



Coastal Environmental Profile of
Olango Island, Cebu
Philippines

Filipina B. Sotto
Joey Li. Gatus
Michael A. Ross
Ma. Fe L. Portigo
Francis M. Freire



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Coastal Resource Management Project
of the
Department of Environment and Natural Resources
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Front cover: *Aerial view of Barangay Santa Rosa wharf*. Inset: *Women's group busy tying coral fragments for rehabilitation*.

Back cover: *PCRA participants in Olango Island; "Pokot" or nets for pelagic fishing; Gilutongan Marine Sanctuary*

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ACRONYMS and ABBREVIATIONS

BFAR	Bureau of Fisheries and Aquatic Resources
CPUE	catch per unit effort
CRM	coastal resource management
CRMP	Coastal Resource Management Project
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
IMA	International Marinelife Alliance
LGU	local government unit
MIIMPS	Mactan Island Integrated Master Plan Study
NIPAS	National Integrated Protected Areas System
NGO	nongovernment organization
NSO	National Statistics Office
OBST	Olango Bird and Seascape Tour
OIWS	Olango Island Wildlife Sanctuary
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAMB	Protected Area Management Board
PAWB	Protected Areas and Wildlife Bureau
PAWD	Protected Areas and Wildlife Division
PCRA	Participatory Coastal Resource Assessment
PD	Presidential Decree
PEGAMASU	<i>Pederasyon sa Gagmay'ng Mangingisda sa Sugbu</i>
PhP	Philippine pesos
RA	Republic Act
SB	<i>Sangguniang Bayan</i> (Municipal Council)
SCUBA	Self Contained Underwater Breathing Apparatus
SK	<i>Sangguniang Kabataan</i> (Youth Council)
SUML	Silliman University Marine Laboratory
UPMSI	University of the Philippines – Marine Science Institute
USAID	United States Agency for International Development
USC-MBS	University of San Carlos-Marine Biology Section
USC-WRC	University of San Carlos-Water Resources Center

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FOREWORD

The Philippines is endowed with a wealth of coastal resources along its 18,000 km of shoreline. Olango Island and its adjoining islands under the political jurisdiction of Lapu-Lapu City and Cordova Municipality, are no exception and contain extensive coral reefs, mangroves, wetlands, and clean marine waters. The coral reefs that surround Olango, that are responsible for its physical presence, support sizeable fisheries that provide food and income to the people on the island. In addition, the reefs and wetlands hold tremendous potential for tourism when managed properly.

Studies have documented the economic value of the coral reefs and wetlands of Olango Island. The 40 km² of coral reef alone can potentially generate between US\$1.53 and 2.54 million annually from well-managed fisheries and tourism. Wetlands can generate another US\$0.4 million from sustainable use and tourism to the Olango Island Bird Sanctuary.

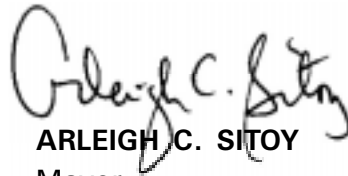
These amounts are not now being realized because of poor management and because the coastal resource base is being degraded through a variety of human caused impacts. Fisheries are depleted from excessive fishing effort and use of destructive methods. Shoreline habitats are either being damaged or converted to alternative uses that no longer support viable fisheries and tourism. All these problems emphasize the need for integrated coastal management.

The first step toward an improved planning and management regime for coastal resources is to develop an information base that guides planning. This *Coastal Environmental Profile of Olango Island, Cebu, Philippines* is an important first step in the management process. It can help guide the long-term solutions to the problems of resource degradation and provide baseline data for measuring changes in the environment and the status of people over time. It can also be used to measure the effectiveness of coastal management projects of the local governments and others.

We, as Mayors with jurisdiction over the Olango Island area, fully endorse this environmental profile as an important step to improve the management of the area. We are committed to the needed coastal resource stewardship that will provide immediate and long-term benefits to people within our city and municipality and to all Filipinos.



ERNEST H. WEIGEL, JR.
Mayor
Lapu-Lapu City



ARLEIGH C. SITOY
Mayor
Cordova Municipality

FOREWORD

The Philippines, comprised of many islands, has one of the world's longest coastlines. As such, coastal resource management, especially the interaction between humans and the coastal environment, should become an integral part of any meaningful development plan. The compilation of this coastal environmental profile thus becomes essential for developing a rational coastal resource management plan.

This book is about Olango Island and its various characteristics—physical, biological, socioeconomic, sociopolitical, environmental, and others. Though focused only on one island, the variables and methodology applied in coming up with a coastal environmental profile can be replicated in other coastal municipalities in the province of Cebu as well as in other parts of our country. It is envisioned that a well-documented coastal environmental profile can help policy-makers design appropriate coastal resource management strategies in their particular locality.

Our task now, using this coastal environmental profile, is to develop and implement coastal resource management strategies for Olango Island. We must pursue strategies that are participatory and which encourage island dwellers and others to be good stewards of their coastal environment.

FR. FRANCISCO T. ESTEPA, SVD
President, University of San Carlos

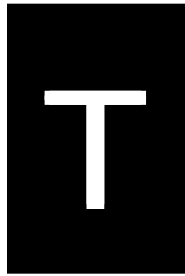
COMMONLY USED LOCAL TERMS

<i>albulario</i>	traditional healer/native doctor
<i>arais</i>	boat captain
<i>balat</i>	sea cucumber
<i>Bantay dagat</i>	fish warden
<i>Bantay dawat</i>	recipient of bribes
<i>banyeras</i>	tin basin for fish
<i>baroto</i>	small outriggered paddle boat
<i>bibiron</i>	baby's feeding bottle
<i>bobo</i>	large fish trap
<i>daug</i>	win
<i>dayo</i>	to travel/journey
<i>guso</i>	commercially farmed red alga, including <i>Eucheuma spinosum</i> or <i>Kappaphycus alvarezii</i>
<i>habagat</i>	southwest monsoon
<i>ice-ice</i>	disease in the red alga <i>Eucheuma</i> or <i>Kappaphycus</i> characterized by a whitening of the thallus or branch
<i>kinhason</i>	shells
<i>kugita</i>	octopus
<i>lab-asera (o)</i>	female fish dealer; with the "o" ending, refers to male fish dealer
<i>lapas</i>	abalone (<i>Haliotis</i> spp.)
<i>mamamanga-ay</i>	middlemen
<i>mobiyahe-ay</i>	traveller
<i>pakyaw</i>	chartered trip
<i>pamalo</i>	drift net 50-100 m in length with a mesh size of 30 mm in diameter
<i>pandayo</i>	literally "to go to some place", but here to go to a remote fishing ground
<i>panggal</i>	smaller fish trap, typically made of bamboo or chicken wire
<i>panglapas</i>	to collect abalone
<i>pinobreng panagat</i>	gear of the poor
<i>plaka</i>	record, record-shaped table centerpiece made of small cowry shells
<i>sapyaw</i>	scoop net
<i>sigay</i>	small cowry (<i>Cypraea</i> spp.)
<i>sudsud</i>	fishing gear made of simple triangular frame with a fine mesh net and provided with a handle for pushing
<i>tubli</i>	wild vine (<i>Derris elliptica</i>), the root extract of which is the source of rotenone and used in stunning fish
<i>tuhog</i>	strand of fish
<i>vale</i>	cash advance

Chapter 1

INTRODUCTION

OBJECTIVES OF THIS PROFILE



The compilation of this coastal environmental profile supports the formulation of a coastal resource management (CRM) plan for the island by providing the following information:

- physical, biological, and socioeconomic characteristics of Olango Island;
- status of coastal resources and identification of further information needs;
- institutional and legal framework governing the island;
- issues and constraints besetting the island as well as opportunities that the island provides;
- management strategies and interventions which may be undertaken; and
- information for communities, government personnel, educators, researchers, planners, and other individuals in the management and implementation process.

The information in this profile is based on published and unpublished studies and surveys, site visits and interviews, and data from the Participatory Coastal Resource Assessment (PCRA) conducted by the Coastal Resource Management Project (CRMP) in 1998.

THE SITE AND ITS GEOGRAPHY

The site comprises the main island of Olango and the 6 satellite islets of Pangan-an, Caohagan, Sulpa, Camungi, Gilutongan, and Nalusuan (10° 14'24" - 10° 17'36" N, 124° 01'06" - 124° 04'30" E) (SUMML 1997). These islands are clustered together about 5.5 km off the eastern coast of Mactan Island in the province of Cebu, Central Philippines (Figure

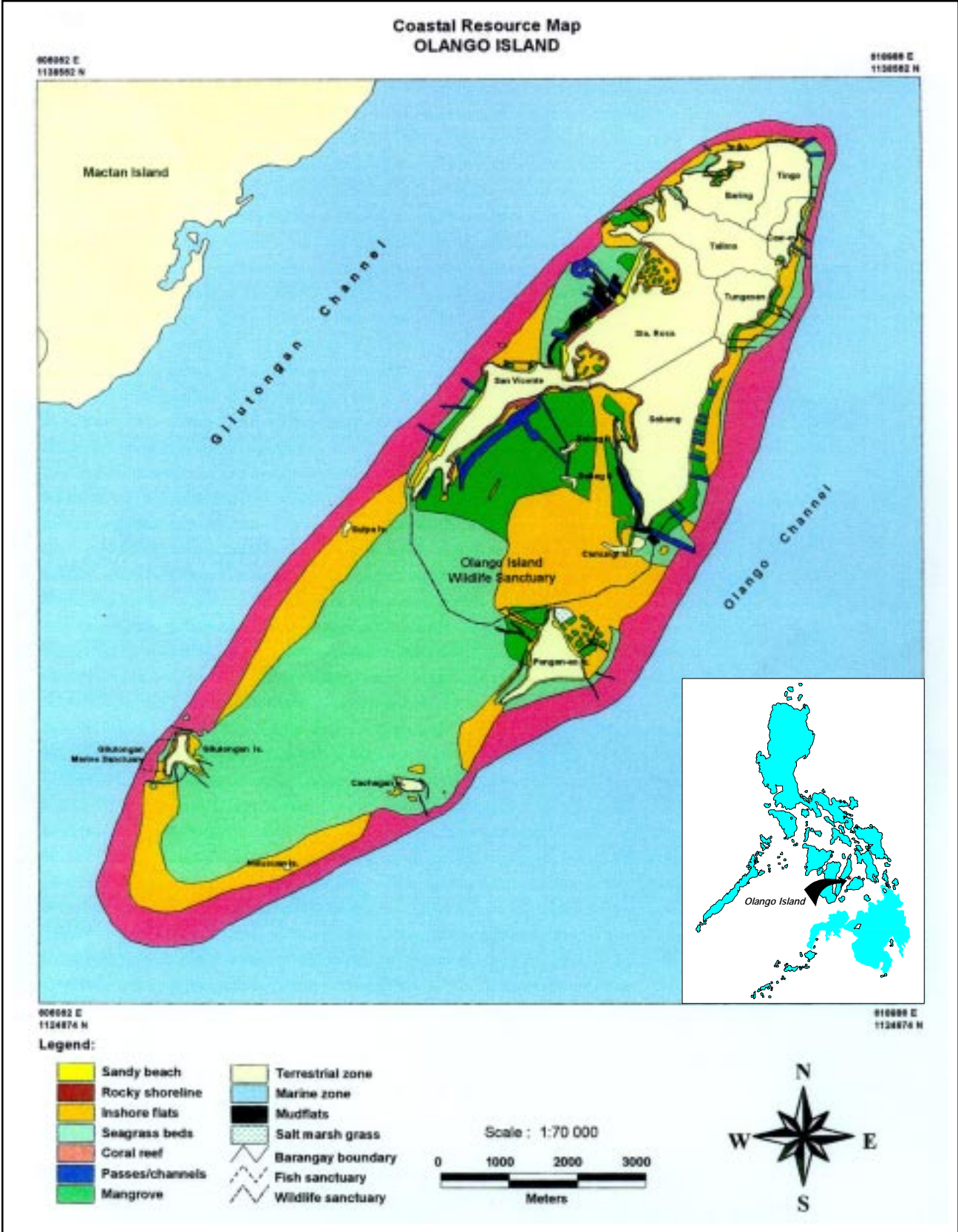


Figure 1.1. Map of Olango Island and its satellite islets.

1.1). The total land area of Olango Island and its islets is about 1,020 ha with a population of 21,027 based on the 1995 census (NSO 1995). It is surrounded by 4 bodies of water namely, Camotes Sea in the north, Cebu Strait in the south, Olango Channel in the east, and Gilutongan Channel in the west.

Olango Island can be described as an exposed limestone reef formation and it is generally flat to slightly elevated with no portion of the island reaching an elevation of more than 10 m above sea level. Due to the lack of soil in the exposed limestone (karst) formation, most of the Olango land area is considered unsuitable for agricultural production (IMA 1996). The exposed and darkened coralline limestone rock in most parts of the island severely diminishes plantable areas for both crops and trees. In the absence of dense arboreal vegetation, the ground absorbs heat, and the island tends to be unusually hot, which leads to increased evaporation.

BARANGAY PROFILES

Olango and its satellite islets are composed of 11 *barangays* (or village - the smallest government unit in the Philippines), all of which are located along the coast. The 8 *barangays* comprising the main island of Olango as well as the 2 island *barangays* of Pangan-an and Caohagan are under the jurisdiction of Lapu-Lapu City. In contrast, Gilutongan and Nalusuan Islands belong to Barangay Gilutongan which is under the jurisdiction of the Municipality of Cordova. (Note: Gilutongan is often alternatively spelled as Hilutongan.)

Lapu-Lapu City is a rapidly growing urban area, which comprises 1 of the 3 cities of the metropolitan area of Cebu City, the second largest urban area in the Philippines. Within the 6,222-ha area of Lapu-Lapu City are located the Mactan-Cebu International Airport, the extensive Mactan Export Processing Zone, as well as one of the Philippines' major coastal tourism destinations with an estimated 1,500 beach hotel and resort rooms located along the eastern coastline of Mactan Island. Lapu-Lapu City occupies more than three-fourths of Mactan Island, while the smaller Cordova Municipality occupies the southern quarter of this island, separated by a tidal creek (Flores 1997).

Profiles of each *barangay* are presented in the following maps showing habitats, resources, their uses, and the various issues and problems based on the information provided by community members during a PCRA conducted in 1998 by CRMP (Walters *et al.* 1998). The *barangay* PCRA profiles are a key step in the formulation of an integrated plan and course of actions towards the proper use of marine resources of Olango (Figure 1.2). During the conduct of the PCRA, many of the participants were surprised to know the issues and problems existing in their respective and adjacent *barangays*.

Coastal resources and their uses, sociocultural and fishing practices vary among the *barangays* yet the management issues, problems, and challenges confronting Olango islanders are basically the same. These common concerns include the:

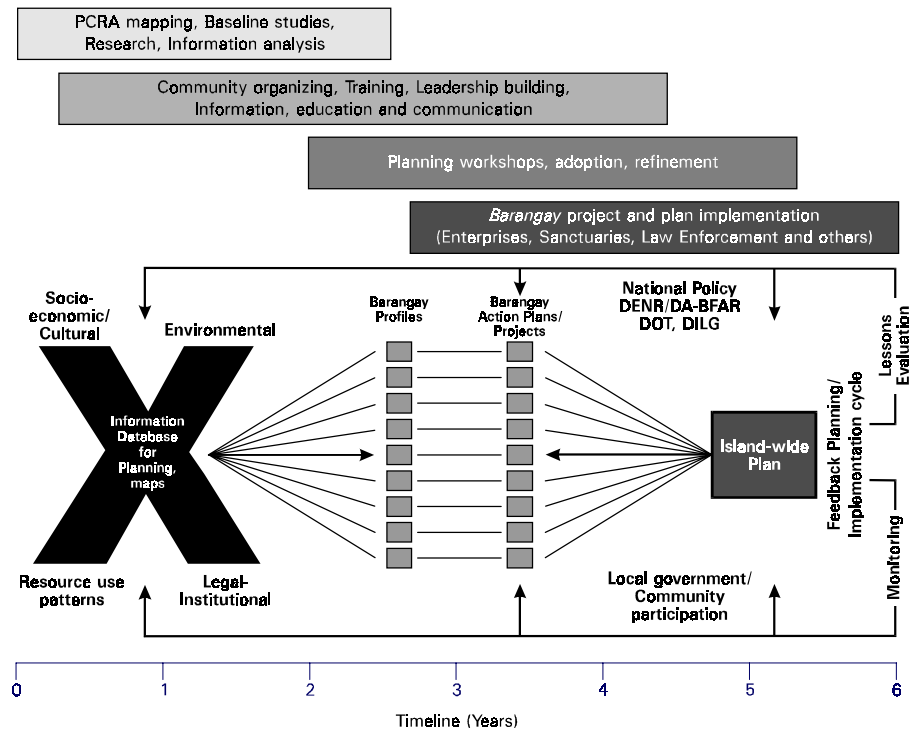


Figure 1.2. Planning process and activities for Olango Island (White *et al.* 2000b).

- scarcity of freshwater
- habitat degradation largely due to destructive fishing practices
- uncertainty of land tenureship
- lack of livelihood options
- lack of infrastructure (Table 1.1).

Santa Rosa (Figure 1.3)

Considered as the hub of Olango's business and sociocultural activities, Barangay Santa Rosa is the largest *barangay* in terms of area (Table 1.1). One major issue in Santa Rosa is the nearly 1 km long causeway. Constructed in 1991 with funding from the United States Agency for International Development (USAID), it provides improved access to Olango residents as well as visitors, which boosts the local economy. In 1995, the causeway was partially damaged by a major typhoon. Although the Lapu-Lapu City government improves and maintains the causeway, the residents are still complaining of the bumpy, sometimes muddy and risky ride that they have to experience daily. The solid causeway appears to have changed the water circulation of the surrounding coastal area to a certain degree, as indicated by accumulation of silt and waste materials along the causeway. The absence or uncertainty of land tenure is also another common issue among the residents.

Table 1.1. Summary profile of the 11 *barangays* of Olango Island and satellite islets (CRMP 1998).

