Chapter 2
PHYSICAL and OCEANOGRAPHIC FEATURES

The physical and oceanographic characteristics of Olango Island are important features of the island's natural resources and provide insights on possible strategies and interventions to be taken in the proper management of such resources. A brief description of the physical and oceanographic environment of Olango Island is given below.

LAND AREA

The total land area of Olango Island and its satellite islets is approximately 1,030 ha and the land area of each *barangay* is presented in Table 2.1. The reef flat-lagoon surrounding the island of Olango is considered one of the most extensive reef areas in the Central Visayas. A total of 4,482 ha of extensive sandy beach, rocky shoreline, inshore flats, seagrass beds, coral reefs, mangrove forest, mudflats, and salt marsh grass surround Olango and its satellite islets.

TOPOGRAPHY

The Olango group of islands is composed of the main island of Olango and 6 satellite islets (Sulpa, Gilutongan, Nalusuan, Caohagan, Pangan-an, and Camungi) which are bounded by continuous fringing reefs (steep reef wall on the west and sloping reef at the east coast of Olango) and reef flats. The islands are low-lying with elevation reaching no more than 10 m above sea level. At the center of these islands is a vast tidal flat, which includes the 920-ha area of the OIWS.

Table 2.1. Land area of the *barangays* on Olango Island and its satellite islets (MIIMPS 1995; NSO 1995).

Barangay	Land area (ha)
Baring	91.4
Caohagan Island	4.5
Caw-oy	42.3
Gilutongan (including Nalusuan Island)	15.3
Pangan-an Island	46.1
Sabang	195.3
Santa Rosa	215.8
San Vicente	69.5
Talima	168.3
Tingo	96.3
Tungasan	86.2
TOTAL	**1,031**

GEOLOGY

Olango Island and its satellite islets are raised coral reefs. The lithology of the island consists of 2 unit types: the Plio-Pleistocene Carcar Formation and the Quartenary Alluvium (the youngest lithologic unit). Carcar formation is typically a porous coralline limestone characterized by small sinkholes, pitted grooves, and branching pinnacles (Hillmer and Scholz 1986; Scholz 1986). This suggests *in situ* deposition. Its dominant composition are shell, algae, and other carbonate materials, while macro and micro fossils are found abundant in its formation. Alluvium, on the other hand, is mostly found in the coastal areas. Calcareous sand derived from the weathering of limestone mostly makes up the tidal flat. This appears as fine to coarse-grained sand mixed with shell fragments.

Earthquakes

Mactan Island is located within the Visayan Sea Basin in an area outside the Philippine Fault, the Mindanao Fault Zone, the Sulu Trench, and the Negros Trench. This area is relatively free from earthquake danger. Distribution of shallow-focus earthquakes, or intermediate and deep-focus earthquakes is minimal. Mactan is classified as an area with minimum cut-off intensity III, meaning that earthquake magnitude does not exceed 5.06 within a 50-year period.

Volcanoes

Mactan is located away from the Negros Volcanic Belt of active volcanoes.

Tsunamis

Mactan is located at a tsunami prone area; however, anticipated wave height at the coast will be less than 5 m.

SOIL

The soil of Olango Island is composed of porous and cavernous Carcar limestone, generally with very thin, reddish soil type similar to Bolinao clay (Olofson *et al*. 1989). The nearby Gilutongan Island is primarily covered by a combination of limestone, coral rubble, and sand while Pangan-an Island is dominated by sand and limestone overlaid with silt. The general substrate of these extensive intertidal flats surrounding Olango Island is of limestone, limestone with sand, silt, or sand-silt combination. Limestone is generally favorable for the growth of *Sargassum* and most algae, while sand and silt are suitable for seagrasses (SUML 1997).

HYDROLOGY

Olango Island and its satellite islets are low in elevation and nearly flat. They have no freshwater streams or springs. All rainwater drains through the porous limestone into the freshwater lens thus erosion is not a problem. However, due to their geographic location, they are threatened by possible intrusion of seawater into the lens and by the percolation of freshwater out of the lens.

A survey of wells on Olango Island conducted by the University of San Carlos-Water Resources Center (USC-WRC) (Alburo and Olofson 1988a) in 1988 revealed that there were 356 wells in the main island of Olango. Of these wells, 8.7 percent (31) are freshwater, 54 percent (54) are brackish, and 76.4 percent (271) are salty wells (Walag *et al*. 1985). During this survey, isobars of conductivity showed 2 freshwater lenses located in Barangays Talima and San Vicente (Figure 2.1).

