

# 1. PHILIPPINES COASTAL & MARINE RESOURCES: AN INTRODUCTION

**THOUSANDS OF ISLANDS.** With its thousands of islands, the Philippines has one of the longest coastlines in the world—estimated at 36,289 kilometers. The coastline extends 2,000 kilometers from north to south, with 25 major cities lying on the coast. It is estimated that more than 60 percent of the nation's total population of 87.8 million (July 2005 estimate) lives in the coastal zone. Table 1.1 provides basic data about the Philippines' coastal geography and population.

**Table 1.1 Philippine Coastal Data.**

Number of islands	7,100
Total land area	300,000 km <sup>2</sup>
Coastline	36,289 km
Territorial Sea (up to 12 nautical miles)	679,800 km <sup>2</sup>
Territorial waters, incl. EEZ	2.2 million km <sup>2</sup>
Coastal waters	226,000 km <sup>2</sup>
Oceanic waters	1.93 million km <sup>2</sup>
Coastal provinces	64 (out of 79)
Coastal municipalities	822 (out of 1,502)
Total coastal population	64.7 million (2000)
Population density in coastal areas, year 1990	227 persons per km <sup>2</sup>
Population density in coastal areas, year 2000	286 persons per km <sup>2</sup>
No. of inhabitants per kilometer of coastline	2,467 persons (2000)

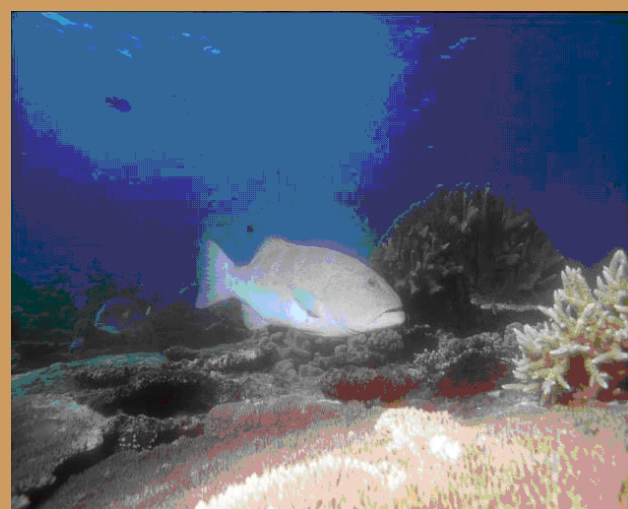
Source: <http://www.census.gov.ph>.

The country depends heavily on its rich coastal and marine resources for the many economic, employment, and biodiversity values and services they provide.

**An abundance of species.** Philippine waters contain some of the world's richest ecosystems, characterized by extensive coral reefs, sea-grass beds, and dense mangrove forests. Blessed with a sunny tropical climate, waters enriched with nutrients from the land, and driven by the wind, the country supports an exceptionally high

diversity of marine life. Factors that contribute to this exceptional range of biodiversity include:

- A warm climate and stable water temperatures (rarely below 18° Celcius);
- Abundant sunlight to fuel the photo-synthesis process that supports the growth of algae, coral, and other organisms;
- Relatively low sediment loads, allowing light to pass deep into the water;
- Generally low freshwater inputs that maintain a salinity level between 30 and 36 parts per thousand;
- Currents, clean water, and hard substrates that provide optimal conditions for corals and other aquatic life to thrive (White 2001).