Barangay	Land area (ha)	No. of families (1997)	Length of shoreline (km)	Main source of income	Existing school facilities	Health services	Source of electricity and light	Main water source	Organized community groups	Major issues identified by community members
Baring	91.4	414	3.8	"Many-day" fisher <i>dayo</i>	Elem.	Health Center	MECO 12 am - 12 pm	Talima	Catholic Women's League, Legion of Mary, <i>Bantay Dagat</i>	Land security, Boundary dispute, Weak law enforcement, Encroachment of outsiders into fishing ground, Beach erosion
Caohagan Island	4.5	50	1	Multiple hook & line	Elem.	Health Center	MECO 12 am - 12 pm	Talima	Caohagan Island Club, <i>Bantay Dagat</i>	Weak law enforcement, Weak organization, No electricity, Inadequate IEC, No potable water
Caw-oy	42.2	189	1.2	Fish trap <i>panggal</i>	Elem.	Health Center	MECO 12 am - 12 pm	Talima	Caw-oy Women's Group, Caw-oy Fisherfolks	Weak law enforcement, Garbage disposal, Gambling, No potable water, Boundary dispute
Gilutongan Island (including Nalusuan Island)	15.3	151	2.1	Seaweed culture <i>guso</i>	Elem.	None	Kerosene lantern, Generator	Cordova Marigondon	Brgy. Gilutongan Vendors Asso., <i>Gagmay'ng Mananagat sa Gilutongan</i>	No electricity, No potable water, Protection of coral reef
Pangan-an Island	46	247	4.4	Multiple hook & line	Elem. & H. S.	Health Center	Generator (now solar power)	Talima	Senior Citizen, Mother Support Group, Sea <i>Kaunlaran</i> Association	No electricity, Destructive fishing, Encroachment of outsiders into fishing ground, Land security, No potable water
Sabang	195	627	10.3	Aquarium fish collection	Elem.	Health Center	Kerosene lantern	Talima	Charismatic Group, Clean and Green, Legion of Mary	Destructive fishing, Gambling, No electricity, No potable water, Weak law enforcement
San Vicente	69.5	49	9.4	Tourist guide	None	Health Center	MECO 12 am - 12 pm	San Vicente	Catholic Women's League, Mother Support Group, San Vicente Vendors Asso., Poo Water Association	Destructive fishing, Alternative livelihood, Land security, Weak law enforcement, Inadequate IEC
Santa Rosa	216	73	7.8	Aquarium fish collection	Elem. & H. S.	Health Center	MECO 12 am - 12 pm	Talima	Catholic Women's Group, Charismatic Group, Rosanian Gals and Guys	Reclamation, Land security, Habitat destruction, Encroachment of outsiders into fishing ground, Weak law enforcement
Talima	168	54	3.8	"Many-day" fisher <i>dayo</i>	Elem.	Health Center	MECO 12 am - 12 pm	Talima	Sea <i>Kaunlaran</i> Asso., Catholic Women's Group	Alternative livelihood, Overfishing, Weak law enforcement, Boundary dispute, Habitat destruction
Tingo	96	442	1.3	"Many-day" fisher <i>dayo</i>	Elem. & H. S.	Health Center	MECO 12 am - 12 pm	Talima Comm. Well	Tingo Organization for Country Development, Calipay Youth Circle	Alternative livelihood, Weak law enforcement, Habitat destruction, Deterioration of water quality, Inadequate IEC, Water quality deterioration
Tungasan	86	260	1.4	Abalone collection <i>panlapas</i>	Elem.	Health Center	MECO 12 am - 12 pm	Talima	Catholic Women's Group, Charismatic Group	Land security, Alternative livelihood, Destructive fishing, Habitat destruction, Encroachment of outsiders into fishing ground, Inadequate IEC

Note: The main sources of information on income and major issues identified are selected PCRA participants.

MECO = Mactan Electric Company

Baring (Figure 1.4)

Barangay Baring is an alternative gateway to Olango via Sitio Buot, Mactan Island. The main livelihood of the people is *dayo* or "many-day" fishing and shellcraft industry. A major issue in Barangay Baring is land tenure. Based on a PCRA survey, only a few prominent families own most of the land while 80 percent of the residents do not own land. There is also an unresolved boundary dispute between Barangays Baring and Talima.

Talima (Figure 1.5)

Talima is the seat of the "mini" City Hall and hospital in Olango Island. It has 2 freshwater lenses, where 3 enterprising individuals are engaged in water services, distributing it to the whole Olango Island and some satellite islets. The majority of the households in Talima are dependent on *dayo* or "many-day" fishing in remote fishing grounds. Since this kind of fishing is seasonal, an alternative source of income is necessary during lean months. Barangays Talima and Caw-oy have an unresolved boundary dispute.

Tingo (Figure 1.6)

Located at the northernmost part of Olango Island, Tingo was once a *sitio* of Barangay Santa Rosa. It became a *barangay* in 1961. The majority of Barangay Tingo's male population are engaged in *dayo* fishing while others are in the boat-making industry financed by some Tingo residents. Most residents are engaged in the shellcraft industry to supplement their income.

A major problem is the lack of livelihood options during lean months when fishing is not possible due to bad weather conditions. The lack of law enforcement against illegal fishing practices has discouraged the residents from supporting *barangay* projects on coastal issues. As a consequence, habitat destruction continues.

Tungasan (Figure 1.7)

Barangay Tungasan is a model site for mangrove stewardship agreement. Residents now harvest from the mangrove plots which they planted 10 years ago. The main source of livelihood is *pandayo* fishing, primarily for abalone collection in distant fishing areas. Even if Tungasan is a fishing village, some residents still buy fish from Pasil Market in Cebu City and resell it in Olango. Although in Barangay Tungasan 75 percent of the population own land, the remaining 25 percent are owned by outsiders and the lack of secure land tenure is a major issue for them.

Caw-oy (Figure 1.8)

Caw-oy is known as the *panggal* country of Olango because almost all surveyed Caw-oy fishers do *panggal* or fish trap fishing. However, Caw-oy fishers no longer deploy *panggal* in their coastal waters but in the intertidal areas of the islands of Caubian, Mactan, and Kuaming, in Bohol. This could be a sign that the coastal resources of Caw-oy are already depleted.

Alternative livelihood is a major concern of Caw-oy residents. In an effort to assist fishers of Caw-oy, the University of San Carlos-Marine Biology Section (USC-MBS) started a pilot project on community-based coral farming as a tool for environmental awareness and alternative livelihood which supports sustainable natural resource management and coral reef rehabilitation.

Another problem that also needs immediate attention is the deteriorating quality of the coastal waters of Caw-oy. Besides the lack of proper education on waste disposal, one cause is the lack of dumping site for the solid and domestic wastes. As a result, residents resort to dumping their waste directly to the sea and shoreline.

San Vicente (Figure 1.9)

Formerly known as Sitio Poo belonging to Barangay Santa Rosa, San Vicente became a separate *barangay* in 1993. It is the site of the Olango Island Wildlife Sanctuary (OIWS) where the Department of Environment and Natural Resources (DENR) maintains a Nature Center for public awareness. In the OIWS Center, different mangroves and associated species are showcased. A boardwalk interlinks a bird hide for ease in moving within the mangrove areas and for viewing.

Seaweed (*Eucheuma spinosum* or *Kappaphycus alvarezii* or *guso* in the local dialect) culture is fast becoming an alternative source of livelihood, which started in Gilutongan Island and is now spreading to the neighboring islands. San Vicente residents and fishers are complaining about the encroachment of *guso* cultivators from Gilutongan Island in their territorial waters.

Presently, there is no formal delineation of municipal or *barangay* waters or lease agreement on where to cultivate *guso*; therefore, uncontrolled establishment of *guso* plots within the vast intertidal areas in Olango is an increasing issue. Unauthorized mangrove cutting prevailed inside the sanctuary until recently when additional park rangers were stationed to guard the area.

Pangan-an Island (Figure 1.10)

Barangay Pangan-an was the recipient of a solar powered electricity project funded by the Belgian government and represents the first solar-powered island in the Philippines. The small, 46-ha island has no freshwater lens and so the people rely on rainwater or buy it from Barangay Sabang at PhP3-5¹ per 20-L container during the rainy season and PhP10 during the dry season.

Pangan-an fishers reportedly use hook and line fishing as their major source of income, while others are into *guso* culture. During the 1998 PCRA workshop, an average of 20 dynamite blasts per day were heard which showed that blast fishing is still very rampant in the area.

¹ US\$1 = PhP50 in 2000

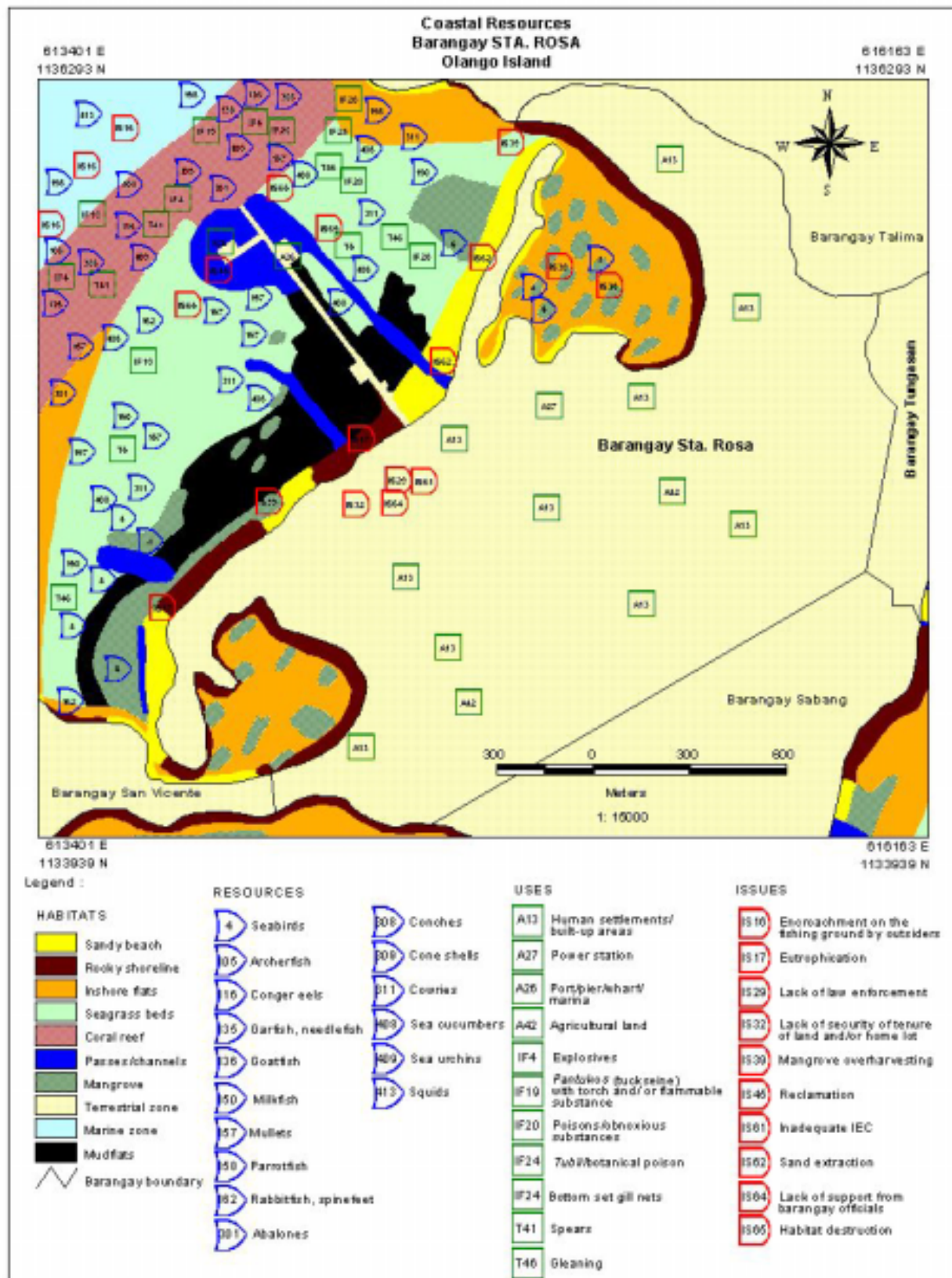


Figure 1.3. Coastal resource map of Barangay Santa Rosa, Lapu-Lapu City, Cebu (CRMP 1998).

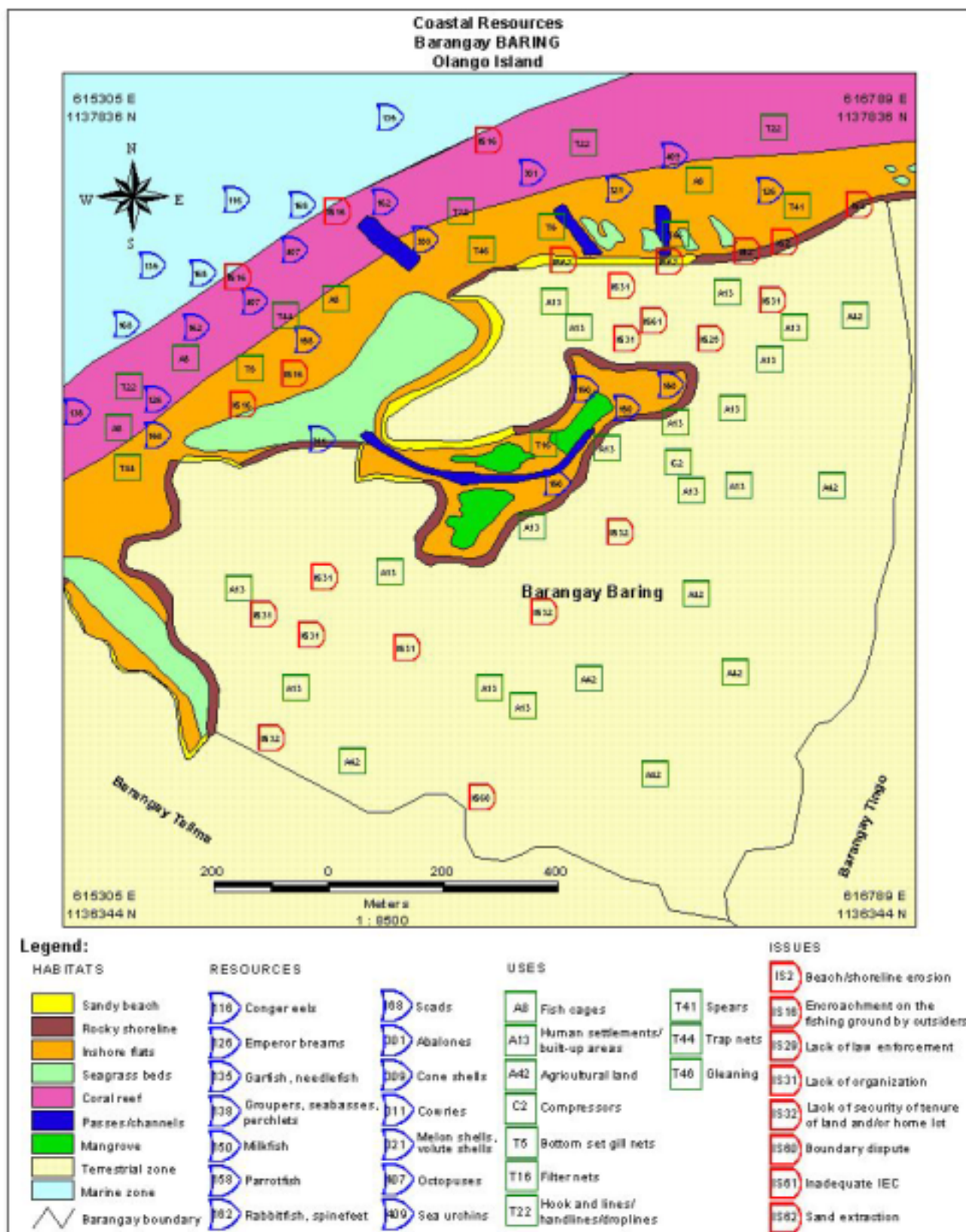


Figure 1.4. Coastal resource map of Barangay Baring, Lapu-Lapu City, Cebu (CRMP 1998).

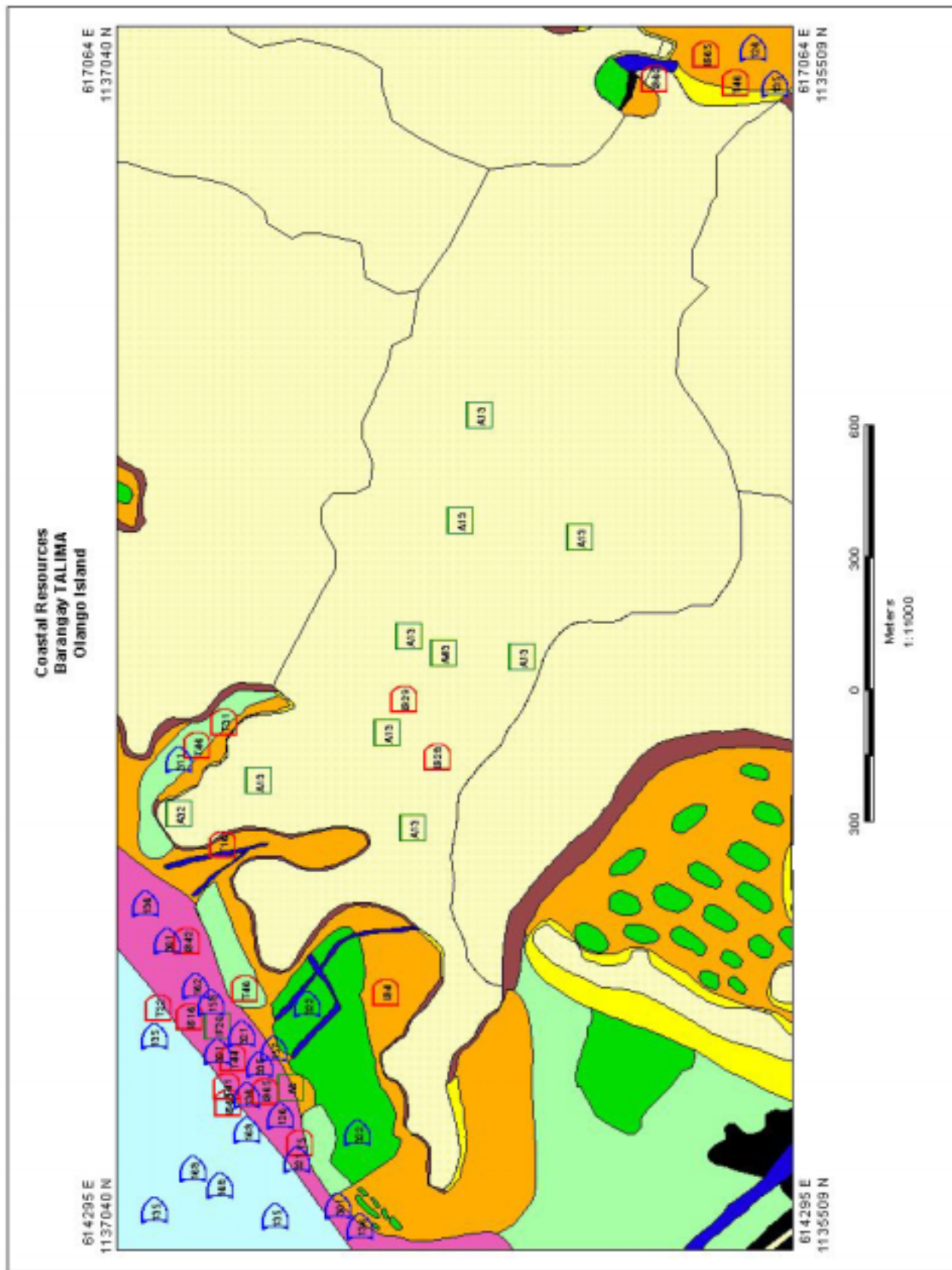


Figure 1.5. Coastal resource map of Barangay Talima, Lapu-Lapu City, Cebu (CRMP 1998).

