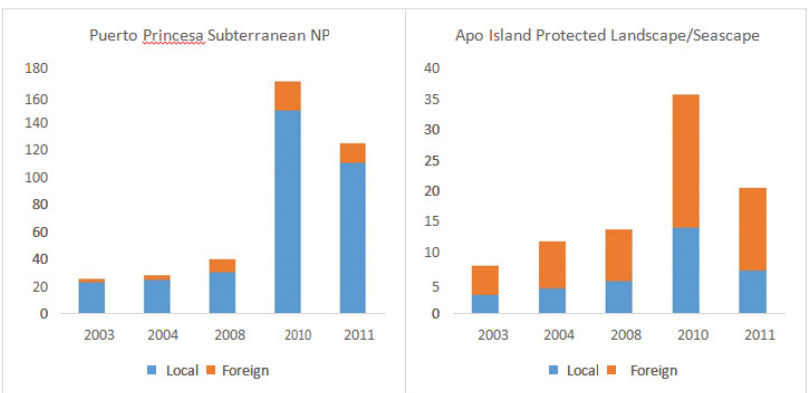
Figure 3.2. Visitor arrivals in Boracay (in thousands) and tourism receipts (in PHP billion)



Note: Left axis corresponds to the visitor arrival figure while right axis corresponds to the tourism receipt.

Source: Department of Tourism, as cited in NSCB Region 6 (2011).

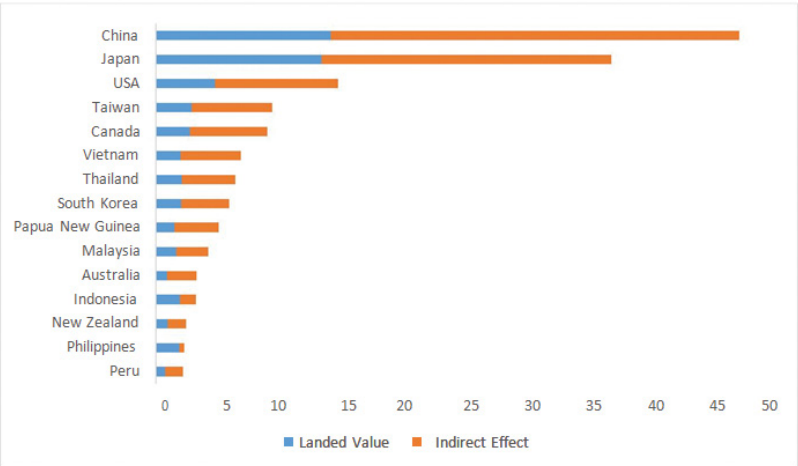
Figure 3.3. Visitor arrivals in Puerto Princesa Subterranean National Park and Apo Island (in thousands)



Source: PAWB (2003), PAWB (2004), Biodiversity Management Bureau.

increasing importance of coastal and marine tourism in the Philippines. The travel and tourism industry is estimated to have directly contributed PHP 472.3 billion (or 4.2 percent GDP) in 2013, and when its indirect contribution (such as production of intermediate inputs by the industry from other sectors and purchases made by employees in the sector) is considered, its total contribution jumps to PHP 1.29 trillion (or 11.3 percent of GDP) (World Travel and Tourism Council 2014). The increased prominence of coastal and marine tourism over the past years is also supported by an upward trend in the number of visitors in Boracay Island from 2001 to 2010 for both foreign (from 76,475 in 2001 to 278,531 in 2010) and domestic and overseas Filipino (from 188,332 in 2001 to 501,135 in 2010) visitor groups. In this case, total receipts from tourism activities in the Boracay have also steadily increased over the 10-year period, from around PHP 4.87 billion in 2001 to PHP 14.33 billion in 2010 (see Figure 3.2).

Figure 3.4. Estimated economic impact of ocean fisheries on some APEC countries (in USD billion)



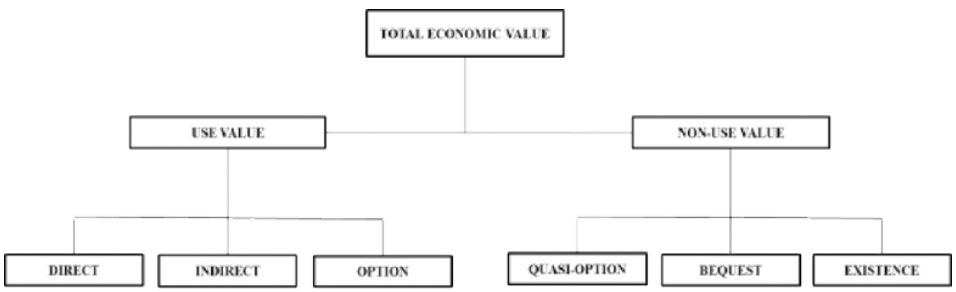
Source: Dyck and Sumaila (2010: 237-242).

Other coastal attractions have also gained prominence over the past years, which include among others: Hundred Islands National Park in Pangasinan visited by 183,000 tourists (around 11,000 of which are foreign tourists) in 2012 and on average accounting for more than 70 percent of tourists who visit Pangasinan annually; Puerto Galera, which is estimated to attract around two million tourists every year; and El Nido town in Palawan, which has seen a dramatic spike in the number of tourist arrivals over the past 20 years (from around 10,000 in 1994 to 65,000 as of August 2014) (Ma. Guerrero 2013; Ma. Guerrero 2012; Rappler.com 2014). A similar trend can be observed for other coastal and marine tourism sites, as in the case of protected areas under the jurisdiction of the Biodiversity Management Bureau. This includes among others the Puerto Princesa Subterranean River National Park whose tourist arrival in 2011 (125,042 visitors) is almost five times the number of visitors in 2003 (25,495 visitors), and the Apo Island Protected Landscape/Seascape in Negros Oriental (considered as a famous scuba diving site and harbors one of the oldest marine reserves in the country) in which number of visitors in 2011 (20,471 visitors) amounts to more than 2.5 times the number of visitors (7,760 visitors) in 2003 (see Figure 3.3).

Overall, the other relevant sectors have GVA of PHP 85.72 billion and employed more than 287,000 workers. A large part of the estimated values in Virola et al. (2010) and the more recent estimates presented here focus on the direct economic activities associated with oceans and seas. In this case, it is also important to measure the indirect contribution of the marine sector (via the purchases of intermediate inputs by firms in other sectors and purchases made by employees in the marine sector), which can be very significant and in some cases be larger than the estimated direct contribution of the marine sector, as the earlier cited studies in the United States and Australia have shown.

Relatedly, Dyck, and Sumaila (2010), using 2003 data, estimated the direct and indirect economic impact of the ocean fishery sector across different economies. In this case, the indirect impact considers the economic value of broader set of economic activities supported by the fisheries sector, which includes, among others, fish processing, production of tin cans, and shipbuilding.

Figure 4.1. The total economic valuation framework



Source: UNEP (2003), as cited in Samonte-Tan and Armedilla (2004).

Figure 3.4 shows the estimated economic impact of the ocean fisheries sector on selected APEC economies. Summing up the estimated total economic impact of ocean fisheries sector among the APEC economies considered above amounts to approximately USD 160.37 billion, which is more than two-thirds of the estimated world total economic impact of ocean fisheries (USD 235.31 billion). Relative to the estimated landed value or direct impact of ocean fisheries, total economic impact varies across economies, ranging from 119 percent of the direct economic impact (in the case of the Philippines) to approximately 369 percent of the direct economic impact (in the case of Australia). Despite the variation, overall, the figure above suggests the significance of the fisheries sector which extends well beyond the value upon harvest.

Further, the estimates above do not consider the benefits from oceans and seas not captured that are of paramount importance but whose markets are usually nonexistent (as will be discussed further in the succeeding section). Also, the methodologies discussed and used in the section do not focus on the sustainability of ocean activities. For instance, measurement of economic activities in offshore oil and gas sector does not reflect the real price of depletion of the said nonrenewable resource, and in the case of tourism, the estimates above do not consider the vulnerability of the said sector to economic or natural shocks (Kildow and McIlgorm 2010). Lastly, there

are environmental risks associated with some of the economic activities included in the accounting of the economic contribution of oceans and seas. These include, for instance, oil spills that may occur as a result of maritime accidents or the use of unsustainable methods to capture fisheries. As such, there is also a need to infuse environmental accounting to ensure sustainable utilization of such resources (Kildow and McIlgorm, 2010; Virola et al. 2009).

IV. Economic Valuation of Coastal and Marine Resources and Ecosystems

Another important concept in quantifying the significance of the marine economy concerns the measurement of all the benefits that accrue from various coastal and marine resources and ecosystems. In this case, many analyses have utilized the Total Economic Valuation (TEV) framework in which the total economic value of a resource can be classified into its use value or the benefit attained from utilizing the resource; option value, which indicates the people's willingness to preserve the resource for future use;[15] and nonuse value or the willingness to pay for the improvement and preservation of a resource regardless of whether it will be directly utilized by the people or not (Tietenberg and Lewis 2009). Figure 4.1 illustrates further disaggregation of the said benefits. Use value can be obtained from direct consumption of the services accruing from the resource (direct use value) and from the benefits that feed in to related economic activities (indirect use value). On the other hand, the nonuse value of a resource takes into account the bequest value in which importance is attached to the direct use value obtained by the succeeding generations from the resource, and the existence value or the benefit obtained from knowledge of the existence of a resource.

Relatedly, one can think of marine ecosystems as a kind of natural wealth, in which case, the interaction of their living and nonliving components produces streams of goods and services (Hanley and Barbier 2009). In this case, the various services that accrue from ecosystems (including marine ecosystems) can be classified as follows (De Groot, Wilson, and Boumans 2002):

- Production function, which refers to the resources that can be obtained from such ecosystems. These can be divided into two, namely, (i) biotic resources or products from living plants and animals and (ii) abiotic resources, which mainly include subsurface minerals. In this case, biotic resources tend to be renewable while abiotic resources most of the time tend to be nonrenewable (although these can be recycled). Biotic resources include food, raw materials (such wood), genetic resources (or genetic inputs derived from these resources, which can be used to improve the productivity of cultivated crops and their ability to adapt to certain environmental conditions), medicinal resources, and ornamental resources.
- Habitat function, which refers to ability of natural ecosystems to provide living space for different wild plant and animal species. These ecosystems serve as nursery areas to various plant and

15 Option value in this case also takes into account benefits obtained from future uses that have yet to be discovered (such as possible medicine for cancer).

animal species and continuously contribute to the maintenance of the biological and genetic diversity on earth. In this case, efforts to maintain the habitat status of such ecosystems serve as necessary condition for the continuous provision of the various goods and services and nonmaterial benefits.

- Regulation functions, which refer to the role played by such ecosystems in the regulation and maintenance of vital ecological processes and life support systems on earth. The interaction of abiotic factors (particularly climate) with living organisms serves to regulate these processes, which include, among others, transformation of solar radiation into biomass, storage and transfer of minerals and energy in food chains, and an array of biogeochemical cycles such as cycling of nitrogen and other nutrients through the biosphere.
- Information function, which refers to the nonmaterial benefits that can be obtained by humans. This pertains to the ability of natural ecosystems to provide various opportunities for spiritual enrichment, mental development, and leisure.

For coral reefs, direct use values identified by different studies include direct benefits from the consumption of fisheries and other marine organisms that the reefs harbor (and products that derive from it), tourism activities associated with the ecosystem, and research expenditures that concern the coral reef ecosystem. Tourism benefits would also include indirect tourism revenues (such as accommodation and travel expenses), while other benefits from research include the value of outputs that may be produced as a result of the said endeavor, such as new medicine products (Spurgeon 1992). Spurgeon (1992) has also noted that indirect use values of coral reefs include biological support that they accord to marine resources in adjacent seagrass beds, mangroves, and other ecosystems, shoreline protection, and reduction of coastal erosion. Studies have also noted the importance attached to biochemical processes that occur in coral reefs, such as storage of significant amounts[16] of carbon.[17] Also, wetlands and other aquatic ecosystems have some capacity to function as water purification plants, treating significant amounts of organic materials that serve as by-product of human activities (De Groot et al. 2002).

For mangroves, one of the benefits associated with them is their potential to become nursery grounds for fisheries, prawns, and other marine animals.[18] Also, mangroves contribute to the reduction of organic pollution in nearby coastal waters and similar to coral reefs, mangroves can protect the shorelines from strong waves and coastal erosions and can produce research activities given the presence of high diversity of organisms (White and Cruz-Trinidad 1998).

16 A previous estimate cited by Spurgeon (1992) puts the amount of carbon that coral reefs can hold every year at 111 million tons.

17 Spurgeon (1992) has also cited as another indirect benefit the entitlement of coral reefs around islands and those exposed at low tide within 12 nautical miles of land to generate coastal zones (and thus ownership rights) of adjacent waters via UNCLOS III (since baselines can be drawn around these reefs from which coastal zones will be determined).

18 Mangroves also serve as breeding grounds for microorganisms, which the marine animals consume.

Economic Valuation of Location-Specific Marine Ecosystems

Previous studies estimated the annual economic benefits from different marine ecosystems and resources in the Philippines. Some of them are location-specific, the results of which are documented in Table 4.1 along with the estimated annual benefits. Estimates vary from USD 3.38 million in the case of Bohol Marine Triangle to USD 52.7 million in the case of coral reefs in the South China Sea biogeographic region. For the coral reefs in the South China Sea region, those located at the Kalayaan Island Group and Northwestern Palawan account for more than 90 percent of the total area.[19] In this case, the benefit transfer method was used by Samonte-Tan and Armedilla (2004) in which the estimated benefits (per km^2 of coral reef for instance) in similar studies were adopted in coming up with their own estimates.

Among the different sets of benefits estimated by the documented studies, the common ones are those associated with fisheries and tourism activities. The more recent studies factored in operating costs, and as such, their estimates represent the net annual economic benefits associated with such activities. For instance, Cruz-Trinidad et al. (2011) estimated the revenues from fisheries activities based on the information obtained from a survey of more than 1,200 fishermen regarding daily catch rates, species caught, and prices received per major gear type. Variable costs were estimated using information from the survey regarding expenditures on items such as gasoline or kerosene and food among others, while fixed costs were primarily based on license fees paid by the fishermen. Benefits associated with tourism were based on the costs incurred by the tourists, particularly those spent on the site. Operating costs (such as costs of labor, maintenance, taxes, utilities, and depreciation on capital investment) of tourism business operators were assumed to account for 75 percent of the total gross revenues. In this case, the estimated direct use values from tourism, fisheries, and aquaculture were adjusted using the Coral Reef Interaction Index (CRII) to avoid double-counting of direct benefits and as such yield values that can be appropriately attributed to the coral reefs in the Lingayen Gulf area.