The freshwater cells are traditionally tapped by unsanitary open wells and restricted to the center of Olango Island. Water from these public wells is not enough to support the daily requirements of the islanders thus, many settle for brackish water for drinking. Those who can afford to buy freshwater from vendors do, while those who cannot, walk to the source and carry water home. Those who are living in distant *barangays* and *sitios* where daily water procurement is a burden resort to rainwater collecting and storage.

CLIMATE

Olango Island has a tropical climate, which is typical to the Central Visayas region of the Philippines. Climate data from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) - Mactan Weather Monitoring Station located at the Mactan-Cebu International Airport indicate that the area is relatively hot and humid, with a mean daily temperature range of 23° to 30° C (Figure 2.2). Daily mean relative humidity ranges from 60 to 94 percent. The annual rainfall averages about 1,579 mm at Mactan-Cebu International Airport and 1,440 mm in Barangay Maribago, which is located along the eastern coastline of Mactan Island (Table 2.2).

Based on climatic charts of the Philippines and Olango Island's geographic location, the climate of Olango Island can be classified as Type 3, which is characterized by not

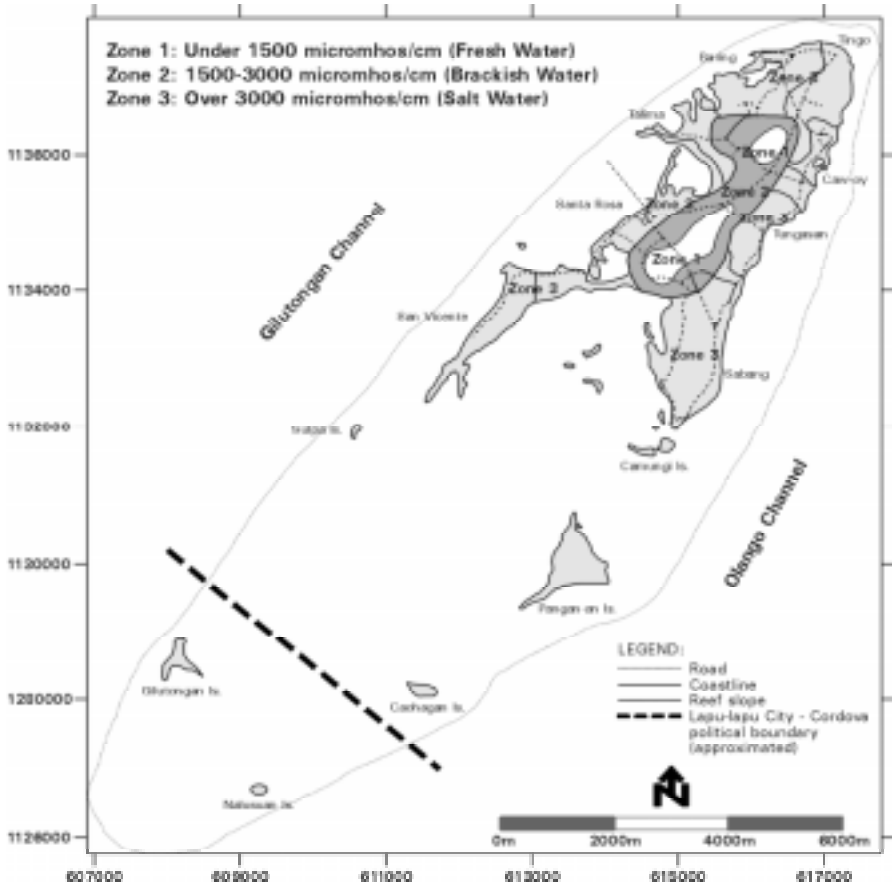

Figure 2.1. Isobars of conductivity (in micromhos/cm) based on well surveys of Olango Island by Walag *et al*. (1985).