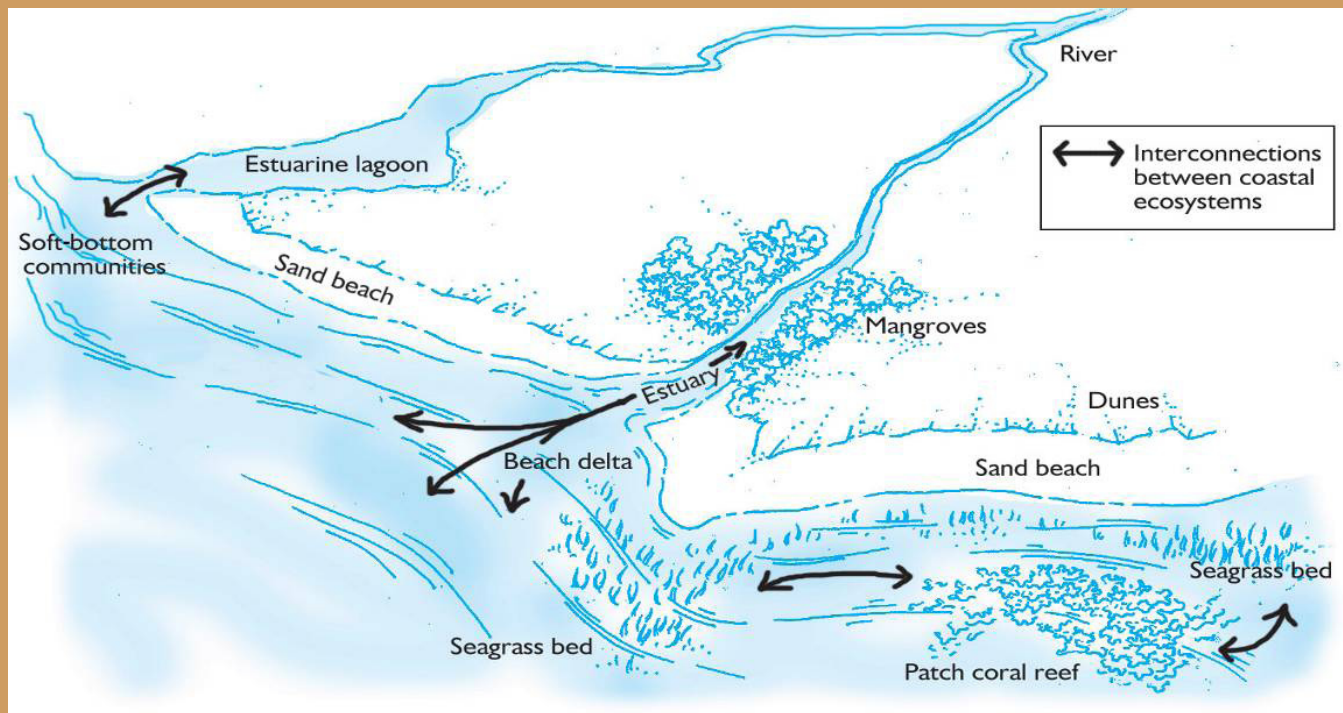
Coral trout is often used as an indicator to monitor the condition of coral reefs.

Photo: Ingvar Bundgaard Jensen.

**Importance of coastal ecosystems.** The coastal zone is the interface where the land meets the ocean. The Philippines' diverse coastal zone consists of a variety of tropical ecosystems, including sandy beaches, rocky headlands, sand dunes, coral reefs, mangroves, sea-grass beds, wetlands, estuaries, and lagoons (Table 1.2). The various ecosystems are interconnected, making it virtually impossible to alter one feature of the coastal zone without affecting another, either directly or indirectly (Figure 1.1).



**Figure 1.1 Important Coastal Ecosystems and Habitats.**



Source: Maragos et al. 1983.

**Table 1.2 Key Coastal Habitats.**

Beaches	An area of unstable unconsolidated sediments like sand or gravel deposited along the shoreline. Beaches are subject to erosion (removal of material) and accretion (deposition of material) produced by waves, wind, and tidal currents.
Coral	Simple marine animals that live symbiotically with algae. In the symbiotic relationship, the algae provide the coral with nutrients, while the coral provide the algae with a structure to live in. Coral animals secrete calcium carbonate to produce a hard external skeleton.
Coral reef	Wave and current resistant calcareous structures formed in situ from the skeletons of corals and other organisms. They constitute the largest biogenic structures on the planet and support assemblages of living corals and many other organisms, including fish, mollusks, marine worms, crustaceans, algae, and sponges.
Estuaries	A semi-enclosed coastal area at the mouth of a river where nutrient-rich fresh water meets with salty ocean water.
Foreshore	The intertidal part of a beach or the part of the shorefront lying between the beach head (or upper limit of wave wash at high tide) and the mean low water mark. The foreshore is legally defined as 40 meters inland from the mean high tide.
Lagoons	A body of seawater that is almost completely cut off from the ocean by a barrier beach or the body of seawater that is enclosed by an atoll.
Mangroves	Tree wetlands located on the coastlines in warm tropical climates.
Sea-grass beds	Areas of salt-tolerant plants that occur in shallow near-shore waters, estuaries, lagoons, and adjacent to coral reefs. They hold sediment in place, support a rich detrital community, and provide food and habitat for many important near-shore species.