A similar approach was carried out by Samonte-Tan et al. (2007) in the case of the Bohol Marine Triangle, which contains, among others, three of the world's eight species of sea turtles and endangered species of whale sharks and other pelagic fishes. The authors also conducted a survey among fishermen, gleaners, tourism establishment operators, and seaweed farmers in the area. For the fishermen, costs recorded include those associated with items such as fuel, ice and salt, maintenance and repair (of boats and other equipments), and cost of labor. On the other hand, marine tourism activities in the area include scuba diving (on 17 coral reef destinations in the area), snorkelling, swimming, whale watching, and boating, among others. Net revenues of boat tour operators, dive shops, restaurants, and hotels represent the annual net benefits associated with tourism activities in the area (estimated to be around USD 1.48 million). Some studies also included the research value of marine ecosystems as one of the direct benefits, noting that the diversity of life in these ecosystems makes them

19 Other areas included in the analysis are coral reefs in Lingayen Gulf, Northern Luzon (Babuyan and Batanes Islands), and Marinduque-Eastern Mindoro- Northwest Tablas areas.

Table 4.1. Economic valuation studies on some marine ecosystems in the Philippines

Study	Location	Marine ecosystems	Use values	Indirect benefits	Estimated annual economic value	Average annual economic value (per ha)
White and Arquiza (1999)	Tubbataha Reef, Palawan	Coral reefs (18 sq km)	Direct • Fisheries production (USD 1 M) • Tourism activities (USD 2.55 M) Indirect • Marine resources in other parts of Sulu Sea and Eastern Palawan that depend on planktonic larvae in Tubbataha (USD 2.8 M)		USD 6.35 M	USD 3,528
White, Ross and Flores (2000)	Olango Island, Cebu	Coral reefs and seagrass beds (40 sq km), mangroves and other wetlands	Coral reef and associated habitat • Fisheries (USD 0.256 M to USD 0.416 M) • Tourism (USD 1.116 M to USD 1.8 M) • Seaweed farming (USD 0.16 M to USD 0.32 M) Mangrove and other wetland • Wood harvest (USD 15,260 to USD 20,350) • Fisheries (USD 203,500 to USD 254,400) • Tourism (USD 129,168 to USD 155,664)		USD 1.532 M to USD 2.536 M (for coral reef) USD 347,948 to USD 430,414 (for mangroves and other wetlands)	USD 383 to USD 634 (for coral reef)
Samonte Tan and Armedilla (2004)	South China Sea Biogeographic Region	Coral reefs (4,640.9 sq km)	Direct • Fisheries (USD 11.3 M) • Tourism/ Recreation (USD 2.3 M) • Research value (USD 0.7 M)	Option value (USD 7 M)	USD 52.7 M	USD 114

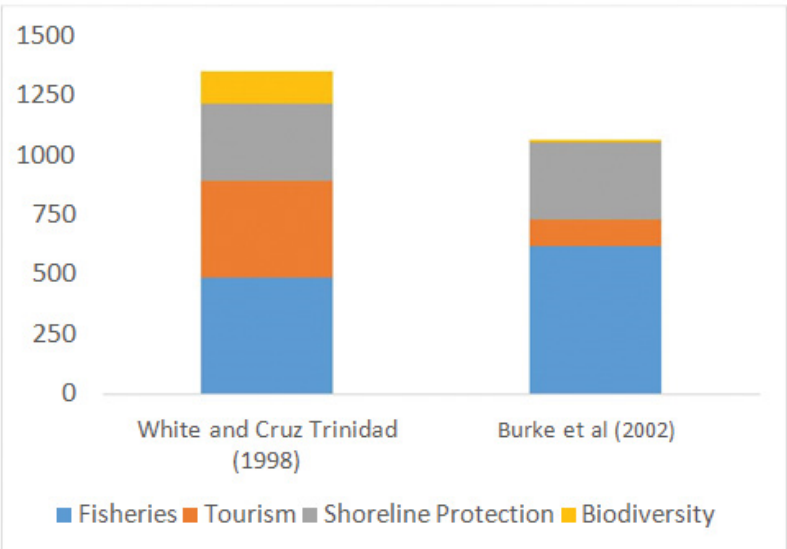
			Indirect • Carbon sequestration (USD 8.4 M) • Shoreline protection (USD 23 M)			
Samonte Tan et al. (2007)	Bohol Marine Triangle	• Coral reef (554.06 ha) • Mangroves (252.53 ha) • Seagrass (2,555.88 ha) • Sargassum (408.13 ha)	Coral reef • Fisheries (USD 655,925) • Tourism (USD 458,149) • Research (USD 27,778) Seagrass • Fisheries (USD 58,846) • Mollusks/ Echinoderms (USD 47,144) Mangrove • Fisheries (USD 3,236) • Mollusks/ Echinoderms (USD 6,667) • Nursery role (USD 61,383) • Erosion protection (USD 169, 674) Beach/ Intertidal Area • Mollusks/ Echinoderms (USD 112, 573) • Tourism (USD 1,004,022) Marine waters • Fisheries (USD 608, 529) • Seaweed Farming (USD 23,087) • Tourism (USD 14, 722)	Biodiversity (USD 125, 073)	USD 3.38 M	USD 2,279 (for coral reef) USD 973 (for mangroves) USD 41 (for seagrass)
Cruz-Trinidad et al. (2011)	Alaminos-Bani-Bolinao-Anda area	Coral reef (200 sq km)	Direct • Fisheries and aquaculture production and tourism benefits that can be attributed to the presence of coral reefs in the area (USD 6.21 M) Indirect • Shoreline protection (USD 31.45 M)		USD 37.66 M	USD 1,883

Sources: As noted in the table.

conductive sites for the conduct of scientific studies. Their estimates take into account expenditures on the research activities (such as field work and primary data gathering) and expenditures in using items such as boats and diving equipment.[20] Studies that determine the economic value of mangroves also estimated benefits associated with materials that can be extracted from them (such as fuelwood), while the analysis by Samonte Tan et al. (2007) included seaweed farming as one of the direct economic activities associated with the marine ecosystem in the Bohol Marine Triangle area.

The studies cited above vary with regard to the indirect use values estimated. In the case of Tubbataha Reef in Palawan, White and Arquiza (1999) noted that the reefs in the area harbour planktonic larvae which serve to feed various marine life forms, and this was represented by the monetary value of around 20 of the total annual catch in Eastern Palawan and in other areas of the Sulu Sea.[21] Coastal protection (from large sea waves induced by typhoons and storm surges for instance) was also cited as a benefit associated with coral reefs and mangroves and to be able to measure this, some studies used the cost of building a seawall as a proxy. For instance, Cruz-Trinidad et al. (2011) cited figures from a previous study (David et al. 2010), which estimated the cost of constructing a seawall with 3 m height, 1 m thickness, 1.5 m of underwater base height and 3 m of underwater base thickness as being equal to USD 850,000 per km. In this case, indirect benefit from coral reefs in 4 coastal municipalities of Pangasinan is estimated to be equal to USD 31.45 million[22] per year. Coastal protection value was also measured for the coral reefs in the South China Sea biogeographic region

Figure 4.2. Estimated annual net economic benefits from coral reefs in the Philippines, USD million



20 See for instance Samonte Tan et al. (2007).

21 This was assumed by White and Arquiza (1999) as the proportion of fish and other marine life forms in adjoining areas dependent on the planktonic larvae in Tubbataha.

(estimated by Samonte Tan and Armedilla (2004) to be around USD 23 million, or PHP 2.901 billion), while for the Bohol Marine Triangle, coastal protection benefits associated with the mangroves in the area were estimated to amount to USD 169,674 per year of USD 672 per hectare per year (Samonte Tan et al. 2007).

Other indirect use values measured include potential of mangroves to serve as nursery and breeding habitats of fish and other marine life forms and carbon sequestration or the potential of coral reefs to store amounts of carbon dioxide, which in turn has implications on the pace of the change in global temperature. Some studies have also come up with an estimate of the option value (or the value associated with direct and indirect benefits that can be attained by future generations) of marine ecosystems.[23] Among the studies cited, indirect benefits associated with marine ecosystems comprise a sizable proportion of the estimated total annual economic benefits, ranging from around 44 percent in the case of Tubbataha Reef in Palawan (USD 2.8 million out of USD 6.35 million) to around 84 percent in the case of the coral reefs in the Lingayen Gulf area (USD 31.45 million out of USD 37.66 million).

Estimated average annual economic benefit per hectare of coral reef also varies across the studies cited, ranging from USD 114 (for the coral reefs in the South China Sea biogeographic region) to USD 3,528 (for the Tubbataha Reef in Palawan). Presumably, this reflects the differences in the methodology utilized by various studies and the different ecosystem services considered by the studies. In the case of the coral reefs in Olango Island in Cebu, the study made use of the observation that a significant proportion of the coral reefs were in poor condition and this was incorporated on the utilization of a lower range of values for fisheries production per hectare of coral reef (as compared to the estimated production range for a healthy coral reef).

Economic Valuation of Philippine Marine Ecosystems

Some studies have extended their scope of analysis to the goods, services, and other benefits associated with marine ecosystems in the whole country. Using 1996 data, White and Cruz-Trinidad (1998) estimated the annual national economic benefits from marine ecosystems in the Philippines to be around USD 3.5 billion, or PHP 140.56 billion. For coral reefs, among the cited benefits are those relating to fisheries production, tourism, coastal protection, and their aesthetic and biodiversity value. In this case, the authors estimated the value of the annual net economic benefits from coral reefs (estimated to cover 27,000 km^2) to be around USD 1.35 billion, primarily accounted for by the value of fisheries production, tourism and shoreline protection (see Figure 4.2). Completing the estimated annual net economic benefits are the estimated benefits associated with mangroves (valued in the study at around USD 84 million) such as fisheries and shoreline protection, and the value of municipal[24] and commercial fisheries production, and production from aquaculture activities.

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22 USD 850,000 per km x 37 km of coral reef.

23 See, for instance, Samonte Tan and Armedilla (2004) and Samonte Tan et al. (2007) for further details.

Table 4.2. Padilla's (2008) estimate of net benefits from Philippine coastal and marine resources, 2006 (PHP million)

Benefits	Coastal					Oceanic	Total	
	Mangrove	Seagrass	Coral reef	Other Coastal	Subtotal		Amount	%
Provisioning	738.4	56.7	997.6	5,912.4	7,705.0	3,176.9	10,881.9	45.2
Fisheries	143.1	56.7	997.6	5,912.4	7,109.8	3,176.9	10,286.7	42.7
Timber	595.2				595.2		595.2	2.5
Cultural	34.1	8.3	304.1	147.0	493.5	1.4	494.8	2.1
Recreation	26.5		94.7	125.6	246.8		246.8	1.0
Education/ Research	7.5	8.3	10.1	4.7	30.6		30.6	0.1
Existence			199.3	16.8	216.1	1.4	217.5	0.9
Regulating	1,080.1	25.2	2,713.5	6,091.9	9,910.8		9,910.8	41.2
Carbon Sequestration	172.2				172.2		172.2	0.7
Shoreline protection	854.1		2,018.4		2,872.5		2,872.5	11.9
Waste assimilation	53.8	25.2	695.1	6,091.9	6,866.0		6,866.0	28.5
Supporting (Mariculture)				2,775.1	2,775.1		2,775.1	11.5
TOTAL	1,852.6	90.1	4,105.2	14,926.5	20,884.3	3,178.3	24,062.6	100.0
Percent	7.7	0.4	16.7	62.0	86.8	13.2	100.0	

Note: Waste assimilation refers to the benefits associated with nonpayment of abatement costs associated with the handling of waste discharges.

On the other hand, Burke et al. (2002) estimated the potential sustainable annual net economic benefits from coral reefs (estimated to cover 25,819 km^2) in the Philippines to be around USD 1.064 billion. The estimated value represents potential annual direct and indirect net benefits (which already take into account costs incurred by fishermen, tourist establishments, and other businesses that depend on the reefs) that can be attained when resources are not over extracted. Distinction was made with regard to coral reefs that have good and low tourism potential, with the latter type referring to those located beyond 10 km from the identified tourism development areas. Higher value was attached to the tourism and biodiversity benefits associated

24 Municipal fisheries pertain to total municipal fisheries production minus production that can be attributed to the coral reefs.

with coral reefs in areas that have good or high tourism potential. For shoreline protection, the report also classified coral reefs into three types, namely, (i) those that are near high development areas, (ii) those that are near medium development areas, and (iii) those that are in low development areas (defined as located more than 4 km from the coastline). As shown in Figure 4.2, more than half of estimated net annual economic benefits are accounted for by sustainable fisheries production (valued at USD 620 million) followed by shoreline or coastal protection (valued at USD 326 million).

More recent estimates by Padilla (2008) put the total annual net economic benefit from the coastal and marine resources of the Philippines to be around PHP 24 billion using 2006 data (see Table 4.2). Benefits associated with fisheries in this case were assumed to be equal to 10 percent of the total potential gross production and in the case of coral reefs, the author considered the differences with regard to the potential yield based on their condition. For tourism, the computed values mostly capture the benefits associated with the direct activities (such as marine ecotourism, snorkelling, swimming and scuba diving) as opposed to some previously cited studies which also considered the value of indirect tourism activities. In this case, the benefits associated with the provisioning and regulating services account for a large part of the estimated net annual benefits from Philippine coastal and marine resources. Among the different ecosystems considered, a significant amount of the estimated annual net economic benefits is associated with near shore coastal ecosystems (at around PHP 15 billion).

The above cited studies provide an overview of the vital role played by such ecosystems other than those captured by straightforward indicators such as the GDP. The study would like to contribute further by also considering the indirect and other benefits that were not included in the calculations above. In this case, two methodologies are proposed. The first one makes use of the estimated benefits from some of the location-specific valuation studies cited earlier, primarily the study by Samonte Tan et al. (2007) on the Bohol Marine Triangle, which has estimates on a wide array of direct and indirect use values, and option value of different marine ecosystems in the area. In this case, the figures for fisheries and tourism are based on survey conducted by the authors among marine ecosystem dependent businesses and resource users in the area, thereby taking into account the possible differences in operating costs among the different businesses and resource users. For the tourism, the said study has also taken into account indirect benefits such as those accruing to restaurants and hotel establishments in the adjacent areas.