Legend :**HABITATS**

	Sandy beach
	Rocky shoreline
	Inshore flats
	Seagrass beds
	Coral reef
	Pasces/khannels
	Mangrove
	Terrestrial zone
	Marine zone
	Mudflats
	Barangay boundary

RESOURCES

	326 Emperor breams
	335 Garfish, needlefish
	336 Goatfish
	357 Mullet
	358 Parrotfish
	362 Rabbitfish, spinefoot
	368 Scads
	301 Abalones
	311 Coonias
	321 Melon shells, volute shells
	322 Miter shells
	335 Top shells

USES

	A8 Fish cages
	A13 Human settlements/built-up areas
	A32 Resorts
	IF20 Poisons/obnoxious substances
	T5 Bottom set gill nets
	T18 Fiber nets
	T22 Hook and lines/handlines/drop lines
	T31 Push nets
	T41 Spears
	T43 Water pumping station
	T44 Trap nets
	T48 Dredging

ISSUES

	S04 Closed access to sea
	S18 Encroachment on the fishing ground by outsiders
	S28 Lack of alternative livelihood activities
	S29 Lack of law enforcement
	S42 Overfishing
	S00 Boundary dispute
	S05 Habitat destruction

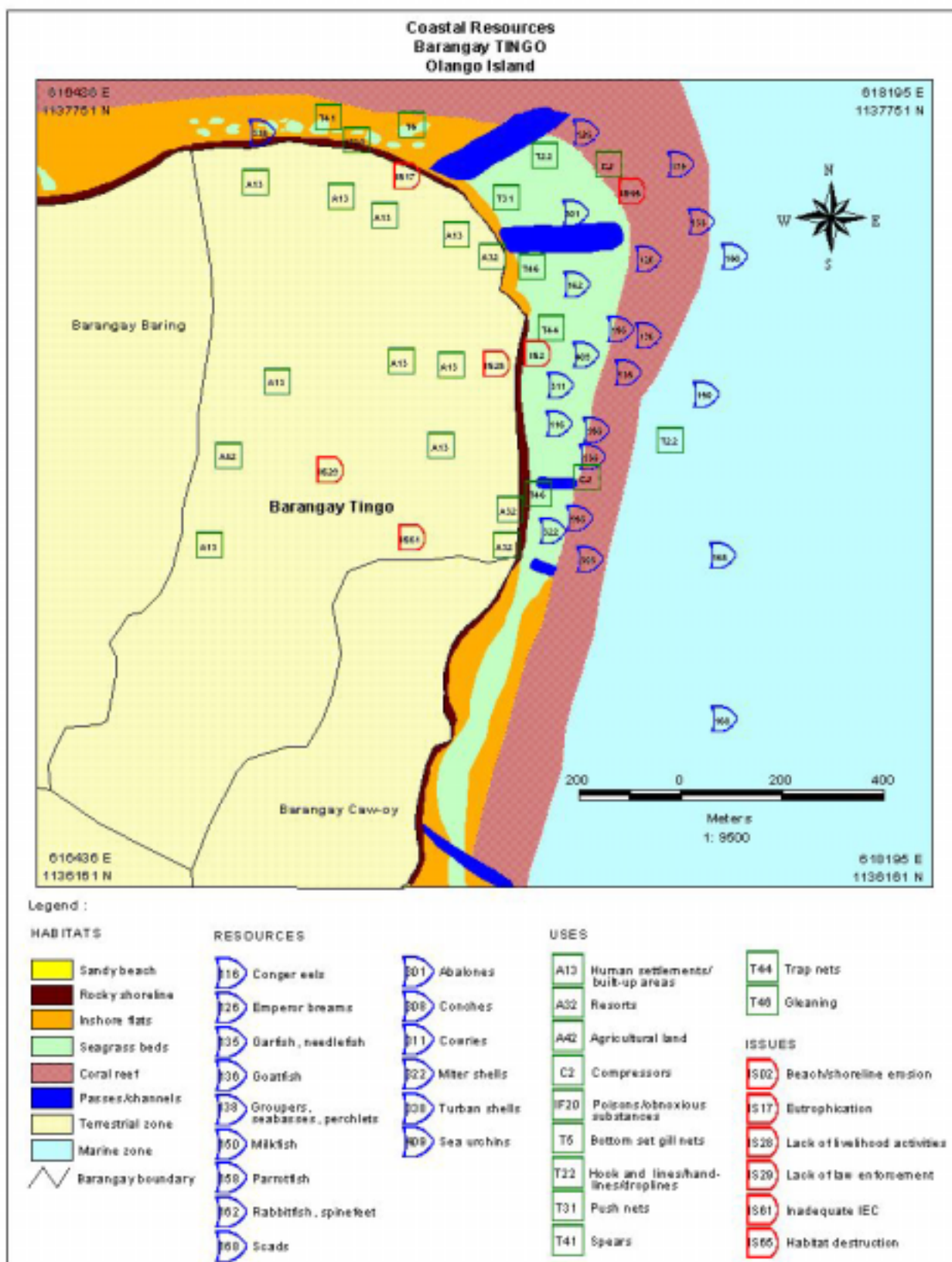


Figure 1.6. Coastal resource map of Barangay Tingo, Lapu-Lapu City, Cebu (CRMP 1998).

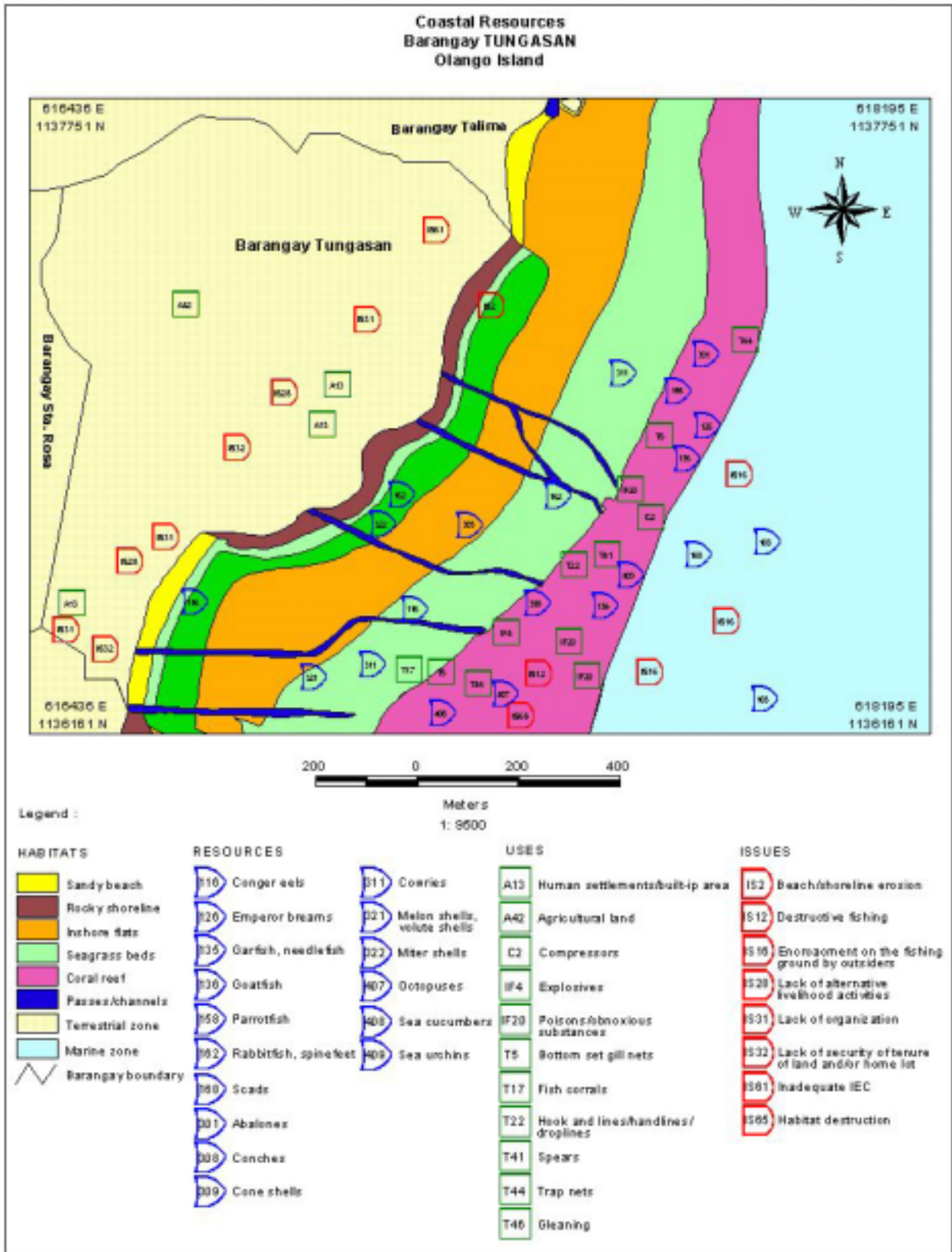


Figure 1.7. Coastal resource map of Barangay Tungasan, Lapu-Lapu City, Cebu (CRMP 1998).

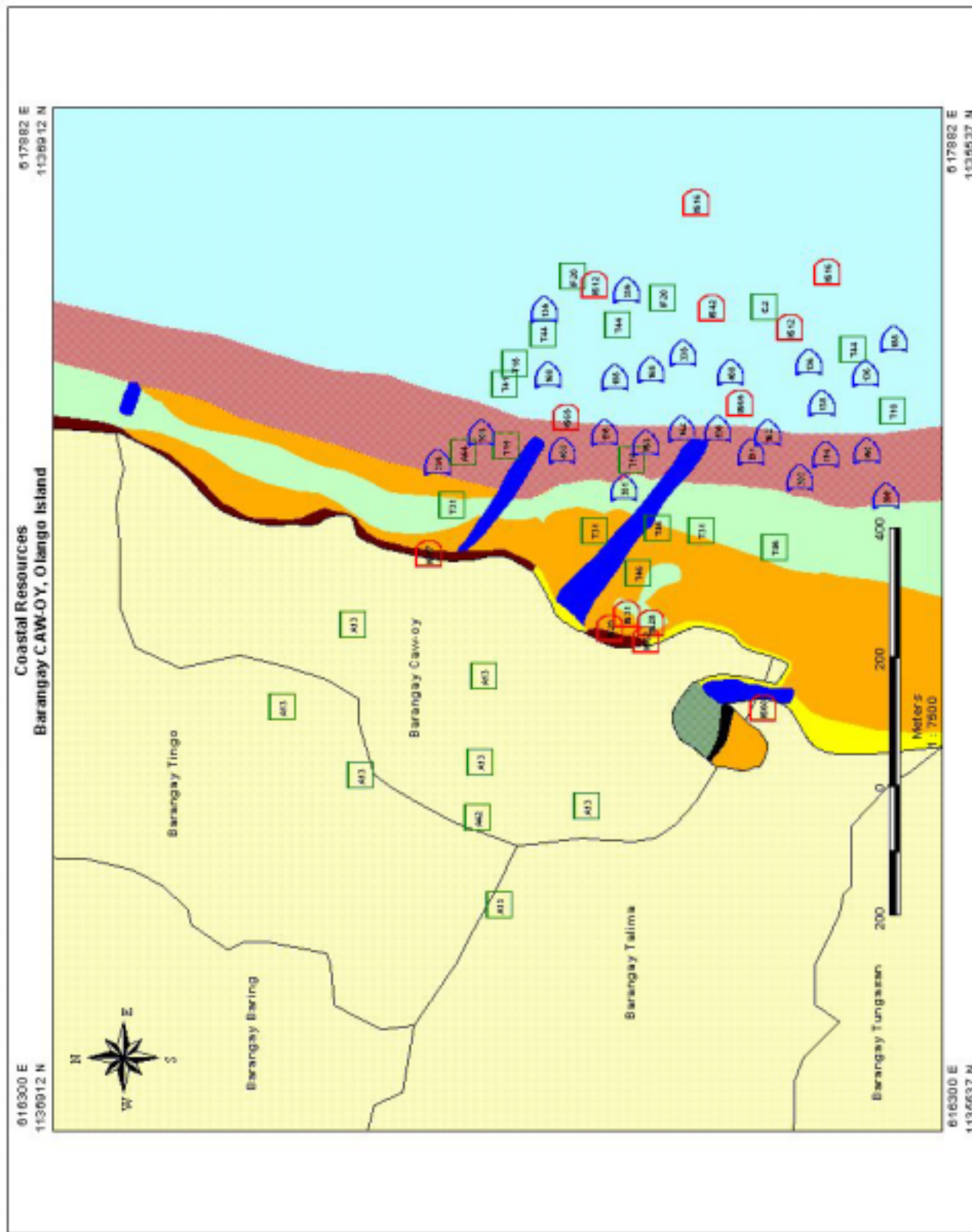


Figure 1.8. Coastal resource map of Barangay Caw-oy, Lapu-Lapu City, Cebu (CRMP 1998).

Legend:**HABITATS**

	Sandy beach
	Rocky shoreline
	Inshore flats
	Seagrass beds
	Coral reef
	Passes/channels
	Mangrove
	Terrestrial zone
	Marine zone
	Mudflats
	Barangay boundary

RESOURCES

	116 Conger eels
	125 Garfish, needlefish
	130 Goatfish
	138 Groupers, seabass, perchlets
	150 Milkfish
	159 Parrotfish
	162 Rabbitfish, spinefoot
	168 Scads
	180 Surgeonfish, tangs, unicornfish
	201 Abalones
	208 Conches
	209 Cone shells
	225 Top shells
	408 Sea cucumbers
	409 Sea urchins

USES

	A13 Human settlements/built-up areas
	A42 Agricultural land
	A44 Coral farm
	C2 Compressors
	IF20 Poisons/toxic substances
	T10 Fish pots and crab pots
	T19 Fish shelters
	T31 Push nets
	T41 Spears
	T44 Trap nets
	T46 Cleaning

ISSUES

	S12 Destructive fishing
	S16 Encroachment on the fishing ground by outsiders
	S17 Eutrophication
	S28 Lack of alternative livelihood activities
	S29 Lack of law enforcement
	S31 Lack of organization
	S42 Overfishing
	S60 Boundary dispute
	S62 Sand extraction
	S65 Habitat destruction

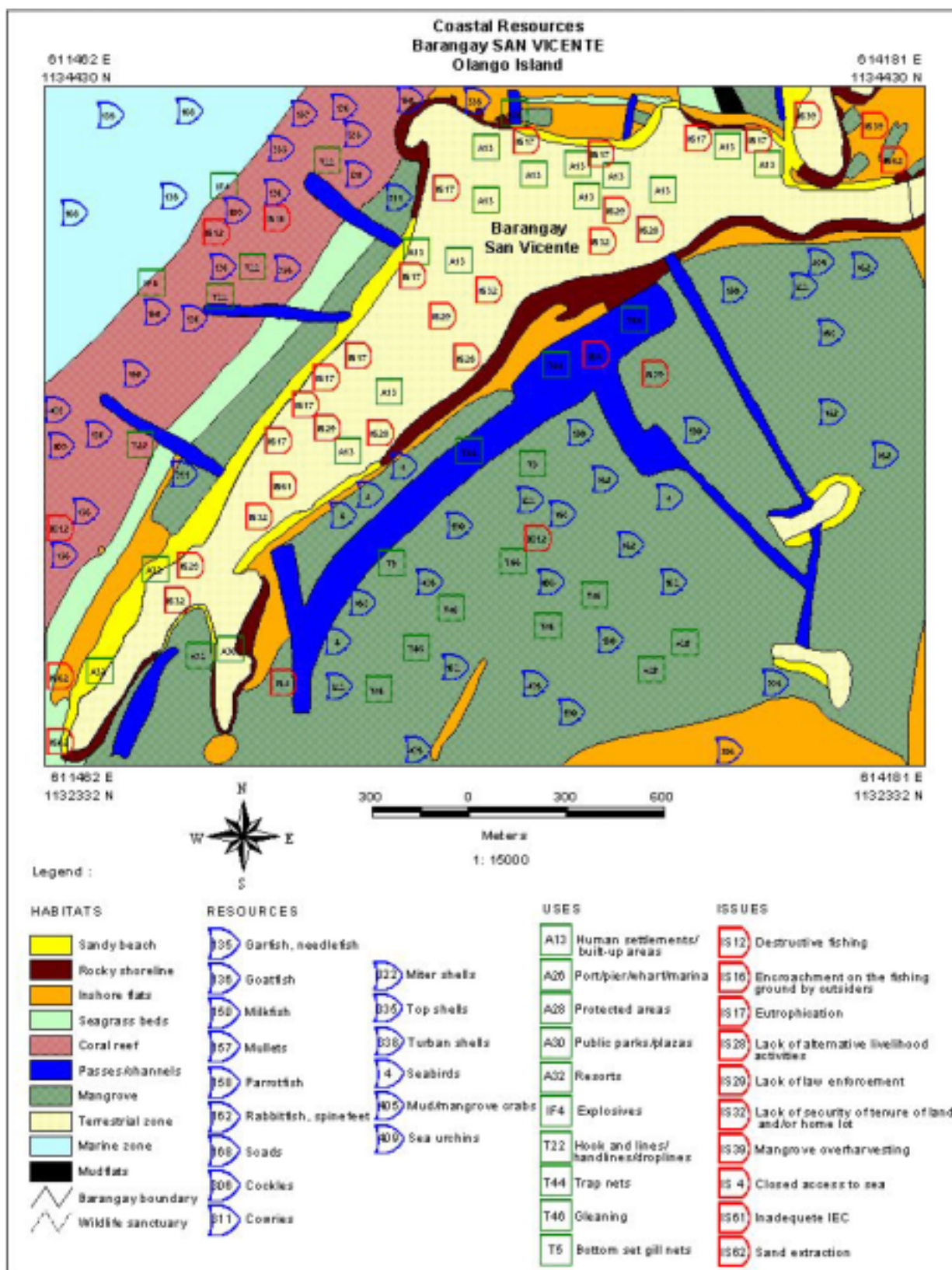


Figure 1.9. Coastal resource map of Barangay San Vicente, Lapu-Lapu City, Cebu (CRMP 1998).