Source: Castro and Huber 1997.



*Resources of significant value.* Coastal ecosystems are valuable in terms of the goods and services they provide (direct use values); the ecological functions, which indirectly support economic activity (indirect use values); and the options for direct or indirect use of these ecosystems in the future (option use values). Coastal ecosystems also have non-use values; for example, individuals derive satisfaction from the aesthetic value of ecosystems and the knowledge that they will continue to exist for future generations (existence and bequest values).

The coastal areas of the Philippines provide a continuous supply of goods—fish, oil, gas, minerals, salt, and construction materials—and services such as shoreline protection, sustaining biodiversity, maintaining water quality, transportation, and recreation.

The direct benefits from mangroves have been estimated to be more than \$600 per hectare per year in fish production and potential sustainable wood harvest. The annual direct benefits in the Philippines from mangroves are therefore at least \$83 million per year (White and Cruz-Trinidad 1998).

It has been estimated that coral reefs alone contribute at least \$1.064 billion annually to the economy (see Table 1.3).

Locally, 1 square kilometer of healthy coral reef with some tourism potential produces net revenues ranging from \$29,000 to \$113,000 (White and Trinidad 1998; White et. al. 2000). These revenue potentials are realistic, since a large proportion of visitors to the Philippines spend time on a beach or swim or dive in a coral reef environment.

Tourism is a major source of income and employment for the Philippines. Coastal and

marine attractions are the most important tourism destinations. Tourism generates revenue through a number of different sources such as recreational user fees, lodging, transportation, food, and souvenirs. Tourism also leads to higher employment rates and increased incomes for businesses related to the tourism sector.

**Table 1.3 Annual Economic Net Benefits from Philippine Coral Reefs.**

Resource Use (Direct and Indirect)	Value (\$ Million)
Sustainable fisheries	620
Coastal protection (erosion prevention)	326
Tourism and recreation	108
Aesthetic/biodiversity value (willingness to pay)	10
Total net annual benefits	1,064
Net present value	9,063

Sources: Burke et al. 2002; White and Cruz-Trinidad 1998.



*A growing tourism industry catering to scuba divers is providing much needed revenue to local communities.*

*Photo: Ingvar Bundgaard Jensen.*

In 2004, 2.3 million tourists generated \$1.9 billion in tourist receipts (Department of Tourism 2004). This is a 20 percent increase over the volume of arrivals recorded in 2003. Visitor receipts in 2004 also gained a double-digit growth at 30.7 percent.



*Tourists receive a welcome drink upon arrival to a community-based ecotourism destination.*

*Photo: Coastal Resource Management Project.*

An estimated 6.2 million people were employed in tourism-related businesses in 1998.

The Philippines is among the largest fish producers in the world. The commercial, municipal and aquaculture fisheries account for 36, 30 and 24 percent of the total annual fisheries yield, respectively. Its annual total fisheries yield is estimated to be worth around \$70 to 110 billion PhP, equivalent to about 2 to 4 percent of its gross domestic product over the years (Barut et al. 1997 and Table 2.1). Municipal

fisheries (excluding reef fish) were estimated to yield production values of \$741 million in 2003. The industry employs also more than 1 million people (5 percent of the national labor force), with 68 percent employed in the municipal sector and 28 percent in the commercial and aquaculture sectors (ADB 2003).

The Philippines also accounts for 43 percent of the marine aquarium fish and 36 percent of the invertebrates traded globally (Global Marine Aquarium Database 2003). Box 1.1 describes the marine aquarium fishery and trade in the Philippines.

Finally, the hunting and collection of eggs from marine turtles are also important sources of income for many coastal communities. But marine turtles may have an even higher monetary value when kept alive (Box 1.2).

**Other ecosystem services.** Other values from marine and coastal resources in the Philippines include the huge potential source of wave energy from the ocean (Box 1.3) and the environmental waste disposal services that marine waters offer (Box 1.4).

### Box 1.1 Marine Aquarium Fishery and Trade.

The collection and trade of marine ornamentals is present in about 100 of the approximately 800 coastal municipalities in the Philippines, and in 38 (out of 80) of its provinces. With a total value of \$7.3 million (2004), the trade supports the livelihoods of 4,000 to 7,000 households of part time and full time collectors and local traders of marine ornamentals. There are approximately 70 exporters of marine ornamentals, mostly based in Manila with some located in Cebu.