The analysis uses the computed average net annual benefits per hectare of coral reef from the Samonte-Tan et al. (2007) study and applies them to the total coral reef, mangroves and seagrass areas in the country, the estimates of which are based on the most recent State of the Coral Triangle Report by the Philippines (see Table 1.1). The said study however does not have estimates for indirect benefits associated with the coral reefs. To augment the analysis, the estimates by Samonte-Tan and Armedilla (2004) are used to compute for the average net annual benefits per hectare of coral reef associated with carbon sequestration and shoreline protection, (see Table 4.3 for the per hectare values). The results are shown in Table 4.3. Estimated annual net benefits amount to around USD 6.35 billion, or PHP 285.75 billion (assuming an exchange rate of USD 1: PHP 45), with a sizable part accounted for by the benefits

Table 4.3. Computed net annual benefits from different marine ecosystem components in the Philippines drawing on previous location specific marine valuation studies

Marine ecosystem components	Net annual benefits per ha (USD)	Total area (ha)	Net annual benefits
Coral reefs	2,347	2,600,000.00	6,102,141,278.00
Fisheries	1,184		
Tourism	827		
Research	50		
Carbon Sequestration	18		
Shoreline Protection	50		
Biodiversity	218		
Mangroves	973	247,200.00	240,451,507.54
Fisheries	13		
Mollusks/Echinoderms	26		
Nursery Role	243		
Shoreline Protection	672		
Biodiversity	19		
Seagrass	41	97,800.00	4,055,676.32
Fisheries	23		
Mollusks/Echinoderms	18		
TOTAL			6,346,648,461,86

Note: Waste assimilation refers to the benefits associated with nonpayment of abatement costs associated with the handling of waste discharges.

associated with the coral reefs. For mangroves, indirect use values (particularly those pertaining to nursery habitat and shoreline protection functions) account for more than 90 percent of the estimated net annual benefits.

The other approach draws from De Groot et al. (2012), which contains estimates of average monetary value of different services associated with different ecosystem types (including marine ecosystems) based on a number of existing studies.[25] The authors included only original case studies (i.e., not based on value transfer or the application of data from earlier studies), and standardized the monetary values using international dollar (or Geary-Khamis dollar) approach to take into account differences in purchasing power of US dollar across different countries. The average monetary value

25 Average monetary value in this case refers to the average of estimated per hectare annual monetary values by the existing studies considered in the De Groot et al. (2012) paper.

for each ecosystem services for marine ecosystems are shown in Table 4.4. As noted in De Groot et al. (2012) study, seagrass and continental shelf are considered as coastal systems while mangroves are part of the coastal wetlands. For all marine ecosystem types, regulating services comprise a sizable share of the average per hectare monetary value, with erosion prevention and waste treatment comprising an overwhelming proportion of average monetary values of regulating services for coral reefs and coastal systems, and coastal wetlands, respectively.

Table 4.5. shows the estimated total annual monetary value associated with each marine ecosystem component, computed by multiplying the estimated per hectare monetary value in Table 4.4 with the area of the corresponding marine ecosystem

Table 4.4. Summary of monetary value for each service per biome
(in Int USD/ha/year, 2007 price levels)

Ecosystem systems	Coral Reefs	Coastal Systems	Coastal wetlands
Provisioning services	55,724	2,396	2,998
Food	677	2,384	1,111
Water			1,217
Raw materials	21,528	12	358
Genetic resources	33,048		10
Medicinal resources			301
Ornamental resources	472		
Regulating services	171,478	25,847	171,515
Climate regulation	1,188	479	65
Disturbance moderation	16,991		5,351
Waste treatment	85		162,125
Erosion prevention	153,214	25,368	3,929
Nutrient cycling			45
Habitat services	16,210	375	17,138
Nursery service		194	10,648
Genetic Diversity	16,210	180	6,490
Cultutral Services	108,837	300	2,193
Esthetic information	11,390		
Recreation	96,302	256	2,193
Inspiration			
Spiritual Experience		21	
Cognitive Development	1,145	22	
Total economic value	352,249	28,917	193,845

Source: De Groot et al. (2012).

component. Estimated areas for coral reefs, mangroves and seagrass in Table 4.3 are used in this case, while the continental shelf is estimated to cover an area equal to 184,600 km^2 (Padilla 2008). In this case, the estimated total monetary value for coral reefs, mangroves and seagrass amounts to Int. USD 966.594 billion per year, or around PHP 15.269 trillion[26] in 2007 prices, which is larger than the country's 2007 nominal GDP of PHP 6.893 trillion. Including monetary value estimate for continental shelf yields total monetary value estimate of Int USD 1.5 trillion or PHP 23.701 trillion in 2007 prices.

There is, however, a significant variance with regard to the estimated monetary values from the studies considered by De Groot et al. (2012), and as such, estimation of

Table 4.5. Estimated total monetary value (using the average monetary value for each service per biome)

Marine ecosystem	Total Monetary Value (in Int USD billion, 2007 price levels)
Coral reefs	915.847
Seagrass	2.828
Mangroves	47.918
Continental shelf*	533.808
Total for coral reefs, mangroves and seagrass	966.594
Total (including continental shelf)	1,500.402

*Area of continental shelf = 184,600 km^2, which is based on Padilla (2008), while measurement of area of coral reefs, mangroves, and seagrass are based on Table 1.1.

total monetary value per year is also done using median, minimum, and maximum per hectare monetary value estimates for each marine ecosystem. Using the median and minimum values, estimated total monetary values associated with mangroves are far lower than the initial estimate using the average monetary value, while a smaller difference can be observed for the seagrass and continental shelf. This can be attributed to a wider range of per hectare monetary values from the studies considered in the case of mangroves and other coastal wetlands (ranging from Int USD 300 to Int USD 887,828 per hectare per year) as compared to seagrass, continental shelf, and other costal systems (which range from Int USD 26,167 to Int USD 42,063 per hectare per year). While using the median and minimum values yields estimates that are lower than the one generated using the average monetary value, the values can still be considered as substantial. In this case, total monetary value associated with coral reefs, seagrass, and mangroves using the minimum per hectare estimate of annual

26 As noted in De Groot et al. (2012), since the estimated monetary values are expressed in international USD, the Purchasing Power Parity (PPP) exchange rate (instead of the official exchange rate) should be used to convert the values in local currency terms. In this case, the 2007 PPP exchange rate of PHP 15.80: USD 1 (estimated monetary values are in terms of 2007 price levels) is used here and for the succeeding estimates in this section.

monetary value (for each marine ecosystem type) is estimated to be around Int USD 98.298 billion, or PHP 1.553 trillion (in 2007 prices), which is almost at par with the contribution of the manufacturing sector to the country's nominal GDP in 2007 (PHP 1.568 trillion). When the estimated total monetary value for continental shelf is included, total monetary value estimate using the minimum values in this case jumps to Int USD 581.341 billion, or PHP 9.183 trillion in 2007 prices (see Table 4.6).

Overall, while there are variation in the estimates presented here with regard to the economic value of coastal and marine ecosystems and resources in the country, these

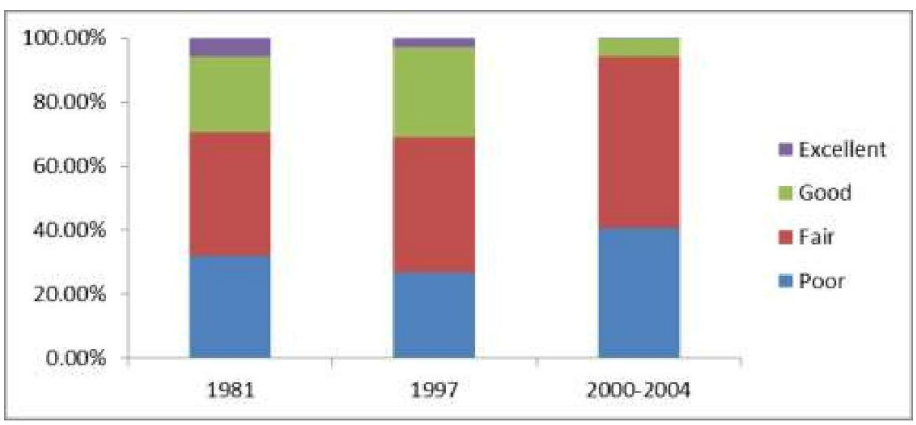
Table 4.6. Estimated total monetary value using the median, minimum, and maximum per ha annual monetary value for each marine biome (in Int USD billion, 2007 price levels)

Marine ecosystem	Median	Minimum	Maximum
Coral reefs	515.54	95.664	5,535.717
Seagrass	2.617	2.559	4.114
Mangroves	3.007	0.074	219.472
Continental shelf*	493.990	483.043	776.483
Total for coral reefs, mangroves and seagrass	520.163	98.298	5,759.302
Total	1,014.153	581.341	6,535.785

Estimates may not add up due to rounding off of values.

Per hectare median, minimum, and maximum values for each coastal ecosystem are obtained from De Groot et al. (2012).

Figure 5.1a. Status of Philippine coral reefs (% of total area)



Source: Gomez et al. (1981), Licuanan and Gomez (2000), Nanola et al. (2005) and Nanola et al. (2006), as cited in Padilla (2008).

point to the significant amount of benefits that can be obtained from them beyond the benefits associated with the resources extracted from them. Particularly, this includes indirect benefits such as providing support to the different vital biological processes, providing support to various marine life forms and acting as natural barrier against strong waves thereby reducing the risk of coastal erosion. The shoreline protection benefit associated with coral reefs and mangroves is relevant given the significant number of people living in coastal areas in the country, thereby making them vulnerable to large waves associated with storm surges induced by typhoons. Such was the case of Tacloban City and adjacent municipalities in Leyte, which suffered casualties and were severely affected by the storm surge induced by Typhoon Yolanda in November 2013. As noted in a report,[27] a study conducted two years preceding the typhoon noted the possibility of Tacloban City experiencing waves with height ranging from 4 to 12 meters in a worst-case scenario. The study recommended among others the construction of seawalls and planting and preservation of mangroves to break up large waves. In this case, future studies must also consider benefits associated with lives and properties saved from inundation induced by large waves associated with typhoons and other calamities in estimation of shoreline protection benefits associated with coral reefs and mangroves.

V. Environmental Degradation and Risks to the Blue Economy

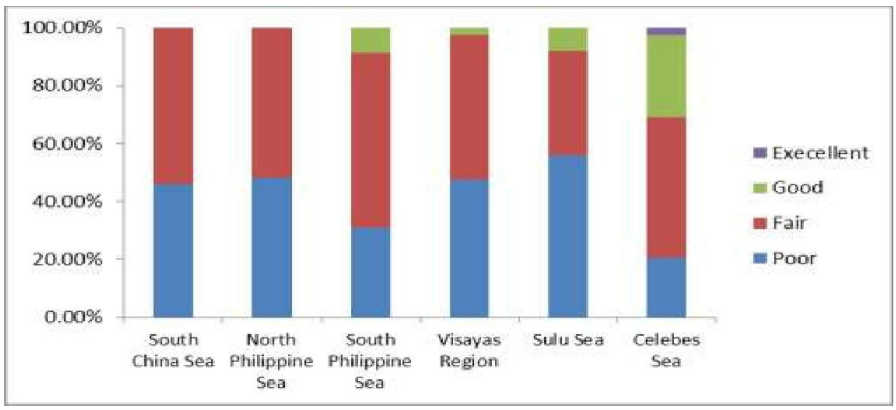
The sustainability of marine resources in the Philippines has been affected by various factors, among which are human-induced activities (such as coastal development and increase in fishing activities) and climate change. In the case of mangroves, a significant decline in terms of total area covered was observed from 1918 (when mangrove area is estimated to be around 450,000 ha) to 1970 (during which mangrove area is only 288,000 ha), and this in turn dwindled by almost half (to around 140,000 ha) in 1988 (White and Cruz-Trinidad 1998). In 1994, total mangrove area is estimated to be only around 120,500 ha (Primavera 2000). A recent study indicates that mangrove cover has declined over the past two decades: 10.5 percent (28,172 ha) of the Philippine mangroves was lost from 1990 to 2010, which corresponds to a yearly decline of 0.52 percent (Long et al. 2014). Even Philippine mangroves in International Union for Conservation of Nature (IUCN) protected area networks, which account for 20 percent, showed a yearly decline of 0.49 percent (Long et al. 2014).

Similarly, degradation of coral reefs has also been documented by different studies in the recent years. As Figure 5.1a shows, the proportion of coral reefs that are in poor (defined as having 0 to 24.9 percent live hard coral cover) and fair (defined as having 25 to 49.9 percent live hard coral cover) conditions[28] have increased from early 1980s to early 2000s. Figure 5.1b, on the other hand, shows that across all major coral reef locations in the Philippines, majority of the coral reef areas is accounted for by coral reefs that are in poor to fair condition. More than half (56 percent) of the total coral reef area in the Sulu Sea is accounted for by coral reefs that are in poor condition, while in the case of South China Sea and Northern Philippine Sea regions, reefs of

27 See Flores (2013).

28 Coral reef areas that are in good condition have 50 to 74.9 percent live hard cover, while coral reef areas that are in excellent condition have 75 to 100 percent live hard cover.

Figure 5.1b. Status of Philippine coral reefs across different areas, 2000–2004



Source: Nanola et al. (2005) and Nanola et al. (2006), as cited in Padilla (2008).

Box 1: Other manifestations of risks currently faced by marine resources

- Harmful Algal Blooms (HABs)

Harmful algal blooms (HABs), commonly and collectively known as "red tides," has been a significant global and national concern for their negative public health and/or economic effects. Despite the decrease or absence of Paralytic Shellfish Poisoning (PSP) cases in some areas in the Philippines in the recent years, the number of areas affected by toxic organisms other than those causing PSP has increased. Some areas are still experiencing the blooms of Pyrodinium bahamense var. compressum, a PSP causing organism primarily due to bloom recurrence or newly reported occurrence (Azanza 2012). To date, Pyrodinium blooms have already affected 31 bays throughout the country, resulting to several PSP cases and deaths including economic losses due to shellfish bans and indirect seafood consumption scares (PhilHABs 2013). Sorsogon was declared in a state of calamity after 129 PSP cases and four fatalities were reported in January 2007. Just recently, 20 PSP cases and two deaths were reported in Samar from the consumption of mussels harvested from Cambatutay (Samar) Bay in July 2013. Pyrodinium bahamense was again the main culprit of the toxicity outbreak.