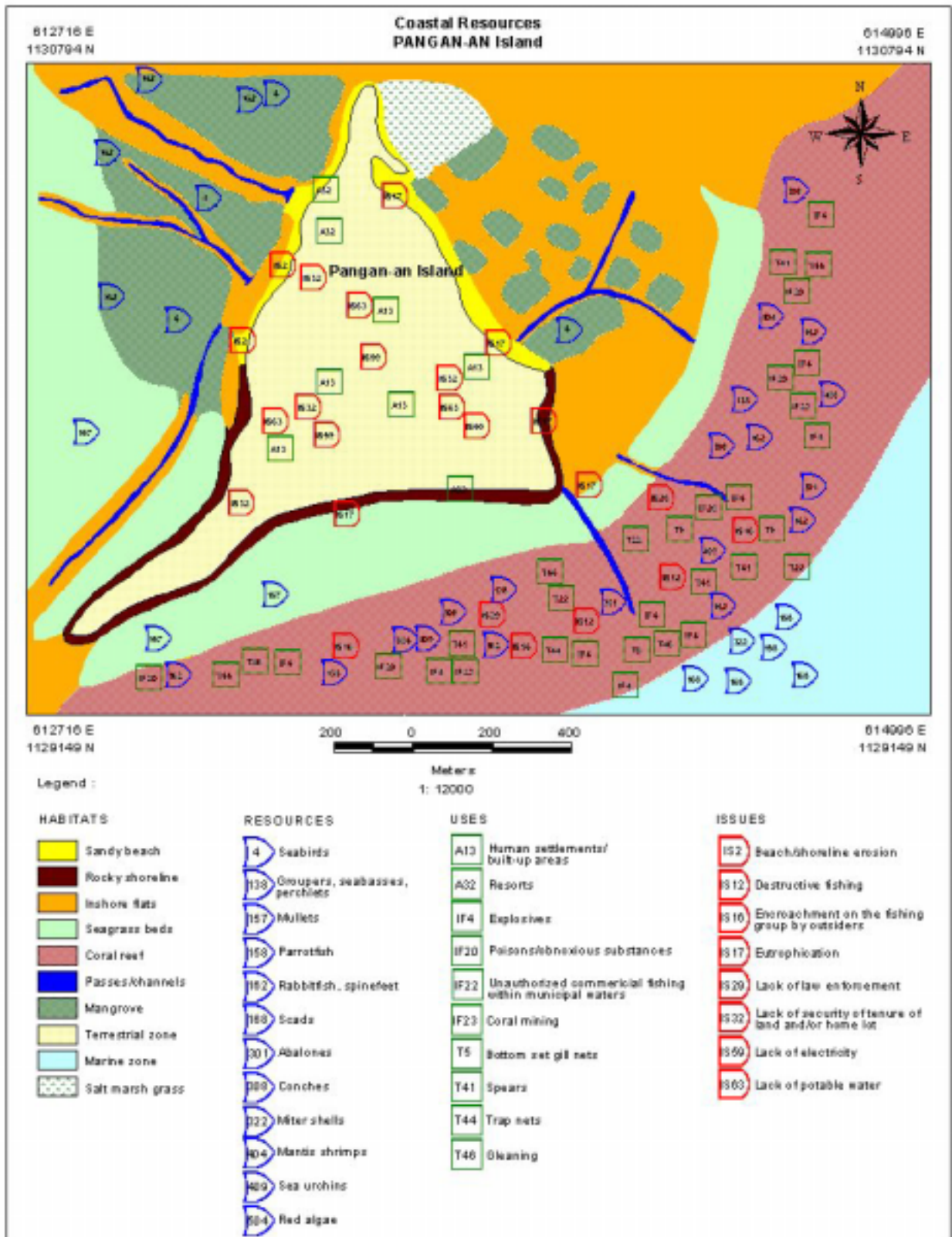


Figure 1.10. Coastal resource map of Barangay Pangan-an Island, Lapu-Lapu City, Cebu (CRMP 1998).

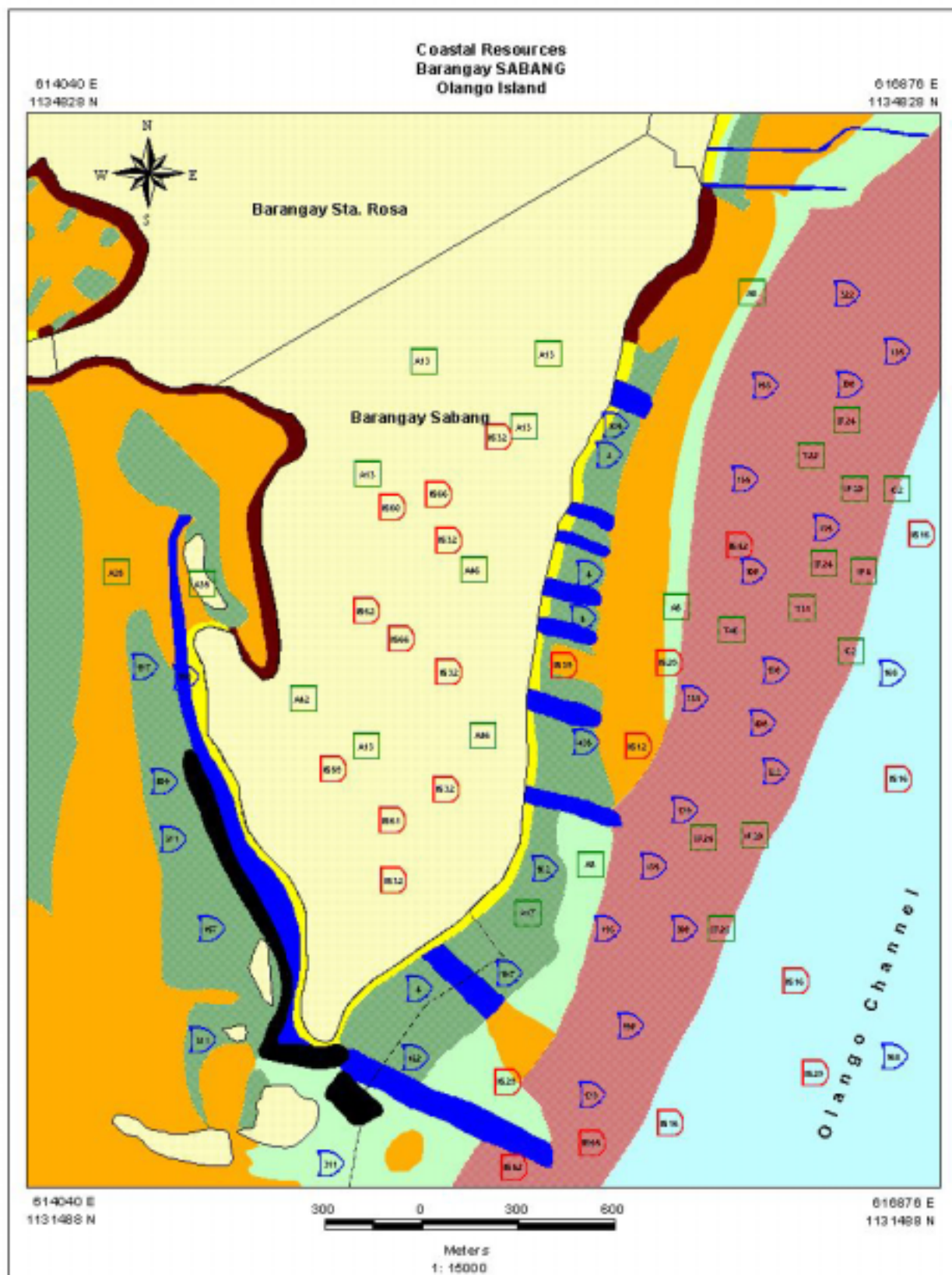


Figure 1.11. Coastal resource map of Barangay Sabang, Lapu-Lapu City, Cebu (CRMP 1998).

Legend :

HABITATS

	Sandy beach
	Rocky shoreline
	Inshore flats
	Seagrass beds
	Coral reef
	Passes/channels
	Mangrove
	Terrestrial zone
	Marine zone
	Mudflats
	Barangay boundary
	Wildlife sanctuary

RESOURCES

	4 Seabirds
	15 Conger eels
	35 Garfish, needlefish
	50 Milkfish
	57 Mulliez
	58 Parrotfish
	62 Rabbitfish, spinefoot
	68 Scade
	208 Concher
	211 Coarier
	322 Miter shells
	330 Turban shells
	405 Mud/mangrove crabs
	408 Sea cucumbers

USES

	A8 Fish cages
	A13 Human settlements/built-up areas
	A17 Mangrove plantations
	A28 Public laundry areas
	A28 Seaweed culture
	A42 Agricultural land
	A48 Recreational areas
	C2 Compressors
	IF04 Explosives
	IF20 Poisons/toxic substances
	IF24 Toxic/botanical poisons
	T22 Hook and lines/handlines/traplines
	T31 Push nets
	T46 Gleaning

ISSUES

	I512 Destructive fishing
	I518 Encroachment on the fishing ground by outsiders
	I529 Lack of law enforcement
	I532 Lack of security of tenure of land and/or home lot
	I539 Mangrove overharvesting
	I542 Overfishing
	I558 Lack of electricity
	I560 Boundary dispute
	I561 Inadequate IEC
	I562 Sand extraction
	I565 Habitat destruction
	I566 Lack of cooperative

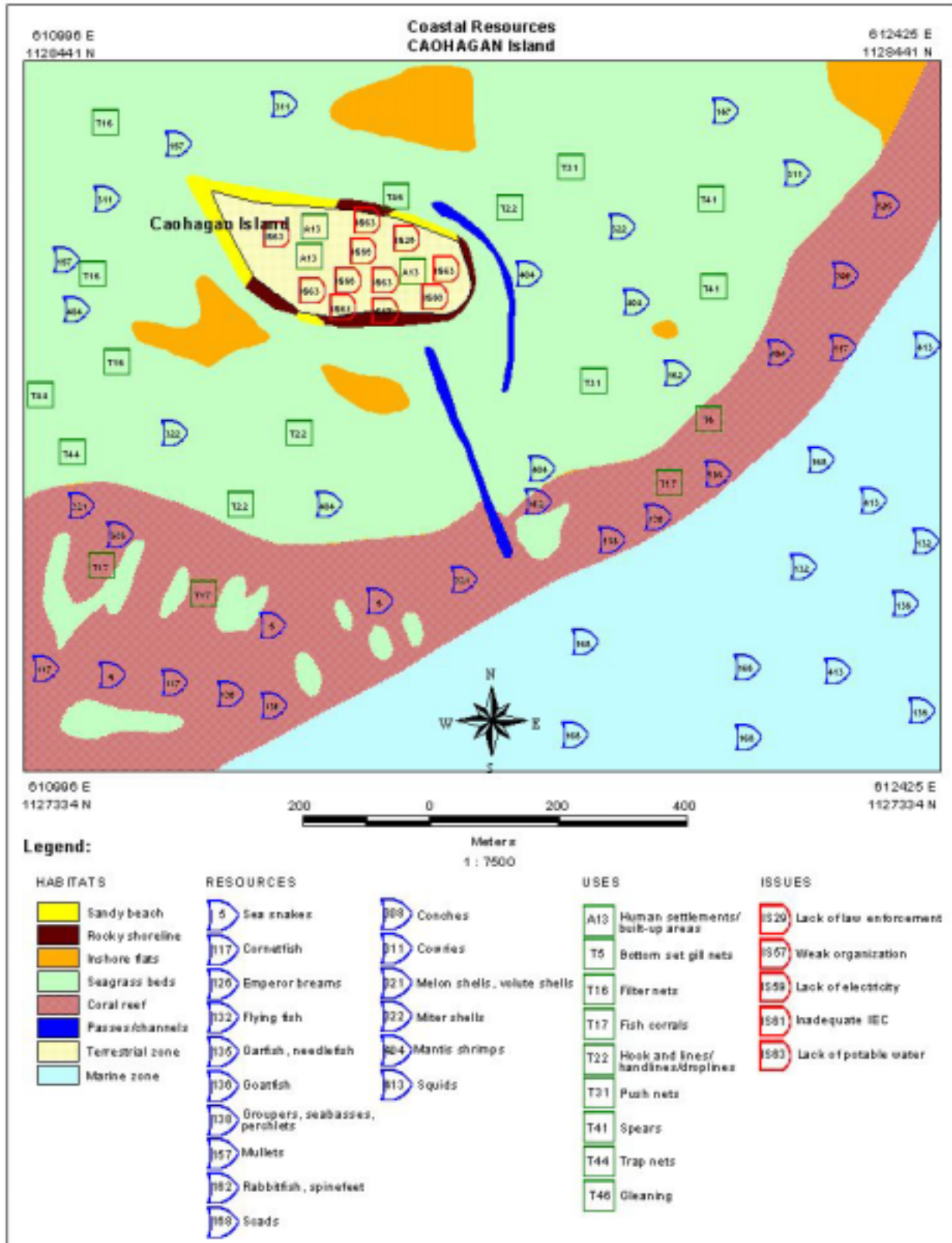


Figure 1.12. Coastal resource map of Caohagan Island, Lapu-Lapu City, Cebu (CRMP 1998).

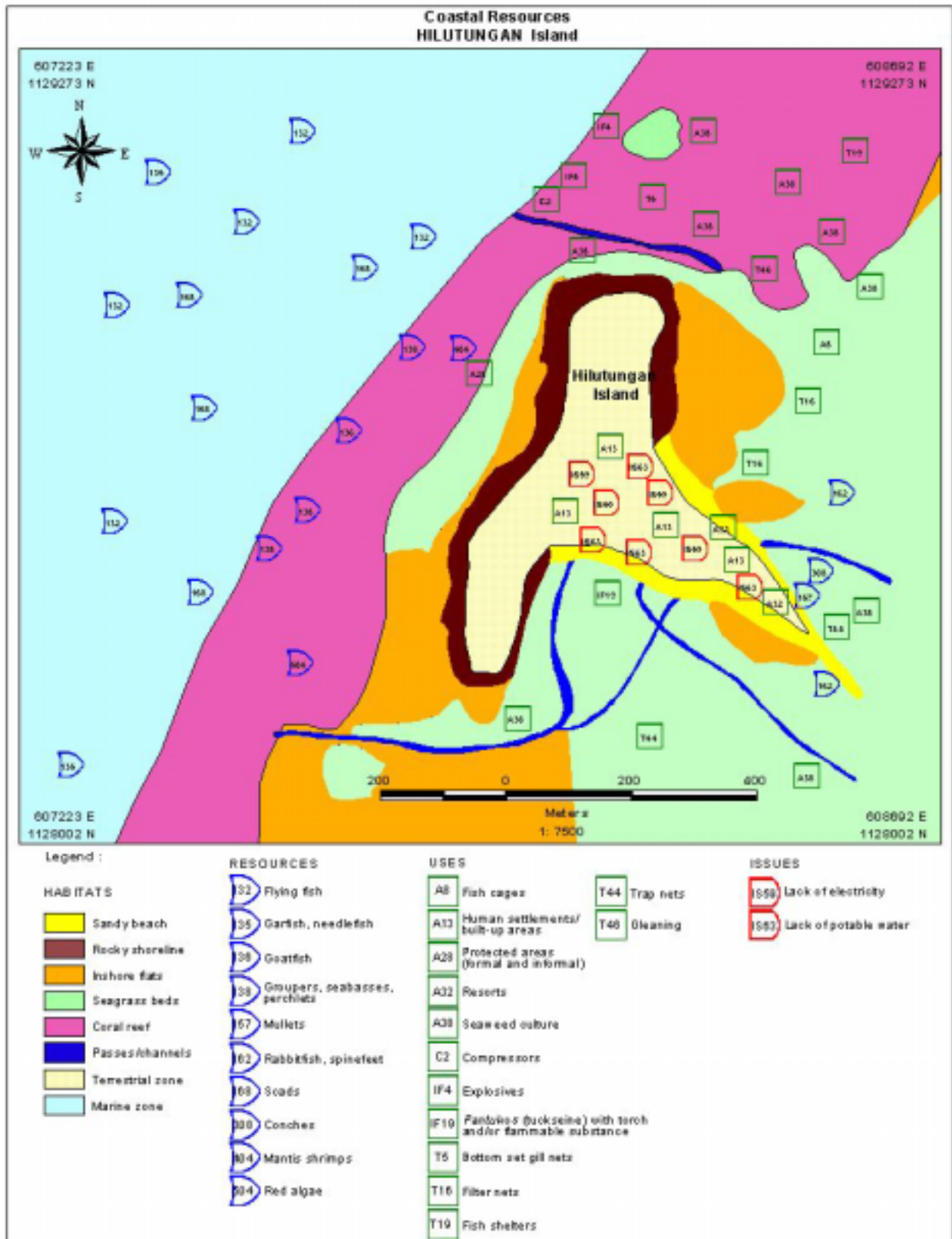


Figure 1.13. Coastal resource map of Hilutungan Island, Municipality of Cordova, Cebu (CRMP 1998).



Coral reef survey in Gilutongan Island.



Floating "guard house" of the Coral Farm in Barangay Caw-oy.



Women's group busy tying coral fragments for rehabilitation.



"Panggal" or fishtrap used in Olango Island.



Shellcraft industry in Olango Island.



PCRA participants in Olango Island.



Early to learn, early in life.



Nets for pelagic fishing showing "scare" device.



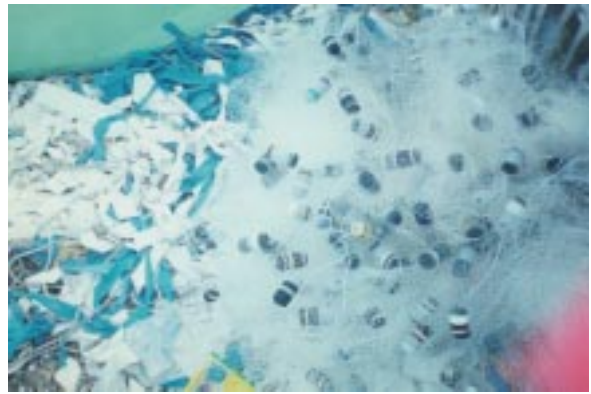
Fisherfolk on their way to the sea with "sudsud".



"Pokot" or nets for pelagic fishing.



Gilutongan Marine Sanctuary.