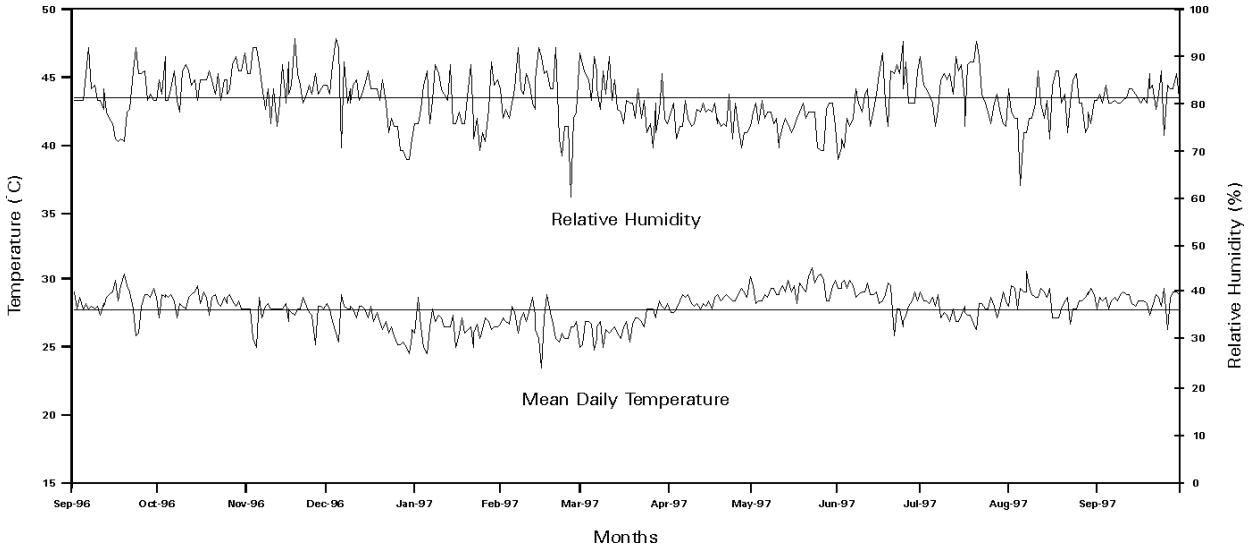

Figure 2.2. Mean daily temperature and relative humidity of Mactan Island (PAGASA 1997).

Table 2.2. The mean annual rainfall of Mactan Island (PAGASA 1997).

Year	Mactan-Cebu International Airport Station (in mm)	Maribago Station (in mm)
1990	1,839.7	1,530
1991	1,459.5	1,267
1992	1,078.2	1,043.8
1993	1,647.6	1,590.9
1994	1,787.1	1,767.8
1997	1,662.0	No data
Average	**1,579.0**	**1,440.0**

having a very pronounced maximum rain period and only a short dry season. The dry season typically occurs from February to May and the rainy season from June to January. Predominant winds include the northeast monsoon (*amihan*) which typically occurs between November and March and the southwest monsoon (*habagat*) which is common between June and August. These 2 monsoon periods can be characterized by stronger winds and rougher sea conditions. Although the Philippine archipelago lies within the typhoon belt, Olango Island is relatively sheltered from typhoons due to the presence of the neighboring landmasses of Bohol and Mactan Island. On the average, about 1 typhoon a year passes through the Central Visayas region.

LAND CLASSIFICATION AND LAND USES

A proposed land use map of Olango Island and its satellite islets was produced in 1995 by the Mactan Island Integrated Master Plan Study (MIIMPS) (Figure 2.3). Portions of OIWS were formerly classified for fishpond development. Sizeable foreshore areas are classified as forestlands due to varying degrees of mangrove vegetation.

Based on land use, Olango Island is divided into 5 major zones namely (MIIMPS 1995: Figure 2.4):

- Urban/commercial area (Barangay Santa Rosa proper)
- High level residential (Barangay Santa Rosa and Baring)
  Land utilization (as measured by population density) will be increased to twice the present land use. There are 2 areas eyed for this (presently site of settlements): one is parabolic in shape embracing the commercial district at the middle of Olango; the other is on the northwest tip going inward
- Low level residential (Barangay Talima and San Vicente)
  This is situated between the 2 proposed high-level residential zones and is proposed for lower density residential use
- Tourism area (Barangays Tingo, Tungasan, and Caw-oy)
  The area is located along the eastern coastal zone of Olango Island, facing the Bohol Strait. Ecological preservation is the prime consideration of tourism. Tourism here is anchored on the OIWS and other environmentally protected islets. Tourism is limited to day time visitors who stay at Mactan and visit Olango in the day time.