- Exotic and Invasive Species

Exotic and invasive species are accidentally transported from distant locations in the ballast water of ships or released from aquariums has an impact in coral communities by killing off or displacing native species. Examples of invasive species are lionfish in tropical waters is a native of the Indo-Pacific, which can be found now throughout the Caribbean and the invasive algae in the Hawaiian islands. Reefs that are located near ports are at risk from invasive species. Also, it has been estimated that as many as 10,000 marine species may be transported in ship's water ballast globally (Burke et al. 2011). Ships including the ballast can be vectors of invasion. The ballast water working group of the Marine Environmental Protection Committee of the International Maritime Organization (IMO) has produced blacklisted species in the waters of South China Sea.

the said type (i.e., poor condition) constitute almost half of the total coral reef areas. Furthermore, only the Celebes Sea area has coral reefs that are in excellent condition, which are estimated to cover around 2.6 percent of the reef area (see Figure 4.1b). A survey conducted by the UP MSI-Community Ecology Laboratory across different sites in the Philippines from 2008 to 2011 show that almost half (46.67 percent) of the reefs are in fair condition, 31.04 percent are in poor condition, 20 percent are in good condition, and only 2.29 percent are in excellent condition (De Jesus et al. 2013).

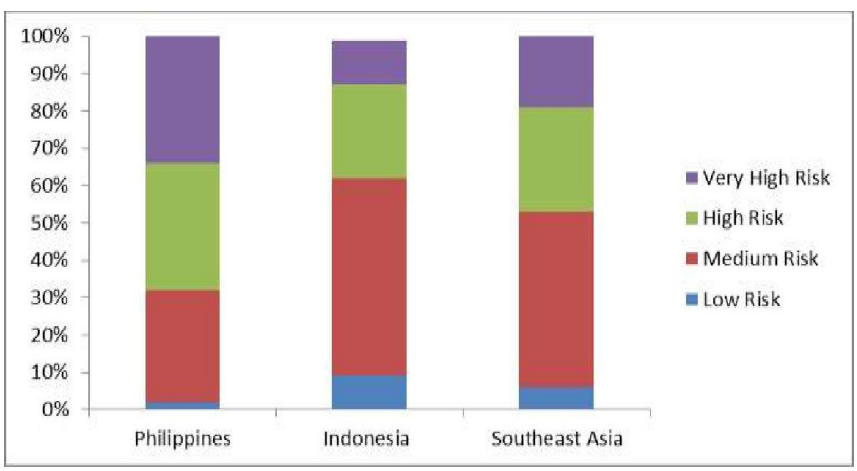
Other manifestations of risks currently faced by marine resources include the proliferation of harmful algal blooms (HABs) and exotic and invasive species (see Box 1 for details).

Risks Induced by Human Activities

A report by Burke et al. (2011) has noted that in the case of Southeast Asia, local threats from coastal development, excessive nutrient input and pollution, sedimentation, overfishing, and illegal, unreported, and unregulated (IUU) fishing served as the primary threat to the sustainability of coral reefs in the area. Almost half (around 48 percent) of all the coral reefs in the Southeast Asia are facing high or very high risk due to combined local threats, while the figure for the Philippines is higher (at around 68 percent) (see Figure 5.2). The State of the Coral Triangle report by the Philippine CTI NCC (2012) cited overfishing and the use of destructive fishing practices as the top two threats to Philippine coral reefs as of 2002.

Another local threat concerns the coastal development[29] that has occurred in many areas. Coastal development adversely impacts the coral reefs both directly (e.g., through

Figure 5.2. Proportion of coral reefs affected by local threats
(coastal development, sedimentation, overfishing, and IUU fishing)



Source: Burke et al. (2011).

dredging and land filling) and indirectly (through increased runoff of sediment, pollution and sewage). Pollution often follows when coastal areas are developed. During land clearing and construction, large quantities of sediments can be washed into coastal waters. The removal of coastal vegetation such as mangroves can take away critical sediment trap that might otherwise prevent damage to nearshore ecosystems. The most widespread pollutant is the sewage, which can induce plankton blooms that can block the light, thus encouraging the growth of seaweeds, which compete for space on the reefs. Another problem concerns the emission of toxic chemicals in aquaculture, agriculture, and industrial activities, as well as from households, gardens, parking lots, and golf courses. For instance, while hotels can bring coastal development to new and remote locations, these are associated with higher levels of construction, sewage, and waste (Burke et al. 2011).

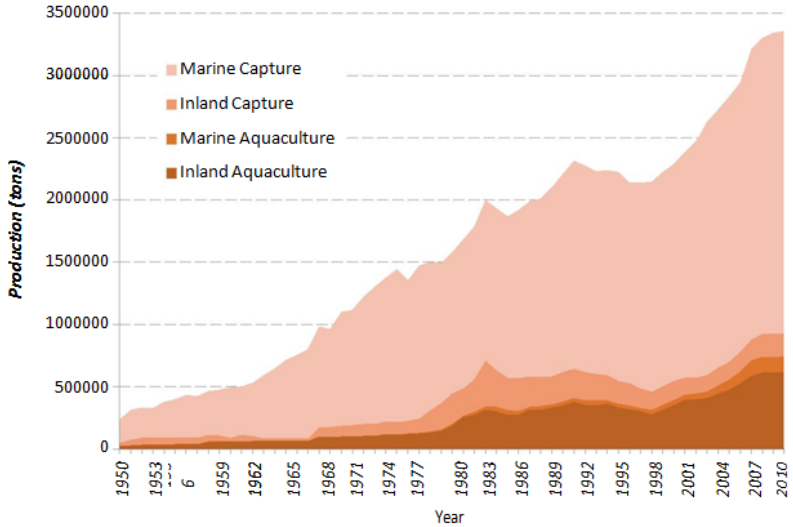
While mangroves are affected by natural dangers such as pests and diseases, typhoons, and rising sea levels, a significant threat to their sustainability comes from human activities. These include conversion of mangroves to fishponds and salt beds, reclamation of mangrove areas for development like airports, piers, and housing, pollution and siltation from upland communities and human disturbance, and overexploitation and utilization of mangroves for firewood purposes, for instance (Melana et al. 2000). Primavera and Esteban (2008) have cited various factors (such as overexploitation of mangrove areas and conversion into salt ponds and agricultural areas) as possible reasons behind the observed decline of mangrove cover as discussed earlier, but the authors have noted that the decline can also be attributed to the increase in aquaculture activity in the recent years. In this case, it is estimated that around half of the total mangrove area lost (amounting to around 279,000 ha) from 1951 to 1988 was converted to culture ponds (Primavera 2000). The issue on mangrove conversion to give way to aquaculture activities as well as the associated nutrient influx from aquaculture is significant given that 22 percent of the Philippine fish production by weight is derived from Aquaculture (inland and marine, Figure 5.3).

Aside from the impact on coral reefs and mangroves, the impact of increased human activity has been manifested on other fronts. These include incidence of fish kills and adverse impact associated with oil spills or mine tailings (See Box 2 for further details). Relatedly, some studies have documented low willingness to spend for marine conservation given the presence of nonmarket benefits[30] (as pointed in a previous section) and the nonexcludability of some of the recreational benefits that accrue from coastal and marine resources. For instance, Ahmed et al. (2007) conducted a survey of local and foreign tourists at various resorts in Bolinao, Pangasinan. Benefits to the tourists are estimated (via the travel cost method) to be around PHP 10,463 per person per annum, which can potentially generate a net annual revenue of around PHP 220.2 million to the local community. However, the same study has found low willingness

29 Relatedly, a 2000 estimate puts the average number of people per km of coastline to be around 2,467 (Philippine CTI NCC 2012).

30 As pointed in a previous section, a marine resource also has nonuse value, which includes quasioption, bequest, and existence values. These benefits are usually not priced in the market and so, as Subade (2007) has noted, these are not usually considered in private and public decision-making processes.

Figure 5.3. Fish production of the Philippine from 1950 to 2010



Data from FAO – Fisheries and Aquaculture Department, http://www.fao.org/fishery/topic/16140/en. Figure from Cabral (2014).

to pay among the tourists for the conservation of coral reefs in the area, with a lower average willingness to pay observed among the domestic (as compared to foreign) tourists. Among the reasons cited by the authors on the observed divergence is the public good attribute of some of the benefits that accrue from the coral reefs in the area, with some respondents noting that they do not consider the coral reefs as their property which in turn translates to less willingness on their part to contribute to the reef protection.

Climate Change

Another source of threat to the coral reefs comes from the warming of oceans (associated with climate change), which in turn has induced thermal stress. It is projected that the proportion of coral reefs (across the whole world) that will be adversely affected by thermal stress will significantly increase in the coming years to roughly 50 percent by 2030s and roughly 95 percent by 2050s (Burke et al. 2011). In the case of the Philippines, the impacts of climate change have begun to be felt more dramatically. The Philippines has been projected to be one of the most vulnerable countries to be affected by climate change. Climate change is expected to exacerbate extreme events such as heavy rainfall events in the Philippines typhoons, as in the case of typhoons Ondoy, which adversely affected Metro Manila and adjacent areas, and typhoons Emong and Yolanda, which are associated with significant damages to infrastructures and livelihood activities in the Visayas and Mindanao areas (Masigan 2013).

The highest increase in temperature will be during summer months (March, April, and May). In general, Mindanao will experience higher temperature increase than the northern part of the country. Both in 2020 and 2050, a reduction in rainfall for seasons DJF (December, January, and February), MAM (March, April, and May), and SON (September, October, and November) in most parts of the country. Also significant increase in rainfall during JJA (June, July, and August) is likely in most parts of Luzon and Visayas. Dry season will be longer as shown by reductions in rainfall from DJF, SON, and MAM in most parts of the country (PAGASA 2011). Overall, evidence indicates that the present climate change is associated with ocean acidification, sea level rise, extreme weather conditions, and elevated sea surface temperature and anomaly, which can adversely affect not only the biodiversity of the marine resources but also coastal livelihoods, infrastructure, and the achievement of poverty and hunger targets for the Millenium Development Goals (MDG 2013).

Box 2: Other manifestations of the impact of higher human activities on the blue economy

Fish kills

Nutrient enrichment of coastal areas from natural phenomena or manmade activities has resulted to eutrophication of inland and coastal waters. A common consequence of this nutrient loading is the increased occurrence of algal blooms that cause hypoxia/anoxia and fish kills. Also, blooms of ichtyotoxic microalgae have been observed to proliferate in these type of environment. Fish killing blooms of dinoflagellates and cyanobacteria have been observed in the Philippines and the rest of the world in eutrophicated waters. One the major and devastating fishkill events was associated with Prorocentrum minimum in Bolinao, Pangasinan, in 2002, which incurred an estimated loss of PHP 500 million in the aquaculture. In June 2010, an estimated PHP 50 million (around USD 1.1 million) worth of milkfish were lost to another fish kill along the Caquiputan Channel in Anda, Pangasinan, which later affected milkfish farmed in the Bolinao area (Visperas 2010) and associated with the bloom of Alexandrium spp and Skeletonema costatum (Escobar et al. 2013). Cochlodinium polykrikoides, red tide in 2005–2006, which caused fish kills and public panic along the western coast of Palawan, has also caused alarm.

Oil spills/ Mine tailings

The Guimaras oil spill was a massive oil spill at the Guimaras Strait, the Philippines. The oil tanker M/T Solar 1 sank on 11 August 2006 at the Guimaras Strait off the coast of the Guimaras and Negros Occidental provinces, causing some 500,000 liters of oil to pour into the strait. It has been said that the recent oil spill has adversely affected marine sanctuaries and mangrove reserves in three out of five municipalities in Guimaras Island and reached the shores of Iloilo and Negros Occidental. Fish catch and sea shells became few and children are now afraid to bathe in the waters for fear of the oil spill's effects. Development of milkfish fish cage, handicrafts, and food preservation was top most livelihood activities resorted to by the fisher folks after the oil spill. Budget inclusion, research, and other trainings were part of the LGU and International interventions that were done after the oil spill (Alimen and Alimen 2013).

VI. Current National Initiatives of the Philippines and Involvements in Regional Cooperations

The Philippines is part of various regional collaboration and initiatives (Table 6.1). Among the initiatives is the Coral Triangle Initiative (CTI) in recognition for the area being the center of global marine biodiversity. The CTI involves the whole or part of the land and waters of the six countries: Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands, and Timor-Leste. The CTI have regional and national plans of actions, which are elaborated in five goals:

Goal 1: Priority seascapes designated and effectively managed

Goal 2: Ecosystem approach to management of fisheries and other marine resources fully applied

Goal 3: Marine protected areas established and effectively managed

Goal 4: Climate change adaptation measures achieved

Goal 5: Threatened species status improving

To attain Goal 1, the Philippines has designated two priority seascapes (Sulu-Sulawesi Marine Ecoregion [SSME] and the West Philippine Sea and has developed implementation plans for the three subcommittees of the SSME, as well as Transboundary Diagnostic Analysis Tool. Goal 2 has been pursued by drafting national policies on EAFM (i.e., policy for tuna management), live reef food fish trade (LRFFT), and monitoring of tuna catches and small pelagics (e.g., sardines). In its report to SOM 7, the Philippines discussed the start of new projects, including the Regional Fisheries Livelihood Project and Livelihood Partnership Program toward Sustainable Tuna, while completing a policy and market study on dulong fishery. The United States Agency for International Development (USAID) Ecosystems Improved for Sustainable Fisheries (ECOFISH) Project through Marine Environment and Resources Foundation, Inc., Marine Science Institute of UP Diliman, and Tetra Tech-Inc. is implementing a five-year project (2012-2016). Building on the progress made under the Fisheries Improved for Sustainable Harvest (FISH) Project (2003-2010), ECOFISH will work on conserving biological diversity, enhancing ecosystem productivity, and restoring the profitability of fisheries in eight MKBAs, using ecosystem approach to fisheries management (or EAFM) as a cornerstone of improved social, economic, and environmental benefits. The eight MKBAs are (1) Lingayen Gulf, (2) Verde Island Passage, (3) Calamianes Island Group, (4) Ticao-San Bernardino-Lagonoy Gulf, (5) Danajon Reef, (6) South Negros, (7) Surigao del Sur and del Norte, and (8) Sulu Archipelago.

The Bureau of Fisheries and Aquatic Resources (BFAR) has implemented various fisheries initiatives in the country. More notably, BFAR has strengthened fisheries law enforcement and reporting to curb IUU and destructive fishing through various programs. These include banning of sardines fishing in the waters of East Sulu Sea, Basilan Strait, and Sibuguey for three months from December 1 to March 1 in order to give way to the fish species' spawning period (Joint DA-DILG Administrative Order or JAO-1 s. 2011) and the National Program for Municipal Fisherfolks Registration (or FISH-R), which enhanced fisheries registration in the country. The BFAR is also

one of the key players in the implementation of Fisheries Administrative Order No. 246, banning Danish seine ("hulbot-hulbot" and "buli-buli"), which was found out to be associated with destruction of marine habitats and other fishery resources. The Supreme Court in its current ruling has sided with the BFAR over the said initiative (Galvez 2014; http://www.manilatimes.net/ban-danish-seine-philippine-waters-lauded/115236).