Nets and scare paraphernalia for pelagic fishing.



Large scoop nets.



A young fisher demonstrating the use of "sudsud".



Aerial view of Gilutongan Island, Cordova, Mactan Island.



Aerial view of Barangay Baring, Olango Island.



Compressor boat for "hookah" diving and collection of tropical fish.



Bangus fry collector along mangrove waterways.



Acroporid corals in Gilutongan Marine Sanctuary.



*Gleaning at night using petromax provided a good catch of "kasag" or crabs (*Thalamita sp.*)*



Aerial view of Barangay Santa Rosa wharf.

Sabang (Figure 1.11)

Among the *barangays* in Olango Island, Sabang is the second largest and has the highest population. The main work of the people of Sabang is aquarium fish collection although small-scale farming (e.g., cassava, sweet potatoes) and vegetable gardening are practiced. Recently, the CRMP launched an alternative livelihood for Sabang residents called the Olango Bird and Seascape Tour (OBST). The program employs women in the food preparation and shellcraft demonstration to tourists and the men are tapped for boat paddling into the OIWS for bird watching.

Not all of Sabang has electricity. Electricity has not been supplied because of budgetary constraints and because some land owners refuse to give a right of way for the installation of electrical posts and wires.

Land tenureship is another issue among displaced Sabang residents with no legal documents to support their ownership claims. Many residents also complained about *sudsud* fishing (push net) in the area, which destroys the seagrass beds.

Caohagan Island (Figure 1.11)

The southernmost and the smallest *barangay* of Olango with an area of 4.5 ha is Caohagan Island. A Japanese resort owner reportedly owns 90 percent of Caohagan.

Similar to other islands, potable water is the major problem. The islanders get their water from Cordova at PhP3 per 20-L container, which is then sold on the island at PhP10. On the average, water consumption is 4-5 containers per family per day. Electricity may not be as basic as water but the people of Caohagan expressed a desire to have electrical services, especially since their neighbors in Pangan-an Island are already serviced by solar-powered electricity. Enforcement of fishery laws is also their concern to minimize destructive fishing practiced in the area.

Gilutongan Island (Figure 1.12)

Barangay Gilutongan includes both Gilutongan and Nalusuan Islands and is under the jurisdiction of the Municipality of Cordova. It is the only *barangay* of the Olango group of islets with a legally declared marine sanctuary (15 ha in area) which is located on the western coastline of Gilutongan Island. In addition, a privately declared 10-ha marine sanctuary is located adjacent to Nalusuan Island. Many Gilutongan residents are into tourism-based livelihood because of the presence of the marine sanctuary and the popularity of the area for diving and "island hopping". On typical days, an average of 20 tourist boats of swimmers, snorkelers, and SCUBA divers visit the sanctuary. Economic activities include selling of souvenirs and native food.

Many Gilutongan households are also involved in seaweed or *guso* farming which to date produces an average of 35 tons of dried *guso* per month, which is sold to seaweed

processors in Metro Cebu. They have the advantage of marketing their product at a good selling price directly to nearby Mandaue City-based processors. Technical assistance for developing seaweed farming was provided through the CRMP, with funding support coming from the Foundation for Sustainable Society Inc. (FSSI). Marketing and management assistance was provided by the Visayas Cooperative Central Fund Federation (VICTO) and the Alternative Commodity Exchange System (ACES). Like other islands, clean drinking water is a problem in Gilutongan Island. Water is bought from Cordova and Maribago, Mactan at PhP3 per container. While the majority of households use kerosene and gas lamps, some families have their own generator set as source of electricity.

HISTORICAL BACKGROUND

Historically, Olango has always been in the background of attention of the City of Lapu-Lapu and the Municipality of Cordova. According to Olofson (1992), Olango was a separate *pueblo* or town before 1892. Its status as *pueblo* was taken away due to a new population limit for a town which set the minimum at 700. At that time, Olango had only about 500 residents (Philippine National Archives, Manila). But during World War II, the population increased as refugees from Mactan migrated to Olango to escape Japanese control. The island must have temporarily regained its status for in 1903, under the name of Santa Rosa, it was fused again with Opon (Lapu-Lapu) by Republic Act No. 952 because of its low taxable income. In 1961, Opon became Lapu-Lapu City, and its major *sitios* became *barrios*. Today, the island has 8 *barangays*, as the large *sitio* of Poo, which was then under Barangay Santa Rosa, became Barangay San Vicente in 1993. The *barrio* of Tingo on the northern end of Olango, was separated from Santa Rosa. In 1982, with the initiative of the late Mayor Maximo Patalinjug, Olango acquired a small hospital, a wharf, and later a mini city hall with heliport, conference room, and a post office.

At the southeast end of Olango Island, a large portion of the reef flat is a winter roosting site for migratory birds traveling between North Asia, Southeast Asia to Australia along the East Asian Flyway. In recognition of its importance, 920 ha of wetlands were proclaimed as the OIWS by virtue of Executive Order 903, which was signed on 14 May 1992 by then President Corazon Aquino. This area is composed mostly of calcareous sand derived from the weathering of limestone mixed with shell fragments, inter-tidal mudflats, and mangrove habitats (Figures 1.14 and 1.15).

On 8 November, 1994, the OIWS was designated as the Philippine's first (and to date the only) Ramsar Site (Wetland of International Importance especially as Waterfowl Habitat). This makes the Philippines the 82nd contracting party to the Ramsar Convention, which supports conservation and management of the world's wetlands and waterfowl habitats.

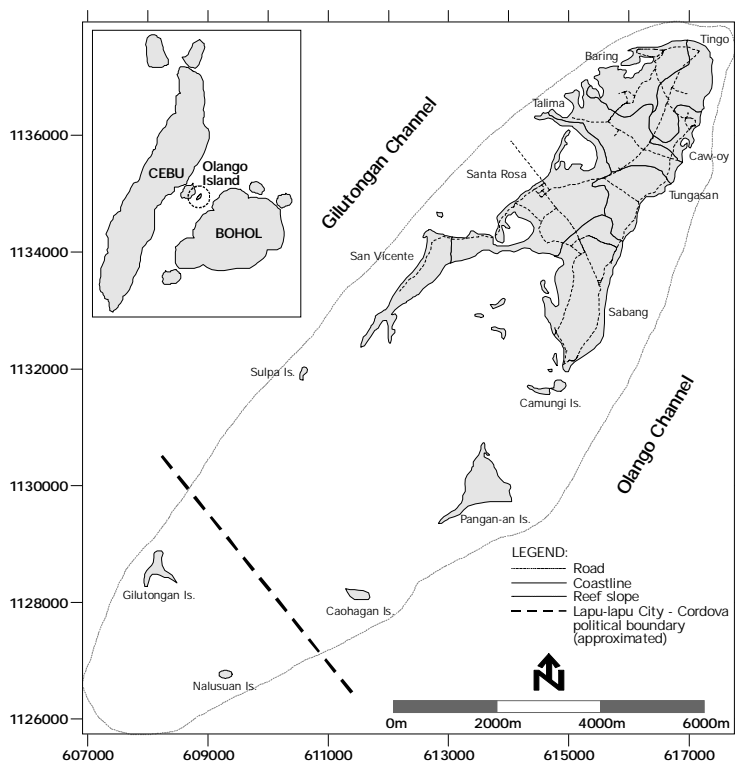


Figure 1.14. General location map of Olango Island, Lapu-Lapu City, Cebu, its satellite islets, and administrative boundaries.

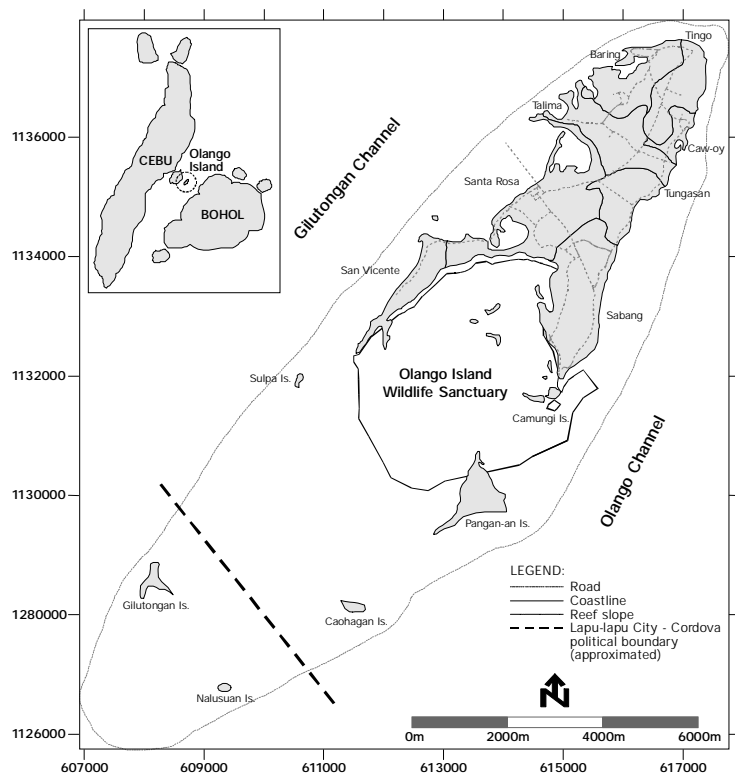


Figure 1.15. The geographic location of the 920-ha Olango Island Wildlife Sanctuary (geographical coordinates provided by the PAWB-DENR 7).

SUMMARY

Like most small islands in the Philippines today, Olango is facing a wide range of environmental problems vital to its future survival. Among the many environmental issues besetting Olango, 5 are considered to be priority and have to be addressed immediately (Parras *et al.* 1998):

- Heavy exploitation of its marine resources
- Prevalence of illegal fishing practices
- Rapid population growth
- Pollution due to improper waste disposal
- Laxity in the enforcement of environmental and fisheries laws

The other issues identified that also need proper management include:

- Scarcity of freshwater for the islanders' daily need and for future development such as tourism
- Poverty experienced by most islanders due to their meager income from fishing
- Low educational attainment and lack of environmental education among islanders
- Strong political patronage and economic dependency of the island to Lapu-lapu City and Municipality of Cordova governments

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 Quaternary 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

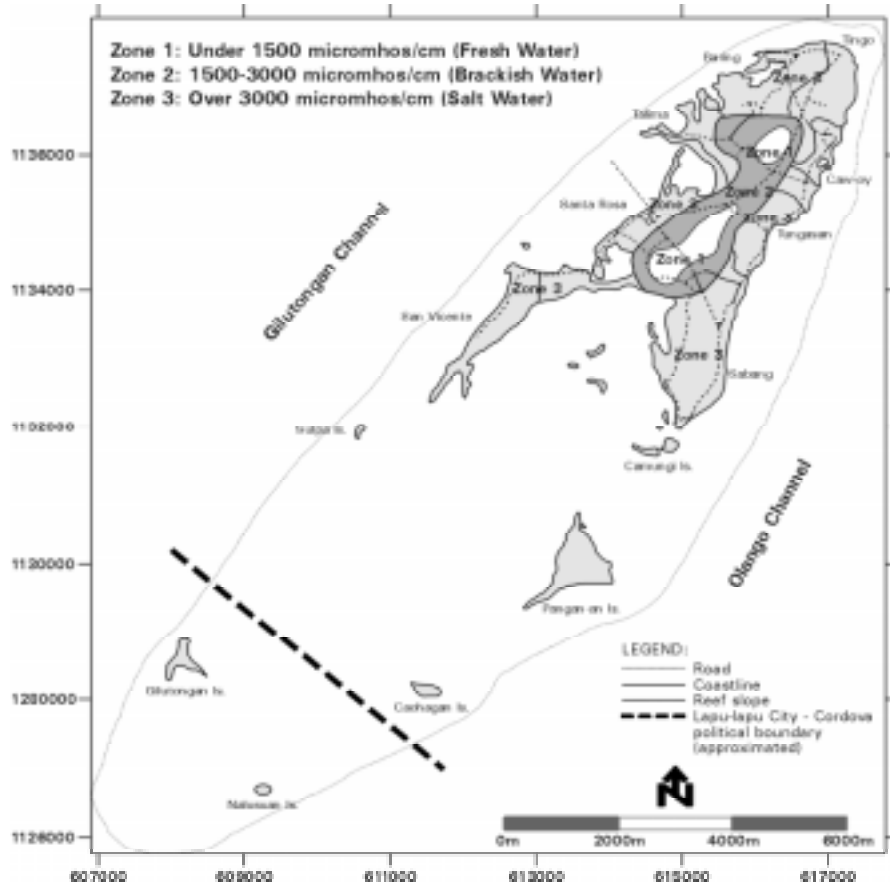


Figure 2.1. Isobars of conductivity (in micromhos/cm) based on well surveys of Olango Island by Walag *et al.* (1985).

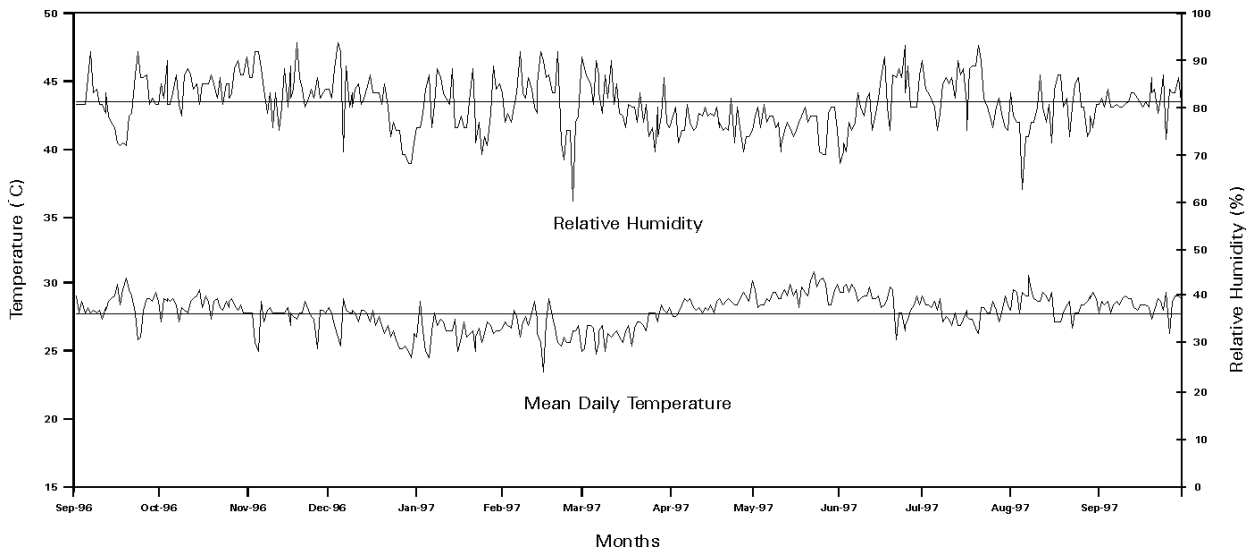


Figure 2.2. Mean daily temperature and relative humidity of Mactan Island (PAGASA 1997).

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.

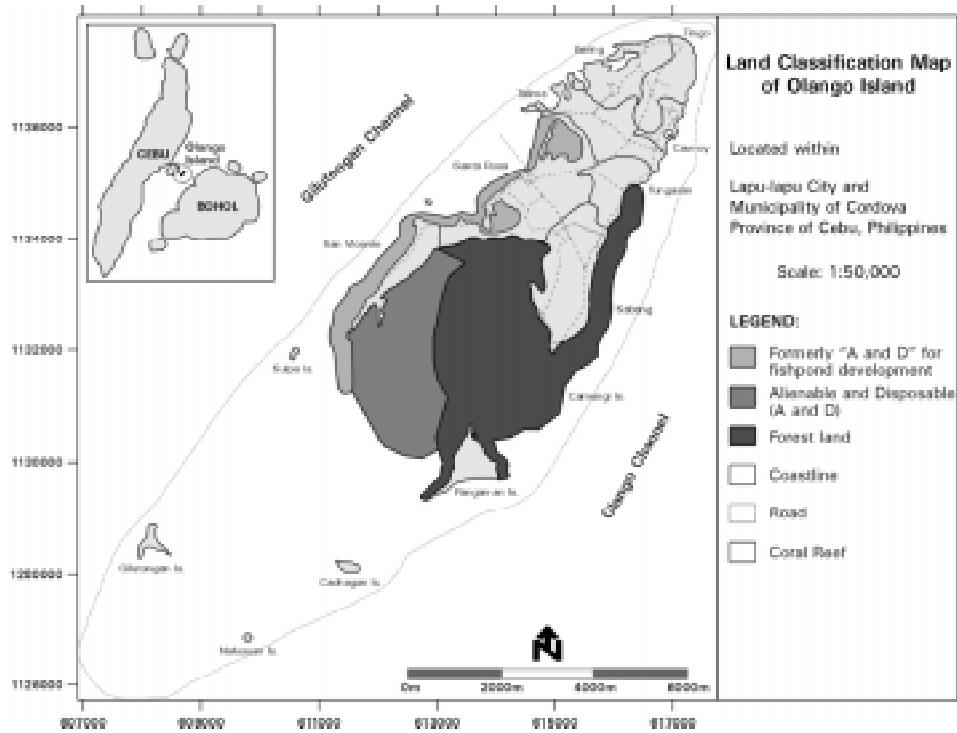


Figure 2.3. Land classification map of Olango Island and its satellite islets (PMD-PAWD-DENR with slight modifications).