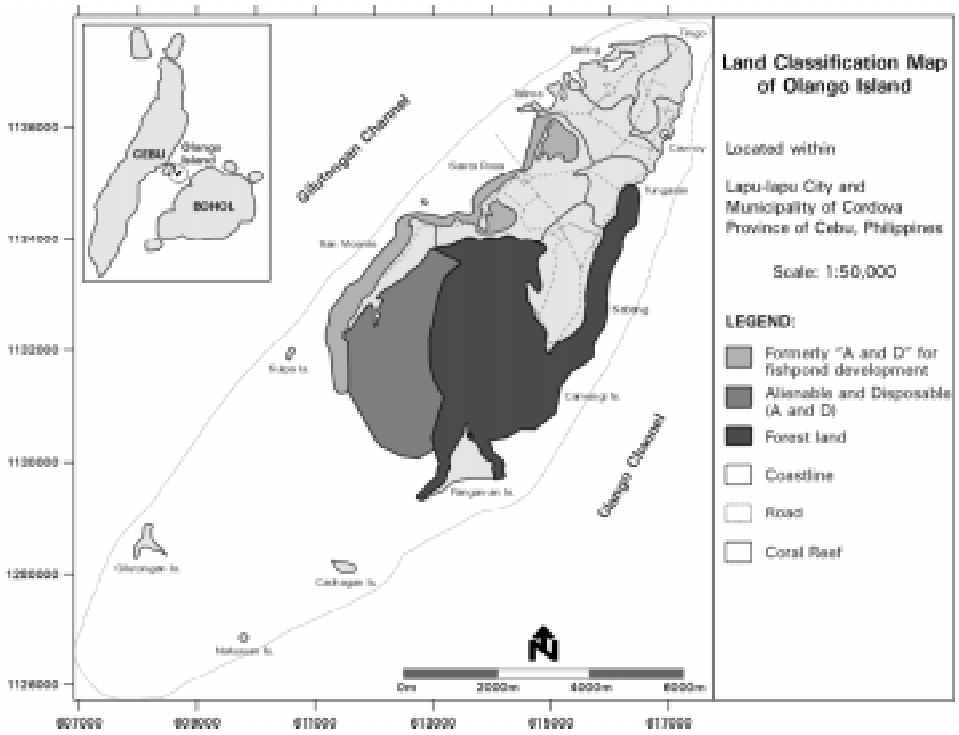

Figure 2.3. Land classification map of Olango Island and its satellite islets (PMD-PAWD-DENR with slight modifications).