Contributions to Goal 3 are the (i) assessment of locally established and managed MPAs by the Marine Protected Area Support Network, (ii) establishment of 10 MPAs under the National Integrated Protected Area System (NIPAS), and (iii) increase in the number of marine key biodiversity areas in marine biogeographic regions. NGOs have conducted nationwide assessment of MPAs using the MPA Management Effectiveness Assessment Tool last 2013 and best MPAs have been awarded in the biennial Para El Mar MPA Awards. A nationwide MPA database containing 1,815 MPAs (see Cabral et al. 2014) has been developed by the Marine Science Institute of UP Diliman with grants from the Coral Triangle Support Partnership (CTSP) under Conservation International–Philippines and the Biodiversity and Management Bureau of the Department of Environment and Natural Resources (DENR).

A Sustainable Coral Reef Ecosystems Management Program was implemented covering nationally declared MPAs (NIPAS) of 1.7 million ha in line with Goal 3. A review of alliances and MPA networks in the Philippines was conducted by Horigue et al. (2012), which provides opportunity for enhancing the role of individual MPAs in achieving local, regional, and global targets. DENR is implementing a national program called Sustainable Coral Reef Ecosystem Management Program (SCREMP 2012-2020) that will conduct a strategic, sustainable, and ecosystem based approach in protecting and rehabilitating the coral reef ecosystem. SCREMP program components include habitat and vulnerability assessments, coral reef rehabilitation and protection, social mobilization and development, MPA strengthening and networking and sustainable livelihood interventions. Rare Inc. together with the environmental defense fund and University of California Santa Barbara is also implementing a 10-year initiative in the Philippines named Fish Forever (launched this 2014), which is aimed at achieving sustainable local fisheries through a suite of proven solutions such as Territorial Use Rights Fisheries (TURF) reserve anchored in local MPA management coupled with social marketing strategies.

For Goal 4, the Philippines adopted the Climate Change Adaptation (CCA) framework in 2010, and CCA plans have been conducted in Dumaran and Taytay in Palawan. There have also been initiatives to conduct vulnerability assessment and climate-change-related research in nearshore habitats with the United States CTI Program supporting two sites—the Verde Island Passage (VIP) and the Sablayan Municipality in Occidental Mindoro Province. The VIP-wide mangrove mapping was completed and communicated to the local governments as input for CCA. The CCA plans have also been prepared for Sibutu and Sitangkai in Tawi-Tawi Province and in Dumaran in Palawan Province. The Remote Sensing Information for Living Environments and National Tools for Sentinel Ecosystems in the Archipelagic Seas Program (2009–2011) built partnerships among national government agencies, local governments, academe, and other local stakeholders to pursue such work.

Table 6.1. Involvement of the Philippines in various regional cooperation

Arrangements		Institution/Project	Countries Involved					
			Indonesia	Malaysia	Papua New Guinea	Philippines	Solomon Islands	Timor-Leste
Regional Fisheries Bodies	Regional FMOs	IOTC: Indian Ocean Tuna Commission	✓	✓				
		WCPFC: Western and Central Pacific Fisheries Commission			✓	✓	✓	
	Fisheries Advisory Bodies	APFIC: Asia–Pacific Fishery Commission	✓	✓		✓		
		FFA: Pacific Islands Forum Fisheries Agency			✓		✓	
		SEAFDEC: Southeast Asian Fisheries Development Center	✓	✓		✓		
Regional Arrangements/Cooperation/Networks/Projects	Scientific Bodies	INFOFISH: Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fishery Products in the Asia–Pacific Region	✓	✓	✓	✓	✓	
		NACA: Network of Aquaculture Centres in Asia–Pacific	✓	✓		✓		
		SPC: Secretariat of the Pacific Community			✓		✓	
	Economic Cooperation	APEC: Asia-Pacific Economic Cooperation	✓	✓	✓	✓		
		ASEAN: Association of Southeast Asian Nations	✓	✓		✓		Observer status
		PIF: Pacific Islands Forum			✓		✓	
	Fisheries/ Environmental Arrangements	BOBLME: The Bay of Bengal Large Marine Ecosystem Project	✓	✓				
		COBSEA: Coordinating Body on the Seas of East Asia	✓	✓		✓		
		CTI: Coral Triangle Initiative	✓	✓	✓	✓	✓	✓
		PEMSEA: Partnerships in Environmental Management for the Seas of East Asia	✓	✓		✓		✓
		SAP: Strategic Action Programme of the Pacific Small Island Developing States			✓		✓	
		RPOA: Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region	✓	✓	✓	✓		✓
		SCS: UNEP/GEF South China Sea Project	✓	✓		✓		
		SPREP: Secretariat of the Pacific Regional Environment Programme			✓		✓	
	Scientific Networks	GoFAR: The Asia–Pacific Group of Fisheries and Aquatic Research	✓	✓	✓	✓	✓	

FMO = fisheries management organization; IUU = illegal, unreported, and unregulated.
Note: Prepared by Christine Marie Casal, WorldFish Center, Philippines.
Source: Lymer et al. (2010).

Source: Table taken from ADB (2014).

Monitoring of threatened species was initiated to address Goal 5. Mechanisms (e.g., payment for ecosystem services) have been identified to generate funds for assisting national and local governments in implementing activities to achieve national plan of action (NPOA) goals. Capacity building programs, such as mentoring of state colleges and universities within Coral Triangle Support Partnership (CTSP) geographic focus areas, are also being undertaken.

Invasive alien species (IAS) are a threat to various ecosystems and directly impacts on biodiversity, biological productivity, habitat structure, and fisheries. The issue of IAS in ballast waters of cargo ships is a growing concern as this has been identified as an important pathway for IAS to invade other habitats. Various initiatives are in placed

toward the ratification of the 2004 IMO Ballast Water Management Convention and the development of a national ballast water management strategy and action plan.

VII. National, Regional, and Global Strategies

The Philippines is an important ecological area where its biodiversity served thousands of local people and beyond for various ecosystems goods and services (e.g., livelihood and food). However, the myriad of local and global threats including climate change endangered this biodiversity. Notably, the marine biodiversity experienced high pressure from highly dependent and burgeoning local population coupled with intensifying global market demand for fish. A blue economy perspective would increase the likelihood of sustaining and preserving this area. Here, a set of actions is recommended that would promote sustainable use of resources, sustain the natural resource base, and distribute benefits derived from the ecosystems that will eventually lead to reduced dependency to resources and unsustainable practices.

The recommendations are sectioned into six parts: incentives for the local communities, improving fisheries and aquaculture sector and its value chain, application of marine spatial planning to manage ocean uses, disaster risk and climate change adaptation, enhancing science research and biotechnology, and governance recommendations for regional cooperation.

A. Incentives for Local Communities

There are various policy options to consider in promoting the sustainable management of marine and marine-linked resources. Key among these are those that seek to promote "win-win" outcomes that align community-level incentives with the public good and the realities of a competitive market economy. Compensation mechanisms offer one way forward to achieve this.

For instance, one response taken by the authorities to curb the incidence of overfishing is the establishment of marine protected areas (MPAs), which aims to regulate resource extraction activities inside the said areas. A public hearing is conducted before any site is declared as a protected area to consider the opinions and recommendations of the people, Local Government Units (LGUs), institutions, organizations and other stakeholders in the affected areas. There are laws that are used as bases for the establishment of MPAs, among which are the Local Government Code of 1991 and the Fisheries Code of 1998 (RA 8550). Some studies have documented the potential for MPAs to be an effective tool, as in the case of a study by Alcala (1988), which found fish abundance among selected coral reef reserve sites in the Central Philippines to be significantly higher than the nonreserve sites. In this case, one of the sites had lost its protection and this provided a platform for the study to be a natural experiment on the impact of reef protection on variables such as fish yields. Also, Russ and Alcala (1999) have noted that in the case of Sumilon and Apo Island Marine Reserves (which are considered as the country's earliest fishery reserves), evidence of increasing fish catch was observed in the said areas and so fishing communities have eventually accepted the idea.

As of 26 August 2014, there are 1,815 locally managed marine protected areas (MPAs) in the Philippines, which cover over 10,000 km^2 of marine areas (see Cabral et al. 2014). The Marine Protected Area Support Network Partnership (MSN) together with the USAID-Coral Triangle Support Partnership program and BFAR has developed a Management Effectiveness Assessment tool (MEAT) for use by the local government to assess the governance effectiveness of their respective MPAs (MSN 2010). However, there remain different challenges associated with the implementation of a marine protected area, among which are lack of funding, lack of alternative fishing grounds for the affected fishers, and lack of support from the adjacent coastal community (Gjertsen 2005). A possible explanation for the lack of community support hinges on the potential for MPAs and related schemes to unequally share the burden of protection and conservation. As Gjertsen and Niesten (2010) noted, people other than those who live in nearby communities also benefit from the said marine resources through related economic activities and nonuse values of the said resources. However, there is a tendency for some of the MPAs to pass the costs largely to the nearby coastal communities, and many of these costs are tangible and can be immediately felt by the communities, such as foregone income from fishing and consumption of marine products. In this case, some governments and private groups have utilized schemes wherein coastal communities are given compensation in exchange for their commitment to help in conservation efforts. Box 3 contains some cases of such compensation mechanisms.

The mechanisms included range from direct financial compensation to fishermen during lean or closed season to other compensation types (such as scholarship packages), which aim to regulate extraction of different types of marine resource. In the case of Western Papua in Indonesia, the scholarships have conditions attached, which aim to discourage recipient households from poaching activities. On the other hand, in the case of Mexico, the government has introduced possible alternative livelihood options to give more incentive to the fishermen to minimize the use of fishing gears that can adversely impact the endangered vaquila population.

For the Tubbataha Reef, authorities and other stakeholders have harnessed the tourism potential of the area, and in this case, the cost is also shared with tourists who also benefit from the existence of the said resource, and that a part of the contribution of the tourists is channeled to the local community, which before the declaration of a Marine Protected Area (MPA) zone largely depended on the reef for their fish catch and consumption. As Dygico et al. (2013) noted, a part of the conservation fund received by the LGU is invested on farm-to-market roads and improvement of other public facilities and that alternative livelihoods (such as production of coconut vinegar and mat weaving) were implemented, which has contributed to reduction in pressure on the marine resources in the area. The said study has also noted the initiatives of other groups to establish microfinance facilities and the efforts of the local government to promote the municipality as an ecotourism site.

Overall, while compensation mechanisms have the potential to distribute more equally the benefits and costs associated with the management of coastal and marine resources, successful mechanisms applied in one country are not necessarily applicable in general case. In this regard, as Gjertsen and Niesten (2010) suggested that continued

Box 3: Selected cases of compensation mechanisms to local communities

• Rendova, Solomon Islands. Biologists from Australia have utilized a turtle incentive program such that for each leatherback turtle spotted going to its nest, USD 2 will be given to the one who has noticed the turtle and has notified the turtle monitor of his observation, USD 1.33 to the monitor (if he has tagged the turtle and made record of the information) and USD 1.33 to be placed on a community fund. On the other hand, a villager who will be able to find a turtle nest (after the turtle returns to the sea) must inform then turtle monitor, which in turn will record the information. For each turtle nest recorded, the observer, turtle monitor and the community fund will receive USD 1.33.

• Jamursba Medi, Indonesia. The World Wildlife Fund (WWF) and the local government in a community in West Papua, Indonesia have collaborated to protect nesting leatherback turtles, with the WWF employing villagers for data collection and patrolling of the beach. However, some issues have surfaced with regard to the limited benefits associated with the compensation scheme such that only the families of those employed by the WWF appeared to benefit from it. In this case, the said organization has donated equipments such as wooden longboat to the villages and has given 13 scholarships (three-year duration) worth USD 23,000. Villagers, in turn, have agreed to establish a nontake leatherback turtle nesting beach (with an area of 280 acre) and fringing forest reserve (with an area of 160 acre), while families of student beneficiaries have pledged to contribute to the initiative. In this case, a beneficiary can lose the scholarship if it is found that his family is engaged in activities such as poaching of turtle eggs.

• Northern Gulf, Mexico. The Mexican government has devised a scheme in 2007 to discourage fishermen from catching vaquitas, which are small porpoise concentrated on a fishing area, which makes them vulnerable to fishing activities (by serving as bycatches). A series of buyouts was conducted by the Mexican government such that fishermen were asked to choose among different options in exchange for giving up their net permits (to catch shrimp or finfish). The options offered by the government include permits for gear that do not harm vaquita , funds for establishment of a tourism-related business and compensation to not fish in the refuge area for one year.

• Brazil. A defeso system is implemented by the government (under the federal fishery and employment agencies) such that closed season is imposed on certain fishing areas and that fishermen in those areas are given compensation (based on the minimum wage) within the duration of the said policy. The said scheme has been applied to shrimp, lobster, marine and freshwater fisheries. Also, the government has been implementing an associated unemployment insurance scheme for artisanal fishermen since 1991.

• India. Savings-cum-relief scheme is implemented in some states wherein a fund is established with the contributions being sourced from the fishermen and the government (both central and state). The said fund serves as the source of financial assistance for the affected fishermen during the lean season.

• Tubbataha Reef, Philippines. A willingness-to-pay (WTP) survey was implemented among dive operators and divers, the results of which served as the basis for the user-fee system for foreign and domestic divers. The amount collected goes to a Conservation Trust Fund, which is distributed as follow: 50 percent goes to savings (to finance the reef's conservation activities), 43 percent is used to finance operations and maintenance of the Tubbataha Park Management Office, and the remaining proportion goes to the Local Government Unit of Cagayancillo (town near the Tubbataha) to be used among others in financing livelihood activities, information and education campaigns, and establishment of other coral reef fish sanctuaries. The Tubbataha Protected Area Management Board (TPAMB) has later on recommended that the share of Cagayancillo LGU to the conservation fees paid be equal to 10 percent.

Sources: Gjertsen and Niesten (2010); Begossi et al. (2011); Kurien and Paul; Subade (2007); Dygico et al. (2013).

monitoring of the said projects must be undertaken and that feasibility tests must be conducted to determine the effectiveness of the said projects.