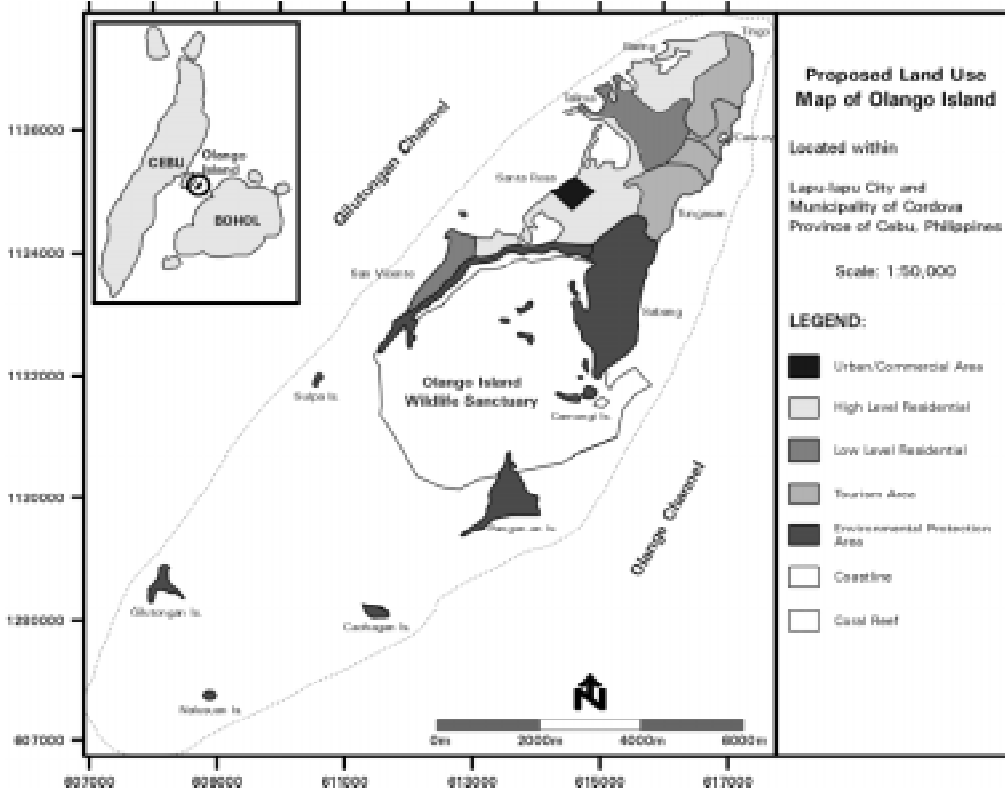


Figure 2.4. Proposed land use map of Olango Island and its satellite islets (MIIMPS and PMD-PAWD-DENR with slight modifications).

- 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).

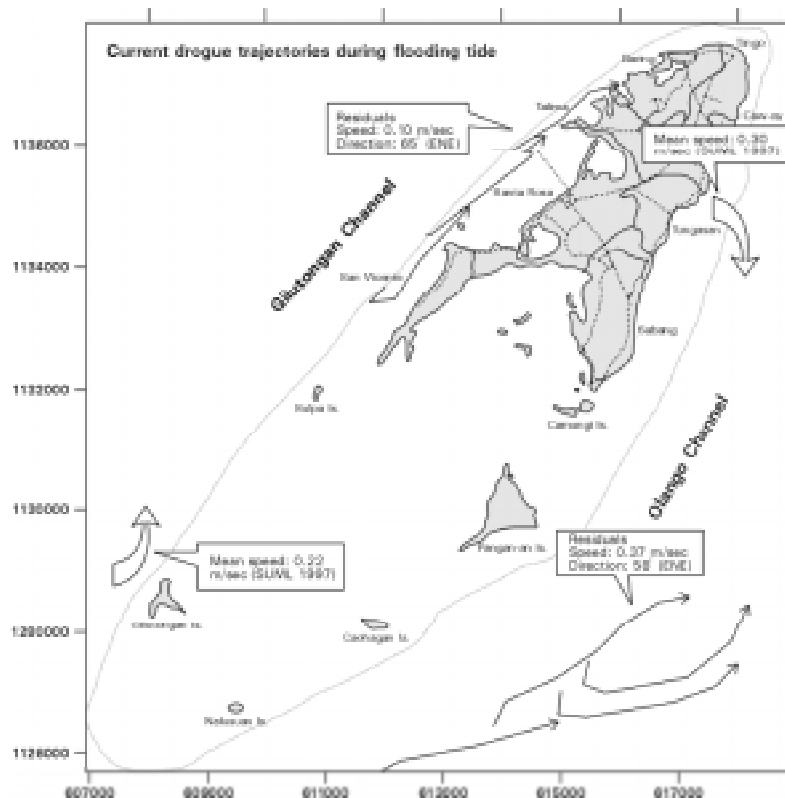


Figure 2.5. Current drogue trajectories during flooding tide in Olango Island.

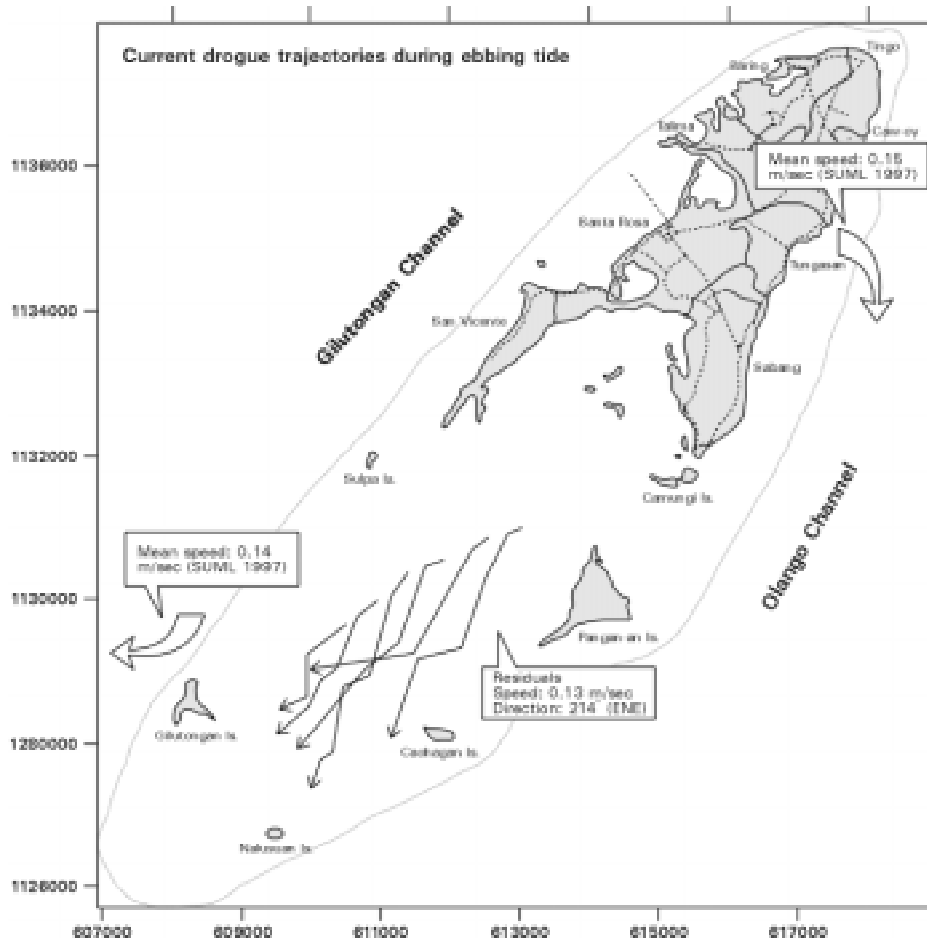


Figure 2.6. Current drogue trajectories during ebbing tide in Olango Island.

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.

Chapter 3

NATURAL RESOURCES



Coastal resources have always been the traditional source of livelihood for the communities of Olango Island. However, the availability of these resources is dependent not only on the amount of resource stock but also on the interdependence of the stock with the rest of the ecosystem. Hence, reliable information on the various ecological aspects of resource availability is critical in helping to determine the best resource use, relative condition, and management approaches. This chapter provides an overview of Olango's natural resources, which is dominated by its coastal and marine resources.

MINERAL RESOURCES

Geologically, Olango Island and its satellite islets are surrounded by 2 major lithologic units: Carcar limestone deposits and alluvial sediments. Carcar limestone, which formed during the Pleistocene period (1.8 million years ago), is porous limestone. This is often characterized by the formation of sinkholes, pitted grooves, and branching pinnacle structures. Alluvial sediments are sedimentary rocks, which appeared during the Quaternary period (1.64 million years ago up to present). These are composed basically of calcareous coarse-grained sand (weathering of limestone) mixed with shell fragments, fossilized shells, calcareous algae, and other carbonate materials.

As an island, salt or sodium chloride (NaCl) is a readily available mineral source of Olango. The islanders occasionally produce it by boiling seawater using mangrove and other terrestrial fuelwood species as firewood (resulting in the decline of the latter). The other method is by simple evaporation (Olofson 1992). Other types of metallic minerals (copper, iron, etc.) are not present in Olango.

FOREST AND AGRICULTURAL RESOURCES

In general, the vegetative cover of Olango Island is limited to agricultural plantings (such as coconuts) and scattered patches of brush and scrub growth and indicates the poor soil condition (mainly limestone rock) and long-term human impact. Mangroves, coconut palms and seasonal crops, weeds and sand-binders, and salt-resistant species characterize the limited vegetative cover of Olango. Olofson *et al.* (1989) listed at least 17 species of plants being used as fuelwood in 7 *barangays* of Olango Island (Table 3.1). According to Remedio and Olofson (1988b), much of the island's interior is in long-term fallow and apparently not productive due to its rocky limestone nature.

Table 3.1. Plant resources used as fuelwood in Olango Island and its satellite islets (modified after Olofson *et al.* 1989).

Scientific name	Local Visayan name	Common/English name
<i>Leucaena leucocephala</i>	<i>Biatilis, ipil-ipil</i>	Leadwood
<i>Rhizophora</i> spp.	<i>Bakhaw</i>	Mangrove
<i>Manihot esculentum</i>	<i>Kamotingkahoy, tungdan</i>	Cassava
<i>Cocos nucifera</i>	<i>Lubi</i>	Coconut
Unidentified	<i>Anasil</i>	None
<i>Pemphis acidula</i>	<i>Bantigue</i>	None
<i>Sonneratia caseolaris</i>	<i>Pagatpat</i>	Mangrove
<i>Gliricidia sepium</i>	<i>Madre de cacao</i>	None
<i>Lantana camara</i>	<i>Kanding-kanding</i>	Lantana
<i>Psidium guajava</i>	<i>Bayabas</i>	Guava
<i>Astrocalyx calycina</i> *	<i>Bungaw</i>	None
<i>Ixora</i> sp*.	<i>O-on</i>	None
<i>Camptostemon philippinense</i> *	<i>Gapas-gapas</i>	Mangrove
<i>Buchanania arborescens</i> *	<i>An-an</i>	None
Unidentified	<i>Hamomi-aw</i>	None
<i>Vitex parviflora</i>	<i>Tugas</i>	Molave

* Identification uncertain

Plantable areas for both crops and trees, especially in the north of Olango Island, are severely limited by outcroppings of limerock (karst). Bolinao clay, which is the dominant soil type of the island, causes chlorosis (yellowing of leaves due to iron deficiencies) in coconut palms. This may explain why coconuts are restricted to the periphery of the island and to beach sand, which is extensive in the south and southeastern portion of the island such as in Barangay Sabang (Olofson *et al.* 1989).

Olango Island and its satellite islets may be unique in that their key coastal resources have been mapped under CRMP through the PCRA conducted in 1998 and a geographic information system (GIS). Based on this information provided by community participants, Olango's coastal resources, dominated by wide reef areas, are more than 4 times more extensive than its land areas.

COASTAL RESOURCES

A summary listing of Olango's coastal resources is provided in Table 3.2, including the distribution of seagrass, coral reef, and mangrove habitats described in the following sections.

Table 3.2. Olango Island coastal habitat distribution and condition (CRMP 1998).

Scientific name	Area (ha)
Coral reef	
Inshore reef flat	1,160
Seagrass beds	1,756
Outer reef	<u>1,083</u>
	3,999
Mangrove	424
Mudflat and others	38
Sandy beach	60
Rocky shoreline	53
Olango Island Wildlife Sanctuary (mud and tidal flats and mangrove)	920

Seagrasses and Seaweeds

The seagrass beds in Olango are in good condition and represent important nursery grounds for fish. Much of the intertidal area of Olango is covered with dense seagrass beds while patches of *Sargassum* locally known as *samo* are found in the subtidal areas. So far, 8 species of seagrass and 72 species of macrobenthic algae were identified. Of the total number of algal species, 28 are red, 27 are green, and 17 are brown (SUML 1997). The area sampled with the highest number of species was Poo Bay (Table 3.3).

PCRA surveys rated the seagrass cover in the Barangays Caohagan, Talima, Santa Rosa, and Pangan-an as good (59 to 71 percent). Barangays Baring, Tungasan, and Cawoy have relatively poor seagrass cover (11 to 24 percent) (Table 3.4).

This extensive and dense seagrass beds is an important resource to the islanders where they gather *sigay*, small cowrie using a gear called *sudsud* to comb the seagrass beds to collect the *sigay*. Some claim that *sudsud* can damage the seagrass beds because of the pressure of combing. Since no studies have been done on the impact of *sudsud*, such contention remains debatable.

Fishes

With regard to fish diversity and abundance, visual census conducted by Gomez *et al.* (1994), SUML (1997), and reef monitoring by CRMP in 1999 around Olango Island's seagrass and coral reef areas resulted in a count of a total of 144 species distributed among 25 families. Of these, 40 are found to be target species. Among families, the

Table 3.3. Number of seaweed and seagrass species per genus at 5 sampling areas on Olango Island (SUML 1997).

Species name	Poo	Talima	Tungasan	Sabang	San Vicente
Algae					
Chlorophyta					
<i>Anadyomene</i> sp.	1	1	1	1	
<i>Avrainvillea</i> sp.	1				
<i>Boergesenia</i> sp.		1	1	1	
<i>Boodlea</i> sp.	1	1	1	1	
<i>Bornetella</i> sp.	1	2		2	1
<i>Caulerpa</i> sp.	2	1	2	1	2
<i>Chaetomorpha</i> sp.	1	1	1	1	1
<i>Cladophora</i> sp.	1	1			
<i>Codium</i> sp.	1			1	1
<i>Dictyosphaerea</i> sp.	1	1	1	1	1
<i>Halicoryne</i> sp.		1			1
<i>Halimeda</i> sp.	1	2	1	1	2
<i>Microdictyon</i> sp.				1	
<i>Monostroma</i> sp.	1	1			
<i>Udotea</i> sp.	1	1			
<i>Ulva</i> sp.	2	2	2	1	1
<i>Ventricaria</i> sp.	1			1	
<i>Valonia</i> sp.	1	1			
n = 18 Sub-total	17	17	10	13	10
Rhodophyta					
<i>Acanthophora</i> sp.	1		1	2	
<i>Actinotrichia</i> sp.	1	1	1	1	1
<i>Amansia</i> sp.	1	1		1	1
<i>Amphiroa</i> sp.	2	2		1	1
<i>Bostrychia</i> sp.	1	1	1		
<i>Champia</i> sp.	1	1	1	1	
<i>Galaxaura</i> sp.	2			1	1
<i>Gelidiella</i> sp.	1	1	1	1	1
<i>Gelidiopsis</i> sp.	1		1		
<i>Gelidium</i> sp.				1	
<i>Gracilaria</i> sp.	2	2	3	2	2
<i>Hypnea</i> sp.	1		1	2	1
<i>Jania</i> sp.	2	1	1	1	
<i>Laurencia</i> sp.	2	2	1	1	2
<i>Mastophora</i> sp.		1	1	1	1
<i>Pseudolithophyllum</i> sp.					
<i>Pterocladia</i> sp.		1			
n = 17 Sub-total	18	14	13	16	11
Phaeophyta					
<i>Colpomenia</i> sp.	1		1	1	1
<i>Dictyota</i> sp.	3	3		1	1
<i>Hydroclathrus</i> sp.	1	1		1	
<i>Lobophora</i> sp.	1	1	1	1	1
<i>Padina</i> sp.	2	2	1	2	3
<i>Sargassum</i> sp.	2	2	2	2	2
<i>Turbinaria</i> sp.	3	3	2		
n = 7 Sub-total	13	12	7	8	8
TOTAL	48	43	30	37	29
Seagrasses					
<i>Cymodocea rotundata</i>	2	1			
<i>Enhalus acoroides</i>	1	1	1	1	
<i>Halodule uninervis</i>	2	1	1	2	2
<i>Halophila ovalis</i>	1		1	1	1
<i>Syringodium isoetifolium</i>	1	1	1		1
<i>Thalassia hemprichii</i>	1	1	1	1	1
n = 6 TOTAL	8	5	5	5	5

Table 3.4. Seagrass assessment of the different *barangays* of Olango Island and its satellite islets (CRMP 1998).

Barangay	Percentage live cover	Rating
Baring	24	Poor
Caohagan	60	Good
Caw-oy	11	Poor
Gilutongan	45	Fair
Pangan-an	71	Good
Sabang	42	Fair
San Vicente	45	Fair
Santa Rosa	60	Good
Talima	59	Good
Tingo	45	Fair
Tungasan	21	Poor
Total	44	Fair

Ratings: Excellent (76-100%), Good (51-75%), Fair (26-50%), and Poor (\leq 25%)

labrids or wrasses were the most abundant with 38 species followed by pomacentrids or damselfishes with 25 species (Table 3.5). In the test fishing activities conducted by Silliman University Marine Laboratory (SUML) in 1997 using beach seine and multi-meshed set gill nets, non-commercially important species or non-target species dominated the catch. For both fishing gear, the average catch was 258.2 g from seagrass beds and 254.9 g from coral reefs, respectively (Table 3.6). Fish species richness and density around Olango Island is shown in Figure 3.1.

Table 3.5. Fish families identified in Olango Island and its satellite islets (Gomez *et al.* 1994; SUML 1997; CRMP 1998).

Fish families	Common name	Local name	No. of species	TS	IS
<i>Acanthuridae</i>	Surgeonfishes	<i>Indangan</i>	8	6	
<i>Apogonidae</i>	Cardinalfishes	<i>Mo-ong/pangan</i>	3	NTS	
<i>Aracanidae</i>	Filefishes	<i>Pugot</i>	1	NTS	
<i>Balistidae</i>	Triggerfishes	<i>Pugot</i>	4	1	
<i>Blenniidae</i>	Blennies	<i>Bugo</i>	4	NTS	
<i>Caesonidae</i>	Fusiliers	<i>Dalagang bukid</i>	4	4	
<i>Chaetodontidae</i>	Butterflyfishes	<i>Alibangbang</i>	4	NTS	4
<i>Cirrhitidae</i>	Hawkfishes	<i>Ungo-ungo</i>	4	NTS	
<i>Grammistidae</i>	Soapfishes		2	NTS	
<i>Holocentridae</i>	Squirrel/Soldierfishes	<i>Baga</i>	1	1	
<i>Labridae</i>	Wrasses	<i>Lawi-an/tangisan</i>	38	6	
<i>Lethrinidae</i>	Emperors	<i>Dugso</i>	1	1	
<i>Lutjanidae</i>	Snappers	<i>Katambak</i>	3	3	
<i>Mullidae</i>	Goatfishes	<i>Timbungan</i>	4	5	
<i>Nemipteridae</i>	Breams	<i>Silay</i>	3	NTS	
<i>Pinguipedidae</i>	Grubfishes	<i>Tiki-tiki</i>	3	NTS	
<i>Pomacanthidae</i>	Angelfishes	<i>Alibangbang</i>	5	3	
<i>Pomacentridae</i>	Damselfishes	<i>Pata</i>	29	NTS	
<i>Scaridae</i>	Parrotfishes	<i>Mol-mol</i>	5	5	
<i>Scorpaenidae</i>	Scorpionfishes	<i>Lawong/bantol</i>	2	NTS	
<i>Serranidae</i>	Groupers	<i>Pugapo</i>	4	1	
<i>Siganidae</i>	Rabbitfishes	<i>Kitong/danggit</i>	4	4	
<i>Syngnathidae</i>	Pipefishes/Seahorses	<i>Kabayo-kabayo</i>	1	NTS	
<i>Synodontidae</i>	Lizardfishes	<i>Tiki-tiki</i>	2	NTS	
<i>Tetraodontidae</i>	Pufferfishes	<i>Botiti</i>	5	NTS	
Total		25 Families	144	40	4

TS - Target species of commercial value; IS - Indicator species; NTS - Non-target species

Table 3.6. Average catch, catch per unit effort (CPUE), and number of fish species caught during test fishing activities in Olango Island (SUML 1997).