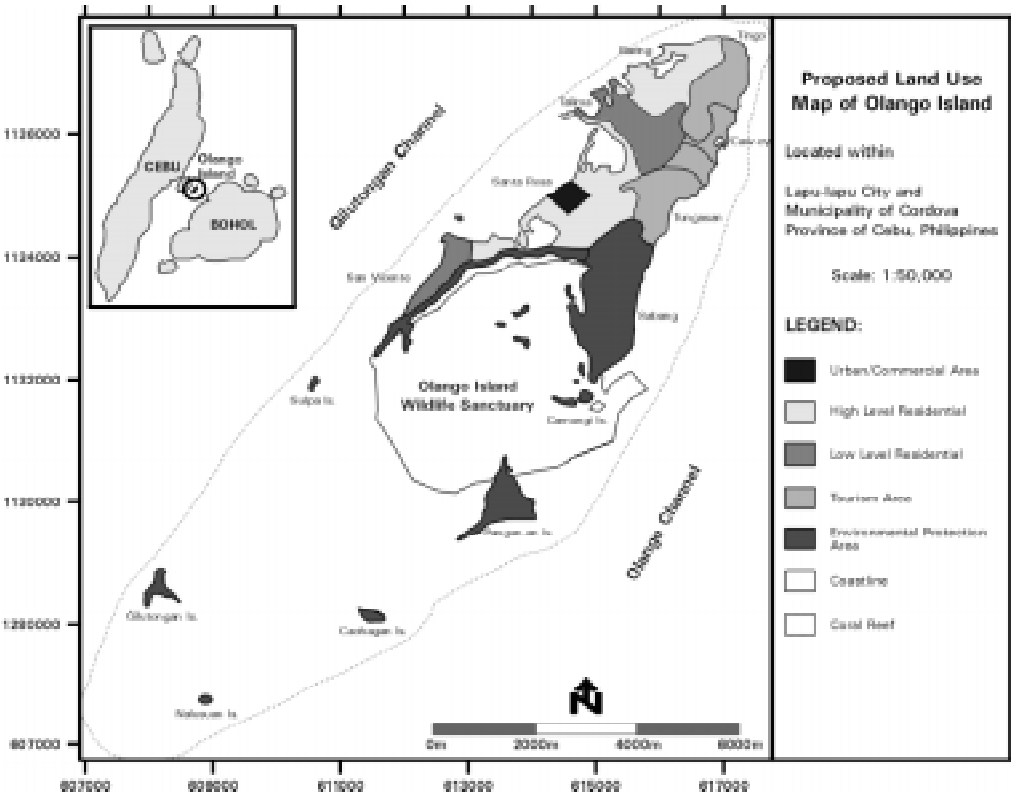

Figure 2.4. Proposed land use map of Olango Island and its satellite islets (MIIMPS and PMD-PAWD-DENR with slight modifications).

- Environmental protection zone (Barangays Sabang, partly of San Vicente, Pangan-an Island, Caohagan Island, Nalusuan Island, Gilutongan Island, and Sulpa Island). The OIWS will be enhanced by extending protection area to include all other adjacent islets to keep their natural character.

Olango's terrestrial areas are classified as "cropland mixed with coconut plantation". Part of the present OIWS was subject to mangrove contract reforestation to rehabilitate denuded mangrove areas. Recent visits to Olango Island showed that several areas had also been developed into small-scale beach resorts.

CURRENTS

Drogue measurements show that the current regime surrounding Olango Island could be considered moderate ranging from 0.19 to 0.36 m/sec during flood tide and 0.09 to 0.23 m/sec at ebb tide. The current directions in both the Olango Channel and Gilutongan Channel are reversing, with directions towards the north at flood tide and southwest during ebb tide (SUML 1997). Additional drogue measurements taken during flooding tides recorded a residual current speed of 0.10 m/sec. The flow is in the east-northeast direction or 65° for currents west of the Olango mainland. The current speed was 0.37 m/sec flowing in the east-northeast direction or 58° for currents east of Pangan-an and Caohagan Islands (Figure 2.5). At ebb tides, waters within the extensive reef flat are flowing towards the southwest direction or 214° with a residual speed of 0.13 m/sec (Figure 2.6).

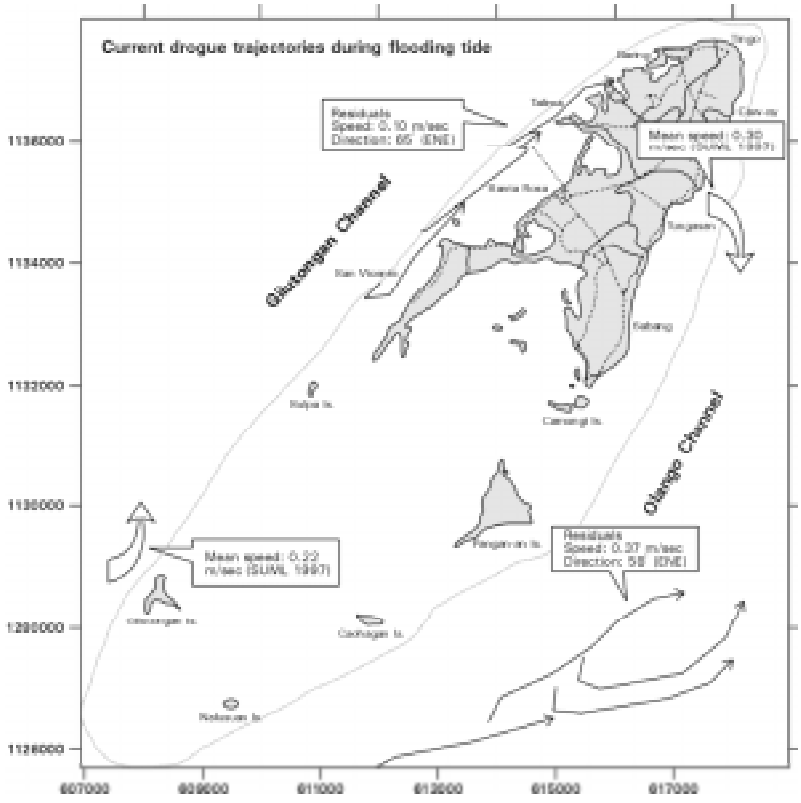

Figure 2.5. Current drogue trajectories during flooding tide in Olango Island.