In this case, among modes of incentives that can be considered for the local communities are listed as follows:

• **A scheme similar to the Conditional Cash Transfer (CCT) program for fishers and fisher-farmer as the poorest of the poor sector of economy**. The Philippine government is presently implementing a Conditional Cash Transfer (CCT) scheme among the poorest of the poor households (based on information from the National Household Targeting System). The cash transfer aims to support a household's investment on the human capital (particularly health and education) of its members. Among the conditions of the program are the need for the beneficiary children to be enrolled in school and attend 85 percent of the school days every month and for the family to regularly access health services from nearby health centers (such as deworming by school-age children, regular visit by pregnant mothers, and attendance to Family Development Sessions) (Chaudhury, Friedman and Onishi 2013).

Given the high poverty incidence among the fisherfolks (as compared to other basic sectors), a similar scheme can be implemented for the said sector. Drawing on the documented experiences on incentive mechanisms, the government can explore the feasibility of providing incentives (such as financial support and alternative livelihood development) to the fisherfolk households (possibly in partnership with other groups such as environmental NGOs) conditional on the performance by the latter of their agreed role in environmental protection (e.g., protection of young leatherback turtle) and stewardship (e.g., sea warden or helping relevant authorities in efforts to monitor the area). In this case, the benefit package must be able to offset the opportunity cost associated with compliance in the agreement (e.g., loss of income from not using unsustainable fishing practices) and cost of conservation actions (such as time spent on vigilance efforts), and that the principal must implement a continuous monitoring system to determine and ensure compliance by the fisherfolk communities (Niesten, Gjertsen, and Pong 2012). It is worthwhile to indicate that local communities have a big role in coastal resource management in the Philippines and that incentivizing them can further enhance coastal resource management programs success in the Philippines and other economies in APEC.

• **Allocation of part of conservation funds (e.g., generated from tourism activities in MPAs) for public basic services**. As noted by Niesten, Gjertsen, and Pong (2012), alternative livelihood projects need to be profitable enough to be able to offset the earnings that the people in the community could have earned when they resort to unsustainable resource extraction practices. In this case, a part of the conservation funds can be allotted to construction of necessary public infrastructures which can allow the community members to access more potential markets for their products (from the alternative livelihood projects) and supply-side intervention particularly capacity-building initiatives for the community members to be able to learn the necessary skills for the alternative livelihood, enabling them to more easily diversify their sources of income or livelihood opportunities.

• **Development of local ecotourism with preferential employment for local residents**. The local ecotourism sector has seen a growing significance over the past years with the increase in number of tourists that it caters and as such, the sector has the potential to induce significant benefits to the adjoining communities. In this case, policies can be implemented to provide incentives for businesses that enhance capacities of locals through skills training prior to hiring, thereby helping to ensure that ecotourism benefits trickles further down to the fisheries sector and spreads to as many households as possible. Also, resource users can be part of the local ecotourism industry, as shown by the case of seaweed farming in Indonesia wherein the local industry association aims to develop certain farming areas as ecotourism destinations wherein tourists can learn tidbits of information regarding the economic and ecological importance of the industry.[31]

• **Increase value retention of fishery resources through technology transfer and innovation**. In the case of Indonesia, for instance, the local seaweed industry association and the government have both encouraged seaweed farmers to not only increase their production but learn to process the seaweed into products with higher value added. In this case, their government has noted that seaweeds can be processed into a wide array of products including those in food, cosmetics and pharmaceuticals groups (Nurhayati 2013). Policies can be implemented to encourage investments (especially industries that intensively utilize inputs from fisheries and the oceans) that have the potential to generate jobs in the local communities. There is a need, however, to ensure that these industries will resort to sustainable utilization of such resources.

B. Fisheries and Aquaculture

Improving fisheries and its value chain means income and livelihood to the fishing communities and beyond.

• Ecosystem Approach to Fisheries Management. Promote the application of ecosystem approach to fisheries management (EAFM), which links functions of different agencies and manage ecosystems from ridge to reef. EAFM requires coordinated coastal and ocean resources governance at the local, national, and regional scales.

• Technologies for sustainable and efficient harvesting. Invest in sustainable harvesting strategy. Fish aggregating device, for example, may be a tool for sustainable and efficient harvesting if properly managed. By aggregating fish over a limited area, fishers would reduce the fuel cost for searching fish schools. But there should be a transformation from commercial-centric FADs, which benefited few individuals only toward small-scale, artisanal FADs fishery, which can distribute benefits to many fishing communities.

• Development of low-environmental impact alternatives to low-valued fish as feed component. 22 percent of the Philippine fish production by weight is derived from Aquaculture (Cabral 2014). Substantial proportion of feeds for aquaculture is from industrial fish (wild fish with low value). The global market demands for fish are high, but unsustainable aquaculture practices to increase culture production

31 See for instance Nurhayati (2013).

will decrease the carrying capacity and ecosystem integrity in the long-term.

• Foreign investments in seaweed farming and technology. The Philippines is one of the top producers of seaweed in the world, providing livelihood to more than 100,000 families. There is a high demand for seaweed production both local and for export but the production is not sufficient. Locally, contribution of seaweed to poverty alleviation can be enhanced by stabilizing seaweed price (competitive and equitable) and development and improvement of processing system to increase value of seaweed and increase employment. Seaweed culture and farming have the potential to substantially contribute to income provided that prices are stable and system for local and international trade are in place.

• Mitigate illegal, unregulated, and unreported (IUU) fishing. Although there has been substantial improvement in arresting IUU, there is still a need to enhance IUU enforcement especially poaching and intrusion. IUU has been very difficult to control offshore and in the high seas. Various government agencies (such as the Philippine Navy) along with other stakeholders (such as private groups and local communities) can collaborate to mitigate the practice of IUU. Also, a multilateral enforcement agreement that will be complied by different parties can be pursued.

• Development and management of regional fisheries management units. About half of the capture production of the Philippines is from the pelagic fisheries (tuna and small pelagics). Pelagic fishes are highly migratory and managing this fishery is a transboundary concern in nature. Regional collaboration and cooperation should be enriched to improve effectivity of the management of pelagic species and straddling stocks. Migratory route of tuna and turtles encompass the entire East Asia and Pacific (Block et al. 2011).

• Professionalize fisheries. Encouraging fisheries professionalism particularly for small-scale fisheries will allow fishers to benefit more from economic development, resulting in a more inclusive economic growth for the country and the region. The Philippines has approximately 1.3 million small-scale fishers compared to 16,497 commercial fishing operators. They are known as the country's poorest of the poor. Various livelihood development opportunities have been provided to fishing households as a way of poverty alleviation and managing excess capacity in small-scale fisheries (Salayo et al. 2008).

However, unless fishers' capacity to engage in other opportunities is enhanced, relatively few are able to successfully apply the technical trainings they receive. Professionalizing fishers and the fishing livelihood can be achieved through formation of fishing "societies," setting standards, certification, self-policing, and implementation of appropriate technologies (McClanahan et al. 2009). Organizing small-scale fisheries and providing the needed infrastructure (e.g., ice plants, fishport-to-market roads, and wet markets) and policies (e.g., setting fair ex-vessel fish price range, etc.) can give small-scale fishers an opportunity to access larger markets, thus increasing the value of their catch. Capacity-building programs for fishers should be provided to enable them to access job and livelihood opportunities offered by an improving economy.

• Advocating for "blue solutions" through sustainable consumption and production (ecolabelling and "blue certification"). Sustainable consumption is part of a growing global advocacy to change individual behaviour and provide incentives

to sustainable and environment friendly production practices. This complements market instruments such as ecolabeling and blue certifications, which are linked to the recommendation on professionalizing fisheries. The government and the public should advocate for more responsible use of coastal and marine resources. One way of changing behavior of marine resource users and consumers is by showing them that sustainable practices make a difference (and is much more beneficial for the country as a whole). Putting a premium on products sourced from the sea through sustainable means can encourage more fishers to take up better resource use practices while at the same time influencing consumer perceptions and preference for a sustainable "blue economy." "Blue" labelling of fisheries products derived from sustainable harvesting can help reduce IUU.

C. Integrated Planning and Ecosystems Management

• **Marine spatial planning (MSP) should be implemented to manage different uses of the oceans.** A major cause for rapid degradation of ocean and coastal ecosystems is its default nature as an "open access" system. Economic theory and case studies suggest that structures of open access are nonsustainable (Visbeck et al. 2014). Although the Philippines and many APEC member-economies implement fishing boundaries based on the scale of fishing sectors (e.g., by size, weight, or power of fishing vessels used), broader spatial planning is needed to address conflicting ocean and coastal resource use. Elements of marine spatial planning have been implemented in the Philippines. Marine protected areas, whether nationally or locally managed, form one of the first efforts on spatial planning to regulate the "open access" nature of marine resources. However, the country is experiencing increased privatization of coasts (Cabral and Aliño 2010). Commercial uses of ocean and coastal waters tend to marginalize small-scale fishers further. Marine spatial planning (MSP) can help safeguard the rights and privileges of small-scale fishers and prevent further marginalization. MSP can also be used to set guidelines for responsible stewardship of marine areas, even for commercial purposes.

• **Mitigating and abating pollution from industries, shipping, and port facilities** (e.g., ballast water), domestic waste, tourism waste, and agricultural waste should be managed through proper zoning of activities, technology transfer for efficient and environmental friendly waste control and treatment facilities, and promoting low-impact activities.

• **Integrated sustainable tourism/ecotourism**. Determining tourist carrying capacity of a site and incentives for good practices through recognition and certification systems such as the blue flag and environmental monitoring (e.g., Green Fins). Waste management through education, strict implementation of rules, and behavioral change such as through social marketing. Promotion of lower-impact activities. Strict implementation of environmental laws, e.g., waste disposal and structures in the foreshore areas, among others.

D. Disaster Risk Reduction and Climate-Change Adaptation

• **Proper zonation of development and potential resettlement of vulnerable communities**. Storms may be more frequent in the coming years; this requires

that adaptation strategies should include adjustments to prepare and protect vulnerable communities as adaptation response to climate change (de Sherbinin et al. 2011). Hazard zones must be avoided. Protection of coastal habitat in hazard-prone areas to enhance resiliency of these ecosystems. Improving the governance regime of foreshore areas is imperative especially considering the appropriate evaluation of their ecosystem services in planning and implementation of land and sea use classification.

• **Improve agriculture and fisheries sector in the face of climate change to achieve more inclusive sustainable development under good oceans inter hierarchical governance**. Productivity of aquaculture, agriculture, and wild fisheries may be affected by climate change. Enhancing resiliency of the stocks to climate change is a worthwhile investment.

• **Enhance research and monitoring**. Some governments are not able to manage resources because of lack of capacity to understand the available resources and their status. Programs should include global climate analysis such as global climate models for greater climate predictability in order to come up with better adaptation strategies for fisheries, livelihood, and safety (e.g., upwelling, El Niño South Pacific Oscillation).

• **Development of Alternative (Ocean) Energy Technologies**. Encourage exploring other means of generating energy other than oil drilling, such as incentives for renewable energy from wave, current, wind, tide, watershed, and solar. Enhance affordability of solar energy can be used as projects for sustainable energy use in the coastal communities.

E. Science and Biotechnology

• **Prioritize Investment in Marine Biodiversity S&T**. The Philippines is strategically located at the center of marine biodiversity (Roberts 2002) and millions of people directly depend on this biodiversity for food and livelihood (Cabral et al. 2013). The Philippines is a key area conducive for studying social and ecological functions of biodiversity. Vast biodiversity of the region potentially contains vast opportunities for biotechnology research such as drug discovery and energy security, among other purposes that is of global interest.

F. General Recommendations (National and Regional Governance)

• **Partially internalizing environmental and natural capital management costs.** Financing coastal resource management has always been a problem for local governments. Benefits from the ocean should be ploughed back to management and ensuring a resilient and sustainable resource base and ecosystem. Unfortunately, the government generates relatively minimal funds from fisheries and fishing-related activities. Many local governments are not able to collect fees or implement very minimal fees yet they are expected to invest more in fisheries management. With a fishery sector contributing PHP 183 Billion (BFAR statistics 2011) to the GDP, making the fisheries sector contribute to the management of the resource base they depend on should not be financially problematic. This does not mean, however, that all management costs should be borne by fishers or direct users of marine

resources. Their active contribution to resource management and sustainable use should be a prerequisite to their "right to fish" and not an afterthought. Absorbing some of the conservation and management costs does not have to stop with the fishers. It can be spread throughout the fisheries value chain from fishers down to consumers and even through public-private partnerships. As recommended by Lam and Pauly (2010), "the ethical lacuna, between governments as trustees and citizens as owners of the fishery resources, can be filled with information, education, and communication inculcating responsibility that shares the societal costs and benefits of marine resource exploitation and conservation."

• **Metrics to capture "blue economy" performance**. Philippine officials admit that at present, measuring the economic contribution of the maritime sector is still at its formative stage (Virola et al. 2009). Officials of the National Statistical Coordination Board advocate for a Philippine maritime sector statistical framework to properly guide the planning and development of the maritime sector. In this case, the following can serve as rubric on the part of the government in its development of a system that accounts for the contribution of the activities in the maritime sector (Colgan 2004 as cited in Kildow and McIlgorm 2010):

  o Data consistency at the national and local level (e.g., definition of employment in maritime sector in one region must be the same as definition of maritime sector in another region)

  o Data consistency across different time periods (to allow for observation of trends in the sector and comparison of its performance in different time periods)

  o Theoretical and accounting consistency (i.e., methodology should not allow for double counting and as such allows aggregation of values across different regions)

  o Replicability of the methodology used to generate data

Aside from the proposed statistical indicators in Virola et al. 2009, tracking the performance of the Philippines' maritime sector or its "blue economy" should also include ecological and human well-being indicators. In this case, efforts must be made to include valuation of nonmarket benefits associated with coastal and marine resources (whose value can be significantly large as previous estimates suggest) and that there must also be a consideration of the sustainability of the economic activities included in the accounting system. These are much harder to estimate than the usually collected economic performance metrics, but a step in that direction should at least be initiated. As the private and public sectors pick up and understand the new metrics, data gathering can be easier with assistance of local governments and corporate social responsibility units. Also, efforts must be made to more rigorously collect information on the economic activities in the coastal areas of the country which are considered as significantly vulnerable to occurrences of natural shocks such as typhoons.

In this case, the development of such a metric can allow policymakers to track trends on the relative importance of different sectors to the marine economy over time, and also allow them to determine the extent of the impact of natural calamities and phenomena such as climate change and its associated implications on the economic

value of the oceans and the seas. Overall, this would allow the government to craft more relevant and more evidence-based policy initiatives with regard to utilization and management of coastal and marine resources. With the current global trends associated with significant extraction of various natural resources (such as decline in ocean and coastal fish stocks, greater incidence of water shortages on tillable land), it is expected that the ocean sector will play a more prominent role in the coming years, given the potential new economic activities that can emanate from it such as wind and wave power and other forms of offshore renewable energy and offshore aquaculture, among others (Kildow and McIlgorm 2010).