Habitat/Area	Talima	Gilutongan	San Vicente	Pangan-an	Total average	Fishing gear
Seagrass beds						Beach seine, (400 m ²)
Ave. catch (g)	429.5	65.8	258.5	278.9	258.2	
CPUE (kg/manhour)	0.52	0.	0.31	0.34	0.31	
No. of species	21	7	10	13	12.8	
Coral reefs						Multi-meshed set gill net (75 m x 2 m)
Ave. catch (g)	157.5	318	289.1	No catch	254.9	
CPUE (kg/manhour)	0.02	0.05	0.04	-	-	
No. of species	4	5	10	-	6.3	

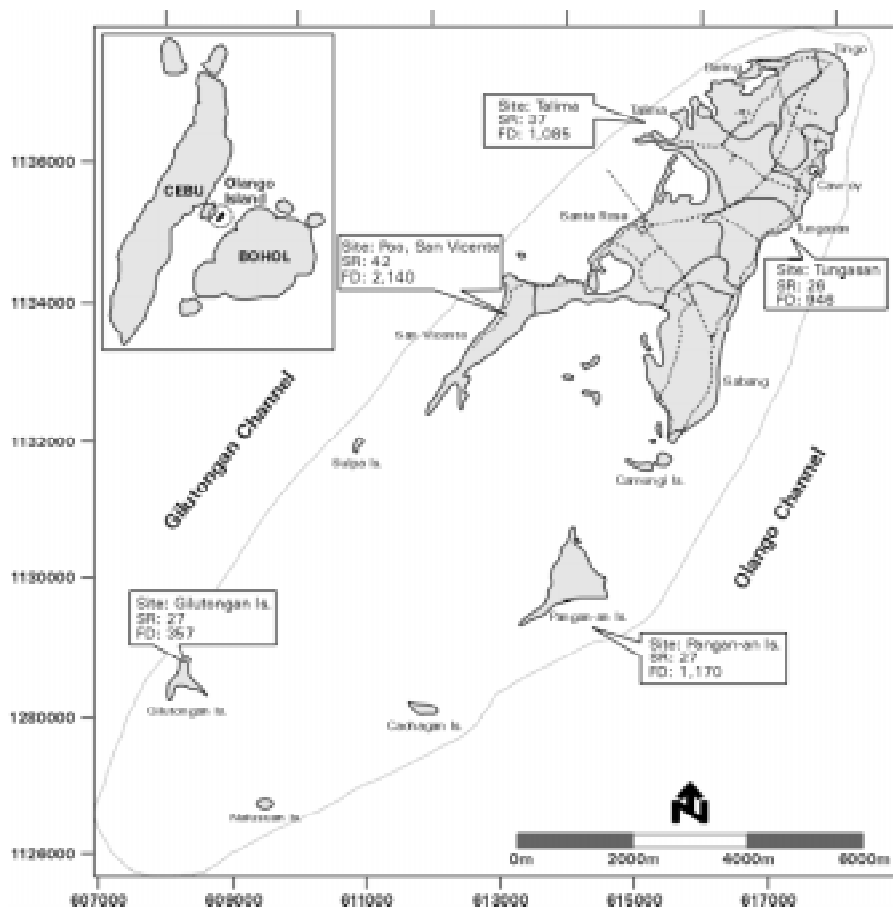


Figure 3.1. Species richness (SR) and fish density (FD) of 5 reef sites around Olango Island and its satellite islets. SR in spp/500 m², while FD in individuals/500 m² (SUML 1997).

Corals and Macroinvertebrates

Olango Island has extensive shallow reef flats, which generally 'drop off' at slope angles of 40-50° to the surrounding depths of Gilutongan and Olango Channels. The coral reef covers an area of 841.5 ha with a mean live coral cover of about 24 percent which is considered 'poor' (SUML 1997). The percentage live coral cover in some of the reef sites around Olango Island is shown in Figure 3.2.

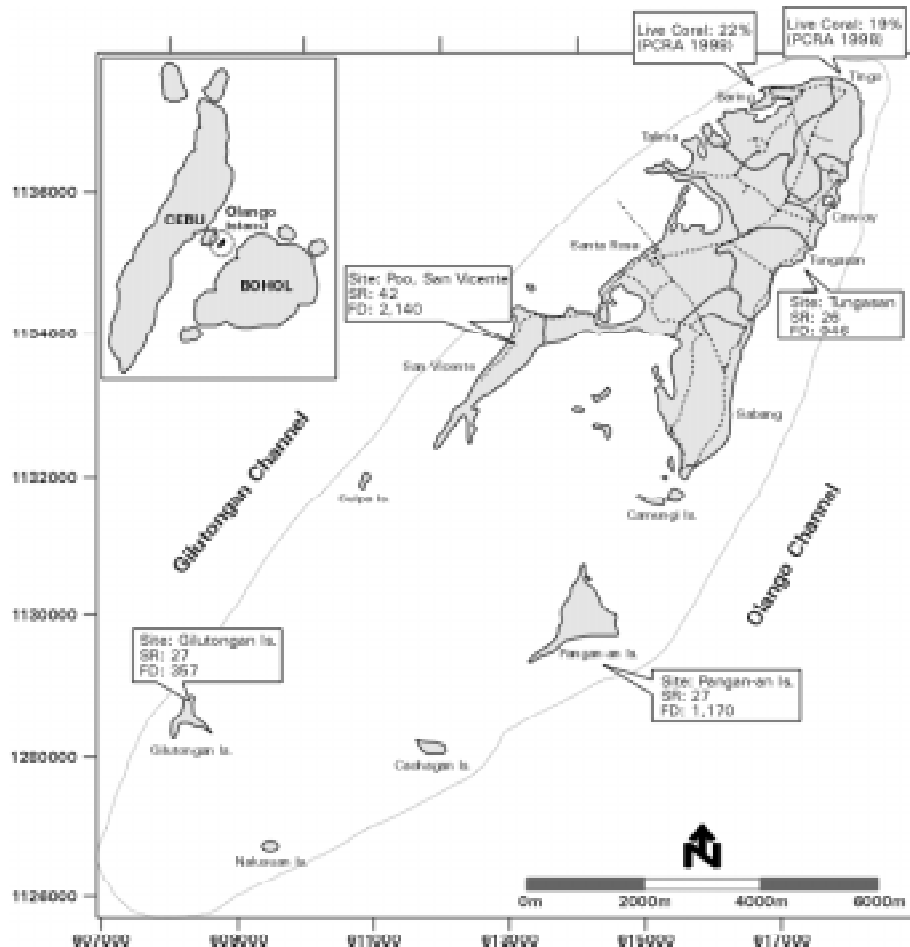


Figure 3.2. Surveyed reef sites around Olango Island (Gomez *et al.* 1981; USC-MBS 1988; SUML 1997; CRMP 1998).

A total of 103 species of scleractinian (reef building) corals, 4 non-scleractinian (non-reef building) species and 4 soft coral species have been recorded to date in the Olango area. The deeper portions of the reefs have relatively higher hard coral cover than the shallow areas. Pangasinan Island has the highest live coral cover at 41.25 percent and the highest number of coral species (Table 3.7). In previous studies (Gomez *et al.* 1981, 1994), the reef fronting Olango Island was classified as "fair" while those of Gilutongan Island was described as "poor".

Table 3.7. Number of coral species per genus at 5 sampling areas around Olango Island and its satellite islets (SUML 1997).

Genera	Poo	Talima	Tungasan	Pangan-an	Gilutongan
Reef building corals					
<i>Acropora</i>	2	5	5	3	4
<i>Astreopora</i>		1			1
<i>Coeloseris</i>	1			1	
<i>Lobophylla</i>	1	1	1	1	2
<i>Cycloseris</i>				1	1
<i>Cyphastrea</i>	2	2	2	2	2
<i>Diaseris</i>				1	
<i>Diploastrea</i>	1		1	1	1
<i>Echinophyllia</i>	1	1			1
<i>Echinopora</i>	1	1	1	1	1
<i>Euphyllia</i>	1	1	1	2	1
<i>Favia</i>	3	3	2	2	4
<i>Favites</i>	2	1	2	2	2
<i>Fungia</i>	1	1	4	6	4
<i>Galaxea</i>	1	1	1	1	1
<i>Gardineroseris</i>				1	1
<i>Goniastrea</i>	2	2	1	1	2
<i>Goniopora</i>			1	1	
<i>Halomitra</i>	1			1	
<i>Herpolitha</i>	2	1	1	1	
<i>Hydnophora</i>	1	1	1	2	1
<i>Leptastrea</i>					
<i>Leptoria</i>	1				1
<i>Leptoseris</i>	1				
<i>Merulina</i>	1	2	1	1	1
<i>Montastrea</i>	1	1	1	3	3
<i>Montipora</i>	1	1	1	4	2
<i>Mycedium</i>	1				
<i>Oxypora</i>	1	1	1	1	1
<i>Pachyseris</i>	2		1	2	2
<i>Pectinia</i>			1	1	1
<i>Physogyra</i>	3	1	2		
<i>Platygyra</i>	1			1	3
<i>Plerogyra</i>	1	2	1		
<i>Pocillopora</i>	3	1	3	2	1
<i>Porites</i>	1	1		2	2
<i>Psammocora</i>		1	2	2	
<i>Pavona</i>	1			3	3
<i>Sandalolitha</i>		1		1	
<i>Scolymia</i>	1		1		
<i>Seriatopora</i>	1	1	1	1	
<i>Stylophora</i>	1	1		1	1
<i>Symphyllia</i>				1	
<i>Trachyphyllia</i>	1	1		1	
<i>Tubastrea</i>	2	1			1
<i>Turbinaria</i>				1	1
n = 46 Total	48	38	40	59	52
Non-reef building corals					
<i>Heliopora</i>	1	1			
<i>Millepora</i>	1	1	1	1	2
n = 2 Total	2	2	1	1	2
Soft corals					
<i>Nephthea</i>		1			
<i>Sarcophyton</i>		1			
<i>Sinularia</i>	1	1	1	1	
<i>Xenia</i>				1	
n = 4 Total	1	3	1	2	0

Assessment surveys by SUML (1997) listed a total of 63 macroinvertebrate species composed of 33 species of mollusks, 19 species of echinoderms, 5 species of sponges, 4 species of crustaceans, and 2 species of cnidarians for Olango.

In the PCRA survey, the participants rated the coral cover of the entire Olango as generally poor to fair at 19 percent, lower than the findings of SUML (1997). The status of coral reefs in Barangay Gilutongan, Santa Rosa, and San Vicente was fair ranging from 27 to 43 percent. Gomez *et al.* (1981, 1994) rated the coral cover of Olango as fair, that of Gilutongan as poor, and Pangan-an as having the highest. Today, Olango's coral reef has poor coral cover (Table 3.8).

Table 3.8. Coral assessment of shallow reef areas of the 11 *barangays* of Olango Island and its satellite islets (CRMP 1998).

Barangay	Live hard coral (%)	Live soft coral (%)	Total live coral cover (%)	Rating
Baring	14	8	22	Poor
Caohagan	11	5	16	Poor
Caw-oy	3	0	3	Poor
Gilutongan	43	0	43	Fair
Pangan-an	6	2	8	Poor
Sabang	7	2	9	Poor
San Vicente	19	8	27	Fair
Santa Rosa	17	17	34	Fair
Talima	10	3	13	Poor
Tingo	10	9	19	Poor
Tungasan	6	7	13	Poor
Average	13	6	19	Poor

Ratings: Excellent (75-100%), Good (50-74.9%), Fair (25-49.9%) and Poor (0-24.9%)

Mangroves

Recent satellite images from National Mapping and Resource Information Agency (NAMRIA) show that the remaining mangrove cover of Olango Island is 366.5 ha, or approximately one-third of its nearshore area (SUML 1997) (Figure 3.3). An inventory by the Protected Areas and Wildlife Bureau (PAWB), DENR-7 in 1988 identified 33 mangrove species and associated species found in Olango. However, a recent survey conducted by SUML in 1997 recorded only 19 mangrove species and associated species. Both surveys found the species *Rhizophora mucronata* present in practically all the mangrove areas visited (Table 3.9).

The decline in the number of mangrove species is indicative of the degree of exploitation by the islanders. But there is also an attempt to reforest the denuded mangrove areas using monospecies stands of *R. mucronata* off the southeastern portion of Olango Island.

PCRA data show that the mangrove forest in Olango is concentrated in the southern portion where the site of OIWS is located.

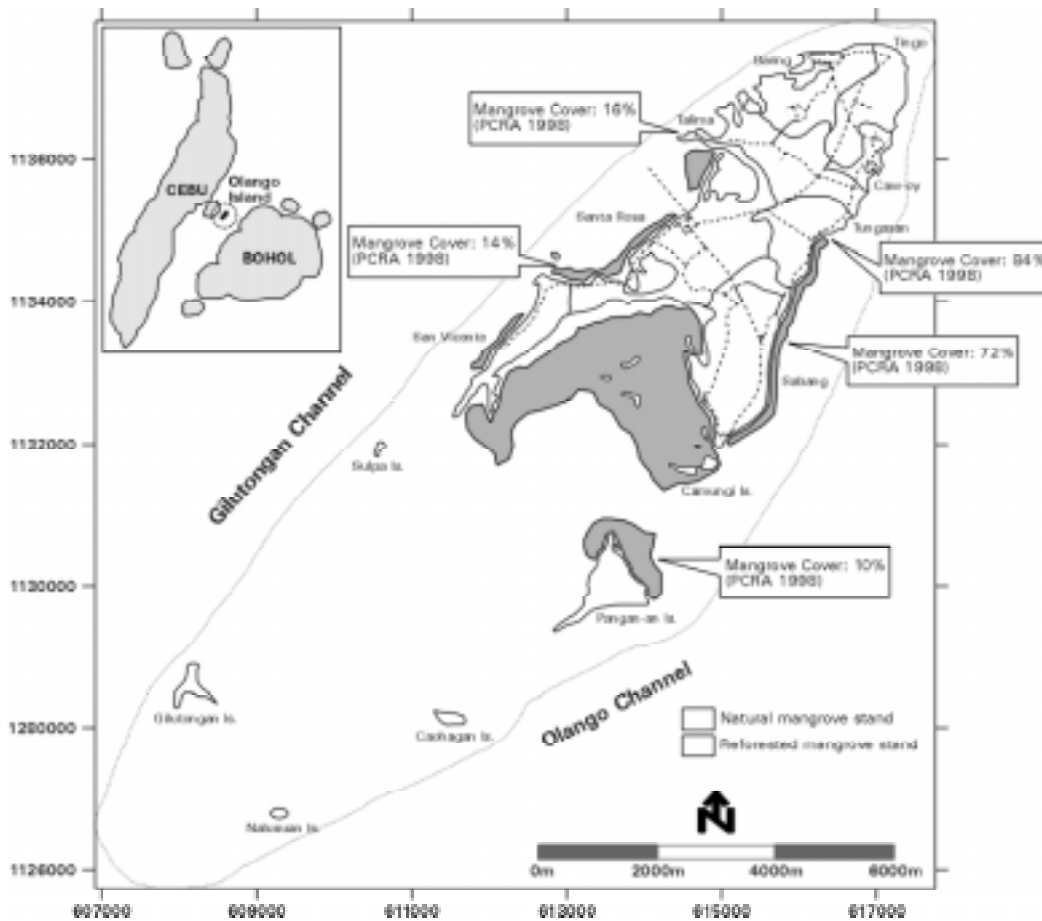


Figure 3.3. Natural and reforested mangrove areas in Olango Island (modified after Magsalay *et al.* 1989 and CRMP 1998).

Extensive sandy mudflats and thick mangrove vegetation (Table 3.10) characterize this area. Among the *barangays*, Tungasan has 84 percent mangrove cover and is in excellent condition, and this is attributed to the reforested area, a project of the DENR Mangrove Stewardship in the early 1990s.

In Sabang, mangrove cover is 72 percent composed of a mixed species of secondary growth mangroves. In the northern *barangays* of Talima and Tingo, which have rugged limestone topography, mangroves occur in small patches, are scattered, or are absent. It is considered poor at 16 percent cover.

OLANGO ISLAND WILDLIFE SANCTUARY (OIWS)

The southern portion of Olango Island is along the path of the East Asian Migratory Flyway where thousands of migratory birds migrate from the northern hemisphere (i.e., Siberia, Northern China, and Japan) to the southern hemisphere (i.e., Australia) and vice versa. The importance of the site to the East Asian Migratory Flyway was discovered in 1987. On 14

Table 3.9. List of mangroves and associated species found Olango Island (PAWD *et al.* 1995; SUML 1997).