While the marine aquarium industry provides livelihoods to a significant number of households, the prevalent use of destructive collection methods—such as using cyanide and breaking of corals—and overfishing, caused by high mortality and poor husbandry, contribute to the deterioration of the Philippine coastal ecosystems. The Marine Aquarium Council addresses these problems by setting standards for best practices in the trade and assessing compliance to these standards through a third party certification system.

*Source: The Marine Aquarium Council, [www.aquariumcouncil.org](http://www.aquariumcouncil.org).*



### Box 1.2 Marine Turtles: Worth More Alive Than Dead.

The monetary value of marine turtles is remarkable. Trade in marine turtle products for consumption is estimated to be worth millions of dollars annually. But marine turtles may be even more worth when kept alive, according to a new international study. The study analyzed the consumptive use of marine turtles—including use for meat, shell, eggs, bone, and leather—at nine case study sites and found that the gross revenue from this use of marine turtles reached an average of \$582,000 per study site per year. The direct beneficiaries from consumptive use vary from a handful to several hundred, including the fishermen and egg collectors in communities close to marine turtle feeding areas and nesting beaches. Other beneficiaries are traders and other intermediaries.



*Green sea turtle.*

*Photo: Author.*

The study also took a close look at the non-consumptive use of marine turtles and found that the average gross revenue for nine case studies where non-consumptive use, such as tourism, was a major revenue generator was almost \$1.7 million per year. The average gross revenue for four sites where marine turtles are one of many attractions was \$40,791 per year.

The overall conclusion of the study was that the non-consumptive use of marine turtles generates more revenue, has greater economic multiplying effects and more potential for economic growth, creates more support for management, and generates proportionally more jobs and social development and employment opportunities for women than consumptive use.

*Source: Treong and Drews, WWF 2004.*

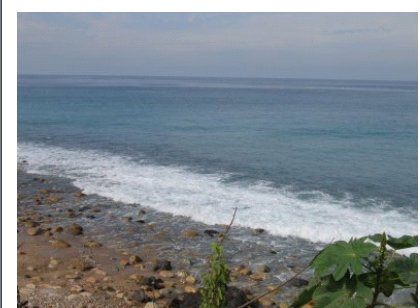
### Box 1.3 Renewable Energy from the Sea.

The oceans are considered one of the best potential sources of renewable energy. Although current technologies for these ocean energy systems are not yet economically competitive with conventional energy systems, it is important to note that Philippine waters provide excellent conditions for ocean thermal energy conversion (OTEC) systems in sites accessible to populated regions such as Manila and Davao.

With new developments in wave energy conversion systems, the Philippines' moderate wave energy resources (an average of 33 kilowatt per meter per year at the Pacific side and 35 kilowatt per meter per year at the South China Sea) will be more than sufficient to provide power to small islands. The strong and continuous currents in the Surigao and San Bernardino Straits are also potential sites for sea current systems.

Energy from the sea is a sustainable resource that will help reduce the dependence upon fossil fuels. It also produces no liquid or solid pollution and has little visual impact.

*Source: Hervella 1993.*



*Renewable energy from the sea.*

*Photo: Author.*

### Box 1.4 Environmental Waste Disposal Services.

The marine environment has a huge capacity to absorb wastes from human activities. While there is a limit on how much marine waters can absorb before they become so polluted that habitats, fish stocks, and other resources suffer, an estimate of the value of this service does indicate its importance.

In 1995, for example, the total value of environmental waste disposal services in the Philippines was an estimated \$428 million, according to the Environmental and Natural Resources Accounting Project (ENRAP).

The project performed these kinds of estimates for both air and water (surface and marine) and based its findings on the amount polluters are willing to pay for the privilege of discharging wastes into the environment, or alternatively, on the prospective cost of reducing pollution to a non-damaging level.

The valuation exercise took into account water pollution from industrial processes, domestic effluents (mainly from households), and surface runoff (agriculture, forestry, and urban sources). Pollutants considered included biochemical oxygen demand (BOD), suspended solids, total dissolved solids, oil, nitrates, and phosphates.

Sources: Orbeta 1994; Morales et al. 1996.



*Clean and pristine coastal waters create opportunities for ecotourism and increased fish catch.*

Source: Authors.