- Capacity building through educational opportunity enhancement such as integrating Conditional Cash Transfer [CCT+++] enhanced with ecosystem stewardship, disaster risk reduction preparedness measures and climate change actions. The blue economy concerns can target marginalized vulnerable sectors such as fishers who share stewardship responsibility, diversifying livelihood opportunities that assist in sustainable use that help in accelerating social and ecological recovery, and resilience building. The government can partner with different stakeholders such as academic institutions and environmental groups with regard to exploring the feasibility of implementing schemes to incentivize fisherfolks and other resource users to contribute to the conservation of coastal and marine resources on a larger scale. Conservation efforts in this case can include initiatives to continuously monitor the status of coral reefs, mangroves and other marine ecosystem components in their respective localities. Also, they can contribute to initiatives that aim to conserve (and increase) the mangrove stocks of the country which can be of utmost importance to a large segment of the population (particularly those living in the coastal areas) given their potential to mitigate the inflow of large waves induced by storm surges and other phenomena.
- Increased support to the government agencies in charge of monitoring the marine resources of the country. The Philippine Navy currently has around 20,000 active officers and enlisted personnel (Mangosing 2014) and in 2013, the national appropriation for the Navy amounted to around PHP 13.450 billion (DBM 2013). Given that the estimated sea area of the Philippines is around 200,000 km^2 (from Table 1.1), on average, approximately PHP 6,725 is allotted for each square kilometer of the Philippine seas, and that there is one Navy personnel assigned for each 10 km^2 of Philippine seas. These suggest the existence of more room to increase the support to Philippine Navy (and also to other government agencies) in charge of monitoring the activities in the seas of the country given also that there is a significant amount of economic value associated with the marine resources of the country (as the discussion on Section IV suggests). The additional support to the Philippine Navy has the potential to increase its capacity to minimize incidence of unsustainable extraction of resources (such as IUU fishing) in the different parts of the seas of the country and minimize unmonitored incursions by resource users from other countries.

  Also, the increased support can be used for a potential collaboration among the Philippine Navy, marine-related agencies of the government (such as BFAR and BMB), and academe people to develop a system that would ensure a more continuous monitoring of the status of different coastal and marine ecosystems in the country. In this case, investments on the establishment of different data-

gathering stations across the country can be done by the government, and that such monitoring efforts can be centralized (for instance, by establishing a Navy Environmental Management Office).

• Synergizing good governance to achieve multidimensional/multiple objectives by integrating system level effectiveness and efficiency, embedding processes like functionality, e.g., how the MDG is able to meet its goals, transparency, and accountability, e.g., state of coasts reporting and participatory decision making e.g., CTI working groups.

• Sustaining fisheries requires building the capacity of national constituencies and regional bodies to transform and change behavior individually and collectively.

• Diversifying opportunities for livelihood options (e.g., the Sustainable Coastal Fisheries and Poverty Reduction Initiative a.k.a. COASTFISH) minimizes threats and provides the bridge between the governance input responses and the drivers that lead to improved ecological conditions.

• Stabilizing ecosystems from ridge to reefs (R2R) – highlands to ocean (H2O) through Integrated Coastal Management and EAFM to reduce threats by integrating marine spatial planning and implementation of harmonized multiple use and nonuse values in a strategic development agenda, i.e., implementing protection, refugia, and multiple use principles like pollution abatement with waste minimization.

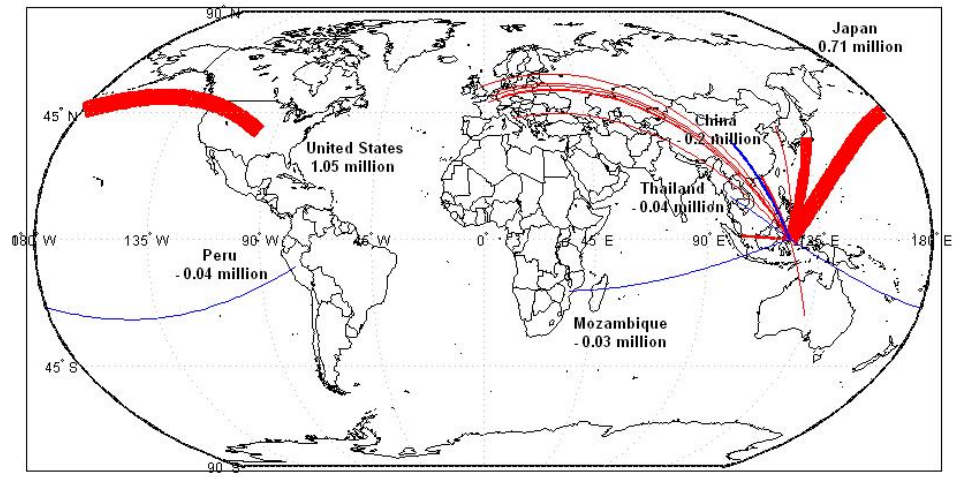
• Trades to be strengthened further. At the APEC level, work toward free trade policies should continue. At the national level, condition of trade and trading facilities should be improved in order to enhance the value retention at the coastal communities. Reduction of middle men transactions through development of satellite (direct access) trading centers can enhance the value retention at the local level and could enhance equitable distribution of benefits for the coastal communities. The Philippines (and the Coral Triangle countries in general, see Figure 7.1) is a net exporter of fish and fisheries product. The margin of prices of import and export is also high (Figure 7.2). Policies should ensure that these margin is distributed equitably throughout the market chain, including the producers/harvesters of the products.

• International Cooperation in Managing Marine Resources[31]

In addition to domestic policy strategies (such as community-level compensation mechanisms), countries will need to consider cross-border cooperation in order to sustainably tap the blue economy. Mendoza and Siriban (2013) undertake a review of international cooperation initiatives in the marine economy, with a view toward sustainable resource management. Based on 14 cases of international cooperation, they find several common characteristics that might comprise the beginnings of an operational approach to regional public goods in the blue economy (see Table 7.1 for the details of the cases).

31 This section draws heavily from earlier work of the authors, notably Mendoza and Siriban (2013).

Figure 7.1. Net fish exports (Import–Export) in USD of CT6 in year 2009



Note: Red indicates CT6 being a net fish exporters while blue as net fish importers. Includes trade of fish, crustaceans, molluscs, and other aquatic animals but excludes aquatic mammals, crocodiles, caimans, alligators, and aquatic plants. Data provided by StefaniaVannuccini, Fishery Statistician (Commodities), FAO FIPS (Fisheries and Aquaculture Statistics and Information Service). Figure generated by R. Cabral.

Figure 7.2. Value of imported and exported fish per ton of the Coral Triangle countries

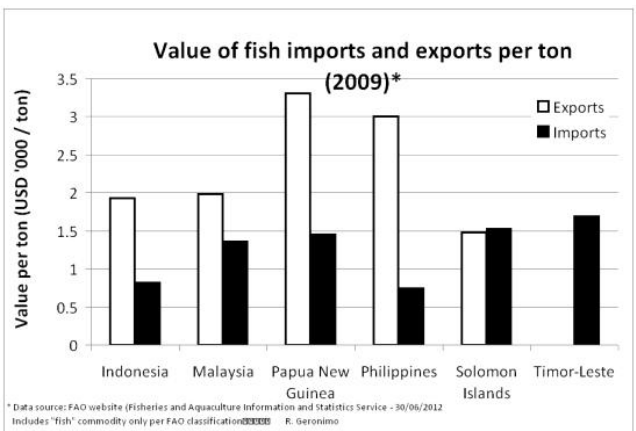


Figure generated by R. Geronimo.

Well-defined cooperation frameworks are key, and these include those embodied in legal framework agreements and treaties. Examples include the Barents Sea Fisheries Management (i.e., several quota and zonal agreements between Norway and Russian Federation and also with third parties), the Pelagos Sanctuary for Mediterranean Marine Mammals (i.e., an agreement to create a marine sanctuary signed by France, Italy and Monaco), Danube River Basin Preservation (i.e., the Danube River Protection Convention signed by the riparian countries), Western and Central Pacific Tuna Management (i.e., several agreements to regulate quotas and catch areas signed by Pacific Island countries) and bilateral joint development initiatives pursued by countries involved in maritime disputes, as in the case of Thailand and Malaysia (i.e., 1979 Memorandum of Understanding and the agreement that established the Malaysia-Thailand Joint Authority) and of Guinea Bissau and Senegal (i.e., 1993 Management and Cooperation Agreement which established the joint development zone), among others.

The agreements aim to address a variety of issues, such as equitable allocation and conservation of fish resources for cooperation initiatives that aim to manage shared and straddling fish stocks; proper allocation of water resource, pollution mitigation, and ecosystem conservation for cooperation initiatives that aim to manage shared water basins (as in the case of Danube River); and mechanisms that can be utilized to tap the resources found in the disputed area, and benefit-sharing arrangements in the case of joint development agreements. These agreements help to articulate shared objectives and at the same time help to specify commitments of all countries involved.

Cooperation in research also typically supports broader cooperation by generating and disseminating credible and unbiased data and evidence, which in turn proves critical in spurring and sustaining collective action. For instance, research on marine ecosystems and fish stocks plays a key role in motivating sustainability and preservation concerns. As Gulland (1980) noted, cooperation in research would enable countries to have a more complete account of events (such as changes in the migration pattern of fish stock) as compared to merely depending on national assessments. This in turn would allow them to have a more complete set of information which they can utilize in coming up with more equitable quota management and benefit sharing arrangements.[32] In the case of the Pelagos Marine Sanctuary, research initiatives have played an important role in increasing the awareness of the governments and citizens of the countries concerned (Italy, France, and Monaco) on the threats to the cetacean population in the area which in turn, motivated the three countries to establish a sanctuary zone for marine mammals and collaborate in harmonizing their monitoring efforts and implementing policies that would minimize the adverse impact of human activities on the marine mammals. In addition, research and evidence also play a key role in establishing how effectively the RPG is being produced by the cooperation initiative. In certain cases, the research also proves critical in avoiding (or in some cases settling) disputes, as new information is necessary to continue to validate original agreements and ensure that a sense of fair benefit and burden-sharing is still being promoted.

32 See also Caddy (1997).

Table 7.1. Summary of information on 14 cases of regional public goods

Case	Countries Involved	Institutional Agreement	Burden-sharing
Barents Sea Fisheries Management	Norway and Russian Federation (plus Iceland)	Norway and Russia previously forged a series of agreements while the territorial dispute was going on: - 1975 Framework Agreement: mechanism in setting annual quota of shared fish stocks that can be harvested and in allocating the quota to the 2 claimant states and third parties; - Mutual Access Agreement: access by one claimant state to the fish stocks in the EEZ of the other claimant state - Grey Zone Agreement: parallel jurisdiction of the two claimant-states in a portion of the disputed area. The two countries also resorted to bilateral negotiations with third parties. The Loophole Agreement was signed by the two claimant states and Iceland which allowed the latter to harvest fish in the EEZs of Norway and Russia in exchange of allowing vessels from the claimant states to access national waters of Iceland	**The two countries both provided maritime personnel in charge of monitoring the Barents Sea including portions beyond their EEZs. Continuous marine research efforts (which serve as the guide of the Joint Norwegian-Russian Fishing Commission) have been led by the marine research agencies of the two countries.**
Coral Triangle Region Preservation	Malaysia, Philippines, Indonesia, Papua New Guinea, Solomon Islands	The heads of state of Malaysia, Philippines, Indonesia, Papua New Guinea, Solomon Islands and Timor Leste signed a declaration in 2009 which established the Coral Triangle Initiative and adopted a Regional Plan of Action which contains goals (such as application of ecosystem-based approach on fisheries management) that the signatory countries are expected to fulfill.	Initial amount of USD 120 million was committed in support of the initiative, a significant portion of which came from the Global Environment Facility (USD 63 million) and the United States (USD 41.6 million). Signatory countries also pledged to **contribute to the initiative, with the Philippines and Indonesia each committing initial amount of USD million and the latter expressing willingness to host the office of the Secretariat. Technical assistance and knowledge management programs were largely funded by international donors (such as ADB and GEF), with the signatory countries covering additional contributions to cover some costs of these projects.**

Case	Countries Involved	Institutional Agreement	Burden-sharing
Danube River Basin Preservation	Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Montenegro, Romania, Serbia, Slovak Republic, Slovenia and Ukraine	The Danube River Protection Convention aims to foster cooperation among the riparian states to ensure proper management of ground water and surface water in the basin. The convention also established the International Commission for the Protection of the Danube River Protection Convention agreed to follow the guidelines of the EU Water Framework Directive (EU WFD).	The signatory countries are expected to contribute equal amount annually to the fund of the ICPDR unless the signatory countries unanimously allowed otherwise applicable for a transitional period. The European Union (EU) also contributes to the ICPDR fund, with its contribution in 2011 accounting for approximately 2.5 percent of the overall contribution.
Ganges River Water Resources Management	India and Bangladesh	The 1996 treaty contains a formula on water-sharing (of the waters in Ganger river entering the Farakka barrage) between Bangladesh and India during the dry season. The treaty also led to the establishment of a Joint Committee, which will check the amount of daily water flow at certain parts of the Ganges river and will serve as the initial arbiter of any water-sharing related dispute between the two countries.	India and Bangladesh send equal number of representatives to the Joint Commission established under the 1996 treaty. India, on the other hand, is the one primarily in charge of the operation of the Farakka barrage.
Nile River Basin Preservation	Kenya, Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Rwanda, Sudan, South Sudan, Tanzania, and Uganda	The 1959 agreement allocates a significant amount of water in the Nile River to Egypt and Sudan and decrees other riparian states to seek permission to the former whenever they implement water-related projects (such as irrigation). A transitional arrangement was established by the riparian states (through the Nile Basin Initiative), which aims to foster cooperation among the latter in managing the resources of the said river.	Majority of the funds received by the Nile Basin Initiative came from donors such as development agencies of some European countries, and multilateral institutions such as the World Bank, and the African Development Bank. As of 2011, contributions from the riparian states account for approximately 1/10 of the total contributions received by the Initiative.
Pacific Salmon Management	United States and Canada	The main treaties guiding the present cooperation between the US and Canada in managing the stock of Pacific salmon are the 1985 treaty which led to the formation of Pacific Salmon Commission, and the 1999 Agreement (updated in 2008 to include further provisions on science-based conservation), which promotes long-term abundance-based management of the Pacific salmon stock.	Two endowment funds ("Northern Fund" and "Southern Fund") were established by the 1999 agreement to be used in stock enhancement and conservation initiatives. The United States provided the initial funding and Canada provided additional contributions. The funds are stipulated to be placed on investments such as interest bearing accounts, bonds, and securities.