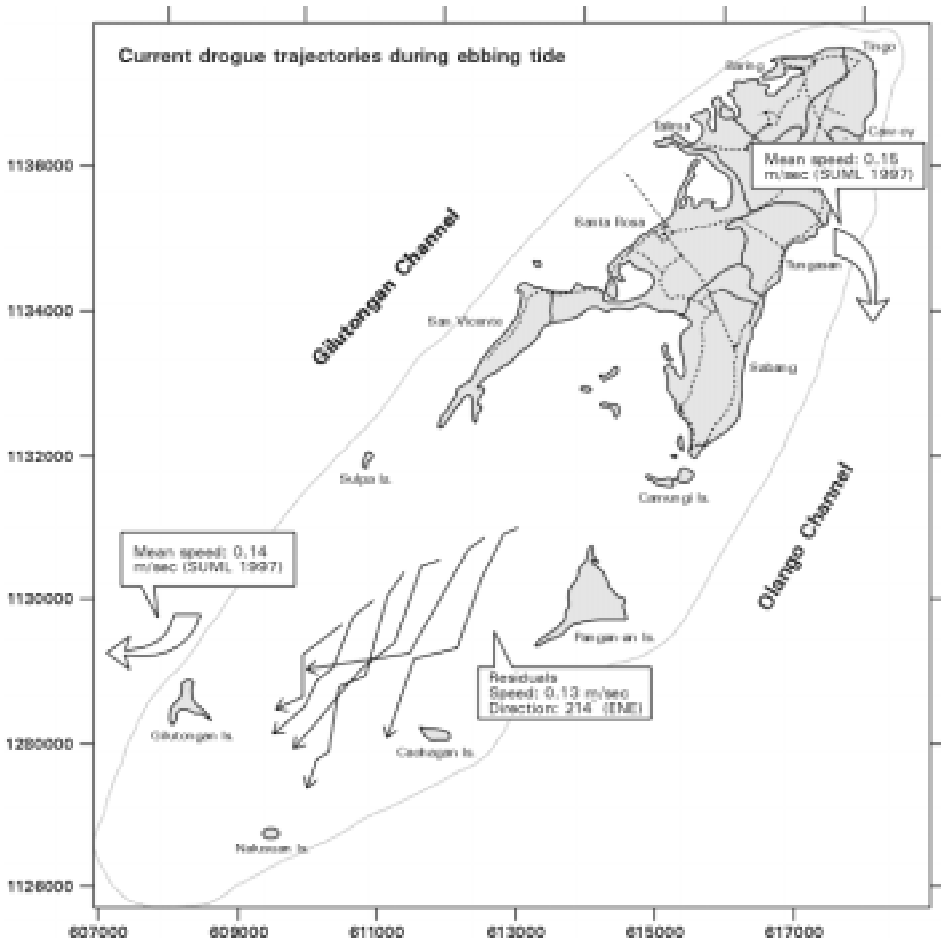

Figure 2.6. Current drogue trajectories during ebbing tide in Olango Island.

SUMMARY

Olango's natural physical characteristics limit the quality and quantity of the resources available in the island. These limitations have implications to the island's present development and to the kind of CRM interventions. For example, like any small island in the Philippines, drinking water is a scarce resource in Olango. As a result, islanders currently use brackish or salty water for their daily use. Also, since most of the total land area is unsuitable for agricultural production as it consists of exposed limestone, Olango residents will continue to rely on Cebu and Mactan for their basic agricultural needs.

On the other hand, Olango's coastal resources, which include extensive seagrass meadows and fringing coral reefs, are crucial in sustaining the food and economic security of the island's population. Currently, however, these marine resources are in a state of serious degradation. Another important asset of the island, which can be a major source of revenue, is land. In Olango, however, there is a need to review the present land classification and use so that the islanders can harness the full potential of such resource.