Case	Countries Involved	Institutional Agreement	Burden-sharing
Pelagos Sanctuary for Mediterranean Marine Mammals	France, Italy, and Monaco	The 1999 agreement signed by France, Italy, and Monaco, which established the Sanctuary aims to address among others the need for the three countries to cooperate in regulating the human activities in the area. The European Union also has regulations that aim to limit the use of driftnet fishing in the region.	Italy hosts the office of the Secretariat while Monaco is the in-charge of the scientific and technical committee. Participating countries have allocated funds for the activities and ratification of laws relevant to the Agreement (e.g., monitoring efforts, research programs).
Prespa Lake Basin Preservation	Albania, Greece, and Macedonia	A joint declaration was signed by the Prime Ministers of the three riparian states in 2000 calling for the creation of a transboundary Prespa Park and the Prespa Park Coordination Committee (PPCC). The said body has representatives from the government, local community and NGOs for each riparian state, and from the International Ramsar/Medwet system. An internationally binding agreement was signed by the Environmental Ministers of the riparian states in 2010, which institutionalized the declaration signed earlier.	Private groups (NGOs such as WWF-Greece, Society for the Protection of Prespa and multilateral entities such as UNDP) contributed to the projects of the PPCC such as the formulation of a Strategic Action Plan, and the development of the Transboundary Environmental Monitoring System.
Southern Blue Fin Tuna Management	Australia, Japan, Republic of Korea, Taiwan, New Zealand, and Indonesia	The Commission for the Conservation of the Southern Blue Fin Tuna (CCSBT) seta a total allowable catch (TAC) per country, monitors the compliance of the member-countries (Australia, Japan, Republic of Korea, Taiwan, New Zealand, and Indonesia), and sponsors scientific research programs regarding the southern blue fin tuna population. In case of violation of the TAC by one of its members, the Commission brings the case to the International Tribunal for the Law of the Sea (ITLOS) for arbitration.	The member-countries of the Commission share equally in their contribution to the 30 percent of the Commission's budget, while the contribution by a member-country to the 70 percent of the budget is based on the share of its nominal catch to the total nominal catch of southern blue fin tuna.
Western and Central Pacific Tuna Management	Pacific Island Countries	Agreements that shaped the cooperation among the Pacific island countries include the Nauru Agreement and Palau Agreement, which aim to strengthen their position with respect to the distant water fishing nations in negotiations over access fees. The Pacific island countries also forged the Niue Treaty, which aims to foster cooperation regarding surveillance initiatives in their EEZs. A convention established the Western and Central Pacific Fisheries Commission (WCPFC), composed of representatives from Pacific island countries and distant water fishing nations and which serves as the regional body that manages fishery stocks in the region (including the high seas).	The Pacific island countries and the distant water fishing nations contribute annually to the fund of the West and Central Pacific Fisheries Commission (WCPFC). The indicative contribution of each country is divided into the following components: base component (10 percent of the total contribution which is shared equally by the member-countries); national wealth component (20 percent of the total contribution which is based on the GNI per capita of the member-countries); and fish production component (70 percent of the total contribution, which is based on the total catch of member-countries' vessels within the Convention area).

Case	Countries Involved	Institutional Agreement	Burden-sharing
Malaysia-Thailand Joint Development Initiative	Malaysia and Thailand	The 1979 Memorandum of Understanding (MOU) delineated the joint development area and called for the establishment of a joint authority with equal representation from member-countries that would be in-charge of overseeing the economic activities in the joint development area. On the other hand, the 1990 Agreement established the Malaysia-Thailand Joint Authority (MTJA), which was given vast powers, including approval of exploration and extraction activities of the contractors.	The two countries equally shared the initial funding of the Malaysia-Thailand Joint Authority (MTJA) and the same proportion is used in allocating the other costs, and benefits that will accrue from the activities of MTJA. Malaysia and Thailand appoint equal number of delegates to the joint authority. The 1979 MOU, on the other hand, divided the joint development area into two: 930 square miles for Malaysia and 1,100 square miles for Thailand. The countries are assigned to exercise jurisdiction in their assigned areas with regard to controlling illegal fishing activities.
Joint Development Initiative by Guinea Bissau and Senegal	Guinea Bissau and Senegal	The Management and Cooperation Agreement signed by the two countries in 1993 delineated the joint development zone and stipulated resource-sharing formula with regard to the fisheries resources (50:50) and mineral resources (85:15 in favour of Senegal) found in the area. The two countries have also agreed that Senegalese laws would apply with regard to mineral resource exploration and extraction activities in the area, while the laws of Guinea Bissau would have jurisdiction on matters related to fisheries. An agreement in 1995 established the AGC, which serves as the joint authority composed of three entities: High Authority (policy-making body composed of Heads of State or their designate), Secretariat, and the Enterprise (corporate body of the joint authority). An agreement in 2000 revised the resource-sharing formula for mineral resources to 80:20 (in favor of Senegal).	Senegal and Guinea Bissau contributed 67.5 and 32.5 percent, respectively, of the capital of the Enterprise (corporate arm of the joint authority).

Case	Countries Involved	Institutional Agreement	Burden-sharing
Joint Development Initiative between Norway and Iceland	Norway and Iceland	The Fishing Agreement of May 1980 called for the establishment of the Fisheries Commission with equal number of representatives from Norway and Russia. The Commission was tasked to submit recommendations to the governments of the two countries with regard to total allowable catch, distribution of harvests and conservation-related measures over the area between Iceland and Jan Mayen island. The agreement also recognized Iceland's right to generate 200 nm EEZ on the said area, and Jan Mayen's entitlement to 200 nm EEZ in areas where it is not limited by Iceland's EEZ. An agreement in 1981 delineated a joint development zone in the waters between Jan Mayen Island and Iceland and stipulated provisions with regard to joint development of hydrocarbon resources in the area.	A larger portion of the joint development zone (32,750 square kilometers or 61 percent of the total area of the zone) lies on the EEZ of the Jan Mayen island. Norway (through its Petroleum Directorate) was tasked to borne the full costs of seismic surveys in the joint development zone.
Joint Development Initiative in the Timor Gap	Australia and East Timor (previously Australia and Indonesia)	The Timor Gap Treaty between Australia and Indonesia created a joint development zone, which was composed of three areas. 90:10 mineral resource sharing rule (in favour of Indonesia) was implemented in the area closest to Indonesia and the same resource-sharing formula (in favour of Australia) was also implemented in the area closest to Australia. On the other hand, 50:50 mineral resource-sharing rule was implemented on the middle area (termed as area A), which is part of the Timor Gap. Upon independence of East Timor, a new agreement was signed by Australia and East Timor, which nullified the Timor Gap Treaty and revised the resource-sharing rule in the area A (now termed as the Joint Petroleum Development Area) to 90:10 (in favour of East Timor). The Treaty on Certain Maritime Arrangements of the Timor Sea was signed by Australia and East Timor in 2007, which stipulated equal sharing of hydrocarbon resource in the Unit Area, which straddles the Joint Petroleum Development Area.	Indonesia and Australia sent equal number of representatives to the joint authority established under the Timor Gap Treaty. In the case of Australia and East Timor, the two countries are also tasked to send representatives to the joint authority in-charge of the Joint Petroleum Development Area.

Source: Mendoza and Siriban (2013).

Clarification of burden-sharing arrangements promotes stronger collective action, by clarifying the respective net benefits from the cooperation initiative. Ultimately, cooperation must make sense for all parties involved, in order for it to be sustainable.[33] An example of a specially designed burden-sharing arrangement is the way countries finance the Commission for the Conservation of Southern Blue Fin Tuna (CCSBT). The member-countries of the Commission share equally in their contribution to the 30 percent of the Commission's budget.

Presumably, this reflects a logic that follows the summation aggregation technology. Nevertheless, each member also contributes to the remaining 70 percent of the budget, based on the share of its nominal catch to the total nominal catch of southern blue fin tuna. This adjustment allows for countries with larger catches (and therefore larger economic benefits) to appropriately pay more for the cooperation initiative (since they are extracting more benefits from it).

A similar burden-sharing scheme is utilized in the case of the West and Central Pacific Fisheries Commission (WCPFC) but in addition to the base fee (10 percent of the total contribution which is shared equally by the member-countries) and the fish production components (70 percent of the total contribution which is based on the total catch taken within the Convention area), the contribution of each member-state also includes a national wealth component (20 percent of the total contribution, which is based on the GNI per capita of the member-countries) to account for the state of development of the member-countries and their ability to pay.[34]

In the case of joint development agreements covered by the study, there are some notable differences in terms of burden-sharing arrangements. While Malaysia and Thailand have agreed to equally share the benefits and costs (including the initial financing) that would accrue from the Malaysia-Thailand Joint Authority (MTJA), Guinea Bissau and Senegal provided unequal amounts of capital investment to the corporate arm of the joint authority, with 67.5 percent of the investment coming from Senegal. The benefits accruing from mineral resource activities in the joint development area are shared unequally by the two countries, with Senegal receiving greater proportion of the benefits (85 percent initially but was revised later to 80 percent). In this case, some studies noted that the existing engagement of Senegal on hydrocarbon exploration and development activities in the area (before the two countries agreed on a joint development initiative) is one of the possible reasons behind the unequal benefit and burden-sharing.[35]

The use of side payments also helps to craft a much more fair collective action agreement among countries (and also within countries). Examples include Cooperation in the Management of Pacific Salmon (provision of the United States of a significant proportion of the initial funding to the endowment funds established to support scientific research and conservation initiatives), Cooperation in Management of West and Central Pacific Tuna (recent move

33 As Munro et al. (2003) noted, in the case of fisheries agreements, a necessary condition for them to be stable is the satisfaction of the Individual Rationality Constraint, which states that each country should be at least as better off in cooperation as compared to not engaging in a cooperation initiative.

34 See WCPFC (2003).

35 See Miyoshi (1999) and Kim (2004).

by some Pacific Island Countries (such as Micronesia, Marshall Islands, Nauru and Papua New Guinea) to allow other countries' fishing fleets to operate within their territorial waters in exchange for the latter's commitment not to fish in the high seas in between the former's EEZs), and Barents Sea Fisheries Management (mutual access agreement between Norway and Russia on the shared fish stock found on each other's exclusive economic zone, and a similar agreement between the two countries and third parties as in the case of Iceland). A side payment scheme provides flexibilities on the part of each country that shares a common marine resource (fish stock, for instance), as it makes a country's harvest share only one of the sources of economic returns that the latter attains from the said resource. This in turn enables all countries that are part of a cooperative resource arrangement to attain higher economic returns relative to the case where they merely depend on their respective harvest shares.

In the case of some Pacific Island Countries, a possible reason behind their decision to use side payments lies on their lack of jurisdiction over the high seas and given that tuna stocks migrate between their EEZs and the high seas, excessive fishing efforts in the latter by other countries' fishing fleets can also affect the tuna stock available in their respective EEZs. On the other hand, many of the cod stocks found on the Russian side of the Barents Sea are of young age and if there is no provision for side payments (i.e., Russia is not given access to the more mature cod stocks of Norway), Russia would have to depend merely on its cod stock to fulfill its quota and this can have serious implications on the cod stock that will be available to Norway eventually.[36]

External parties also played a major role in some agreements (e.g., Asian Development Bank and the Global Environmental Facility in the Coral Triangle initiative; and the European Union to some extent in the preservation of the Danube river basin). This type of involvement may be necessary in cases where there are challenges in the ability of the countries to adequately provide the RPG.

An example for considering the merits for regional investment and cooperation is the Coral Triangle Initiative. In the ADB funded regional state of the coral triangle report, they noted that the establishment of the CTI Regional Secretariat and attaining the five CTI goals would require around USD 8.4 million, this is less than 1 percent of the capture fisheries value of the CT6 countries, which was estimated at USD 9.9 billion in 2007 (RSCTR, ADB 2014).

In the case of the Coral Triangle Initiative, the Global Environmental Facility (GEF) provided a significant proportion of the initial funding of the project. The Asian Development Bank, on the other hand, has been involved in capacity-building efforts of the relevant government agencies of some signatory countries in terms of knowledge management and information sharing, and of training with regard to utilizing an ecosystem-based approach in managing the shared resources. In this case, the said capacity-building efforts underscore the importance of building institutional capacities of government of each member-country in the provision of RPGs, as states with weak capacities can contribute less and can even induce negative externalities with regard to the production of RPGs.[37]

36 See, for instance, Caddy (1997).

37 See Nogueira (2003).

Private groups have also played an important role in the provision of RPGs in some cases. In the case of Pelagos Marine Sanctuary, the lobbying efforts of the private groups have led one of the leaders of the three countries (Prince Rainier of Monaco) to seek the cooperation of the other two countries in the conservation of marine mammals. The private groups have also taken the lead in ensuring the momentum of the conservation initiative. Similarly, in the absence of a formal agreement among the governments of Greece, Macedonia and Albania, environmental NGOs have played an important role in coordinating efforts by various stakeholders to implement necessary measures for the conservation of the Prespa Lake.

Overall, these lessons suggest that regional cooperation initiatives can focus on different areas, such as the following:

- **Promotion of further research and monitoring collaboration among the countries**. In this case, countries can collaborate with regard to continuous refinement of their system of accounting the economic importance of oceans and seas, with emphasis on the measurement of the nonmarket benefits and more sustainable indicators of relevant economic activities. Also, research collaboration can focus on related areas, particularly on the impact of climate change and other related phenomena on the economic value of coastal and marine ecosystems for each country and for the marine ecosystems located in high seas also given the interconnectedness of the different ecosystems. Cooperation can also be extended on collaboration with regard to beefing up monitoring measures, particularly against severe extraction of resources.
- **Provision of support to initiatives that aim to provide incentives for resource users to sustainably utilize coastal and marine resources**. Regional organizations (such as APEC) can explore the feasibility of partnering with different stakeholders and providing capacity-building services in provision of incentive schemes to fisherfolks and other direct resource users on a larger scale. Given the increasing prominence of marine tourism industry, the need to come up with enforceable standards agreed upon by different tourism establishments (such as hotels) that aim to promote a more sustainable utilization of the resources. This can include for instance setting a limit on the number of scuba diving activities allowed in an area for a day (as in the case of Apo Island in Negros Oriental in the 1990s) due to concerns on the potential impact of unregulated scuba diving activities on the coral reef environment (Alcala 2001).

To see the figures and tables in color, please see the online version at http://dfa.gov.ph/index.php/apec-2015-policy-studies

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