Species Name	Local name	PAWB 1995	SUML 1997	Traditional Use
<i>Acanthus ebracteatus</i>	<i>Pagaypay</i>	+		
<i>Acanthus ilicifolius</i>	<i>Pagaypay</i>	+	+	n.k.u. (vegetable prop)
<i>Aegiceras corneculatum</i>	<i>Saging-saging</i>		+	Firewood, fish poison
<i>Aegiceras floridum</i>	<i>Saging-saging</i>	+		Firewood, fish poison
<i>Avicennia alba</i>	<i>Piape laki</i>	+	+	Firewood, medicine
<i>Avicennia lanata</i>	<i>Piape laki</i>	+	+	Firewood, soap-making
<i>Avicennia marina</i>	<i>Piape baye</i>	+	+	Firewood, fodder
<i>Avicennia officinalis</i>	<i>Piape laki</i>	+	+	Firewood, fodder
<i>Barringtonia asiatica</i>	<i>Bito-bito-on</i>		+	Firewood, medicine
<i>Bruguiera cylindrica</i>	<i>Pototan lalaki</i>	+		Firewood, vegetable
<i>Bruguiera gymnorhiza</i>	<i>Busain</i>	+		Firewood seasoning
<i>Ceriops decandra</i>	<i>Malatagal</i>	+		Firewood, tannin
<i>Ceriops tagal</i>	<i>Tangal</i>	+		Firewood, tannin
<i>Dolichandrone spathecea</i>	<i>Tui</i>		+	Firewood, timber
<i>Excoecaria agallocha</i>	<i>Alipata</i>	+	+	n.k.u.
<i>Lumnitzera littoria</i>	<i>Mayoro</i>	+	+	Timber, medicine
<i>Lumnitzera racemosa</i>	<i>Kulasi</i>	+		Firewood, medicine
<i>Osbornia octondata</i>	<i>Tualis</i>	+		Firewood, timber
<i>Pandanus sp.</i>	<i>Pandan</i>		+	Mat weaving
<i>Pempis acidula</i>	<i>Bantigi</i>		+	Firewood, fencing
* <i>Pongamia pinnata</i>	<i>Bani</i>		+	n.k.u.
* <i>Prosopis vidaliana</i>			+	n.k.u.
<i>Rhizophora apiculata</i>	<i>Bakhaw laki</i>	+	+	Firewood, timber, Christmas tree
<i>Rhizophora mucronata</i>	<i>Bakhaw baye</i>	+	+	Firewood, tannin, Christmas tree
<i>Rhizophora stylosa</i>	<i>Bakhaw tigre</i>	+	+	Firewood, timber, Christmas tree
* <i>Scaevola frutescens</i>	<i>Aroma</i>		+	Natural fencing
* <i>Scyphiphora hydrophyllacea</i>	<i>Nilad</i>	+		n.k.u.
<i>Sesuvium portulacastrum</i>		+		Firewood, fencing, Christmas tree
<i>Sonneratia alba</i>	<i>Pagatpat</i>	+		Firewood, fencing, Christmas tree
<i>Sonneratia caseolaris</i>	<i>Pedada</i>	+	+	n.k.u. (shade, food)
* <i>Terminalia catappa</i>	<i>Talisay</i>	+		n.k.u. (woodcraft)
* <i>Thespesia populnea</i>	<i>Banalo</i>	+		n.k.u. (construction, furniture)
* <i>Xylocarpus molluccensis</i>	<i>Piagau</i>	+		

n.k.u. - No known use

* associate species

May 1992, a 920-ha wetland area was officially declared as Olango Island Wildlife Sanctuary (OIWS). Two years later on 8 November 1994, it was designated as the first RAMSAR site in the Philippines in recognition as a wetland area of international importance. The area currently hosts numerous migratory shorebird and waterbird species, some of which are already endangered. PAWD *et al.* (1995) listed 97 species of birds so far known from Olango Island (Table 3.12). Of the total number of species, 48 are migratory, 42 are resident species while the status of the 7 species is uncertain. DENR-PAWD has established a Nature Center in Barangay San Vicente and developed a proposed management plan for the OIWS (Figure 3.4).

Aside from OIWS, there are several other protected areas found in Olango, which are smaller in size and stature. This includes the 15-ha marine sanctuary in Gilutongan

Table 3.10. The percentage cover and status of the mangrove resources of the 11 *barangays* of Olango Island and its satellite islets (CRMP 1998).

Barangay	Percentage live cover	Rating
Baring	0	Not applicable
Caohagan	0	Not applicable
Caw-oy	0	Not applicable
Gilutongan	0	Not applicable
Pangan-an	10	Poor
Sabang	72	Good
San Vicente	36	Fair
Santa Rosa	14	Poor
Talima	16	Poor
Tingo	0	Not applicable
Tungasan	84	Excellent
Average	21	Poor

Ratings: Excellent (76-100%), Good (51-75%), Fair (26-50%), and Poor ($\leq 25\%$)

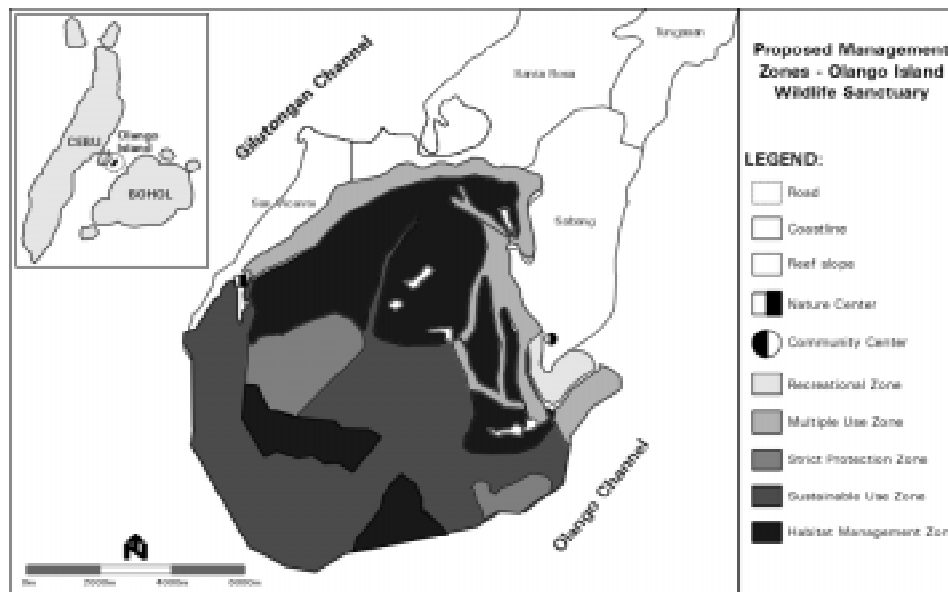


Figure 3.4. Proposed Olango Island Wildlife Sanctuary (OIWS) management zones (PAWB-DENR).

Island, which is now one of the sites frequented by divers and swimmers from Mactan Island. The sanctuary was originally established in 1991 through Municipal Ordinance No. 1 enacted by the Cordova Municipal Council. Recently, the Barangay Council of Gilutongan amended Ordinance No. 1 to include the basic user's fee to generate funds for the effective management of the sanctuary. Other marine sanctuaries like in Nalusuan exist but are not fully functional or have legal problems.

Table 3.11. Transect diagram of coastal resources in Olango Island and its satellite islets (CRMP 1998).

Barangay	Land	Beach	Mangrove	Tidal flat	Seagrass	Coral reef	Oceanic
Baring	coconut, cassava, <i>pandanus</i> , bread fruit, neem tree, mango, jackfruit, banana, bamboo	coconut, <i>talisay</i> , hermit crab, sand	none	sea urchin, trumpet shell, clam, <i>sigay</i> , sea star, strombus	cowrie, damselfish, cardinal fish, sea cucumber	damselfish, cardinalfish, wrasse, parrotfish, catfish, belonids, snapper, spider conch, top shell, giant clam seastar, abalone parrotfish, snapper	fusiliers, sea turtle, silver sides, flying fish
Caohagan Island	coconut, <i>ipil-ipil</i> , <i>pandanus</i> , guava, banana, papaya, <i>gmelina</i> , beach grass, bamboo, <i>ipomea</i> , bird	sand, <i>talisay</i> , <i>pandanus</i> , hermit crab, coconut	none	stingray, parrotfish, wrasse, damselfish, spider conch, strombus, top shell, sea star	cowrie, turret shell, breams, sea cucumber, rabbitfish, mantis shrimp, cardinalfish, catfish, sea urchin, blue crab, barnacle, wrasse	barracuda, fusiliers, grouper, belonids, damselfish, breams, eels, catfish, giant clam, seastar, spider conch, cucumber, butterfly fish, top shell, abalone parrotfish, wrasse	flying fish, belonids, big eye scads, silver sides, mackerel, squid
Caw-oy	bread fruit, cassava, coconut, banana, <i>gmelina</i> , <i>chikos</i> , <i>ipil-ipil</i> , neem tree, tamarind, <i>noni</i>	none (rocky shoreline)	none	damselfish, cardinalfish, wrasse, parrotfish, strombus, spider conch	sea urchin, sea cucumber, eels, cowrie, rabbitfish, seastar	catfish, lionfish, butterflyfish, rabbitfish, seastar, abalone, grouper, spiderfish, giant clam, cowrie, fusiliers, strombus, top shell, algae butterflyfish, parrotfish	fusiliers, sharks, mackerel, dolphin, jacks, squid, flying fish
Gilutongan Island including Nalusuan Island	coconut, aroma, <i>pandanus</i> , papaya, <i>ipil-ipil</i> , para grass, <i>gmelina</i> , <i>noni</i> , beach grass, <i>ipomea</i> , bird	coconut, <i>talisay</i> , hermit crab, sand	none	spider conch, cowrie, strombus, abalone, top shell, damselfish, catfish, cardinalfish, rabbitfish, breams	sea urchin, cowrie, seahorse, seastar, abalone, rabbitfish, catfish, cardinalfish, seaweed, sea cucumber, mantis shrimp	catfish, breams, snapper, cardinalfish, belonids, wrasse, giant clam, barracuda, strombus, top shell, spiderfish, algae, fusiliers, seastar, abalone	mackerel, fusiliers, flying fish, stingray, dolphin, big eye scads, squid
Pangan-an Island	coconut, neem tree, <i>cogon</i> , cassava, <i>pandanus</i> , aroma, <i>gmelina</i> , <i>ipil-ipil</i> , beach grass, <i>ipomea</i> , birds	coconut, <i>talisay</i> , aroma, hermit crab, sand, <i>pandanus</i>	cowrie, crabs, cardinalfish, algae, seastar, clam	abalone, spider conch, <i>nassarius</i> , <i>ipomea</i> , sargassum, sea urchin, catfish, cardinalfish, damselfish, wrasse	cowrie, <i>nassarius</i> , sea cucumber, sea hare, eels, jellyfish, sea urchin, seastar, catfish, rabbitfish, wrasse	damselfish, grouper, cardinalfish, eels, butterflyfish, barracuda, belonids, wrasse, catfish, parrotfish, breams, spider conch, abalone, clam, top shell, giant clam, strombus	fusiliers, mackerel, sharks, sea turtle, big eye scads, squid, flyingfish

Barangay	Land	Beach	Mangrove	Tidal flat	Seagrass	Coral reef	Oceanic
Sabang	coconut, banana, cassava, guava, para grass, papaya, jack fruit, bread fruit, <i>ipil-ipil</i> , bamboo, sugar apple, beach grass, <i>ipomea</i> , noni, birds	sand, <i>talisay</i> , coconut, hermit crab, <i>ipil-ipil</i> , <i>pandanus</i>	crab, <i>imbaw</i> , eels, algae, mudskipper, cardinalfish, sea snake, birds	cowrie, <i>nassarius</i> , sea urchin, sea cucumber, eels, parrotfish, sea hare	cowrie, <i>nassarius</i> , sea hare, filefish, sea horse, crab, sea urchin, catfish, cardinalfish	parrotfish, wrasse, rabbitfish, butterflyfish, catfish, grouper, belonids, breams, snapper, lionfish, squid, octopus, eels, damselfish	flying fish, belonids, jacks, big eye scads, mackerel, sea turtle, sharks, dolphin
San Vicente	coconut, papaya, bread fruit, guava, <i>noni</i> , banana, <i>pandanus</i> , mango, cassava, para grass, sugar apple, <i>ipomea</i> , beach grass, <i>aroma</i> , birds	sand, <i>talisay</i> , coconut, <i>ipil-ipil</i> , <i>pandanus</i> , hermit crab	crab, cardinalfish, shrimp, clam, birds, <i>nassarius</i> , sea snake, algae, mudskipper	seastar, spider conch, <i>nassarius</i> , clam, algae, sea urchin, sea cucumber, damselfish, cardinalfish	sea cucumber, sea urchin, seastar, cowrie, turret shell, rabbitfish, parrotfish	sea urchin, sea cucumber, giant clam, spider conch, top shell, eels, damselfish, butterflyfish, lionfish, snapper, parrotfish, breams, belonids, barracuda	big eye scads, jacks, mackerel, barracuda, sea turtle, dolphin, squid, flying fish
Santa Rosa	acacia, bread fruit, coconut, <i>aroma</i> , bamboo, banana, <i>talisay</i> , jack fruit, cassava, beach grass	<i>talisay</i> , coconut, <i>ipil-ipil</i> , <i>aroma</i> , <i>pandanus</i> , hermit crab	seastar, crab, mudskipper, clam, cardinalfish, algae	damselfish, cardinalfish, bream, algae, sea cucumber, seastar	cowrie, <i>nassarius</i> , sea hare, filefish, sea horse, crab, sea urchin, catfish, cardinalfish	squid, eels, damselfish, fusiliers, abalone, parrotfish, lionfish, butterflyfish, spider conch, turret shell	mackerel, fusiliers, sea turtle, dolphin, flyingfish, belonids, barracuda
Talima	bamboo, banana, mango, coconut, bread fruit, sugar apple, guava, cassava, <i>noni</i> , beach grass, <i>pandanus</i>	none (rocky shoreline)	birds, crab, cardinal, clam, damsel fish, sea snake, mudskipper	sea urchin, sea cucumber, damsel fish, bream, cardinal fish, sea star, spider conch	cowrie, <i>nassarius</i> , sea hare, file fish, sea horse, crab, sea urchin, cat fish, cardinal fish	grouper, lionfish, giant clam, abalone, butterflyfish, damselfish, fusiliers, barracuda, belonids, squid, seastar	flyingfish, belonids, barracuda, big eye scads, mackerel, squid, dolphin, sea turtle
Tingo	<i>pandanus</i> , <i>noni</i> , cassava, sugar apple, coconut, jack fruit, bread fruit	none (rocky shoreline)	none	<i>pata</i> , <i>moong</i> , <i>balat</i> , <i>kuros-kuros</i> , <i>dunsol</i> , <i>samo</i> , <i>lumban</i>	sea urchin, cowrie, crab, sea horse, rabbitfish	butterflyfish, damselfish, cardinalfish, catfish, snapper, fusiliers, giant clam, abalone	big eye scads, flyingfish, barracuda, mackerel, jacks, silversides, dolphin
Tungasan	<i>aroma</i> , cassava, coconut, beach grass, <i>gmelina</i>	<i>talisay</i> , <i>aroma</i> , coconut	algae, cardinalfish, crab, damselfish	<i>pangan</i> , <i>ibis</i> , <i>kapal</i> , <i>kuros-kuros</i> , <i>pata</i> , <i>nasa</i> , <i>lumban</i>	rabbitfish, parrotfish, damselfish, cowrie, catfish, sea	giant clam, abalone, catfish, squid, snapper, cowrie, parrotfish	belonids, sharks, barracuda, mackerel, dolphin

Table 3.12. Birds found in Olango Island Wildlife Sanctuary (DENR-7 1995).

Scientific name	Common name	Status	Abundance
<i>Acrocephalus arundinaceus</i>	Great reed warbler +	R	3
<i>Actitis hypoleucos</i>	Common sandpiper	P/N	3
<i>Alcedo atthis</i>	Common kingfisher	R	1
<i>Anas clypeata</i>	Northern shoveler	N/V	1
<i>Anas querquedula</i>	Garganey	N/P	1
<i>Anthus gustavi</i>	Pechora pipit	R/P	3
<i>Anthus novaeseelandiae</i>	Richard's pipit	R	3
<i>Aplonis panayensis</i>	Asian glossy starling	R	3
<i>Ardea cinerea</i>	Grey heron	N/V	1
<i>Ardea purpurea</i>	Purple heron	R/V	1
<i>Arenaria interpres</i>	Ruddy turnstone	P/N	3
<i>Asio flammeus</i>	Short-eared owl	R	1
<i>Bubulcus ibis</i>	Cattle egret	R/V	1
<i>Butorides striatus</i>	Green-backed heron	R	3
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	P/N	1
<i>Calidris alba</i>	Sanderling	P/N	2
<i>Calidris canutus</i>	Red knot	P/N	3
<i>Calidris ferruginea</i>	Curlew sandpiper	P/N	3
<i>Calidris ruficollis</i>	Rufous-necked stint	P/N	3
<i>Calidris tenuirostris</i>	Great knot	P/N	3
<i>Centropus bengalensis</i>	Lesser coucal	R	2
<i>Centropus sinensis</i>	Greater coucal	R	2
<i>Centropus viridis</i>	Philippine coucal	R	2
<i>Cettia diphone</i>	Oriental bush warbler	R/P	2
<i>Ceyx lepidus</i>	Variable dwarf-kingfisher	R	1
<i>Chalcophaps indica</i>	Emerald dove	R	2
<i>Charadrius alexandrinus</i>	Kentish plover	P/N	3
<i>Charadrius dubius</i>	Little ringed plover	P/N/V	1
<i>Charadrius leschenaultii</i>	Greater sand-plover	P/N	3
<i>Charadrius mongolus</i>	Lesser sand plover	P/N	3
<i>Charadrius peronii</i>	Malaysian sand plover	P/N	1
<i>Chlidonias hybrida</i>	Whiskered tern	P/N	3
<i>Chlidonias leucoptera</i>	White-winged black-tern	P/N	2
<i>Cisticola exilis</i>	Bright-capped cisticola	R	2
<i>Copsychus saularis</i>	Oriental magpie-robin	R	3
<i>Corvus macrorhynchos</i>	Large-billed crow	R	2
<i>Coturnix chinensis</i>	Blue-breasted quail	R	1
<i>Cuculus saturatus</i>	Oriental cuckoo	P	2
<i>Egretta eulophotes</i>	Chinese egret*	P/N/E	3
<i>Egretta garzetta</i>	Little egret	P/N	3
<i>Egretta intermedia</i>	Intermediate egret	R	1
<i>Egretta sacra</i>	Reef egret	R/V	1
<i>Eudynamis scolopacea</i>	Koel	R	2
<i>Falco peregrinus</i>	Peregrine falcon	R/V	1
<i>Fregata ariel</i>	Lesser frigate-bird	P/V	1
<i>Gallinago megala</i>	Swinhoe's snipe	P/N/V	1
<i>Gelochelidon nilotica</i>	Gull-billed Tern	P/N	3
<i>Geopelia striata</i>	Zebra dove	R	3
<i>Greygone sulphurea</i>	Golden-bellied flycatcher	R	2
<i>Haematopus ostralegus</i>	Palaearctic oyster-catcher	L/V	1
<i>Halcyon chloris</i>	White-collared kingfisher	R	3
<i>Heteroscelus brevipes</i>	Grey-tailed tattler	P/N	3
<i>Hirundo daurica</i>	Red-rumped swallow	R/P	2
<i>Hirundo rustica</i>	Barn swallow	P	3
<i>Hirundo tahitica</i>	Pacific swallow	R/P	3
<i>Hypsipetes philippinus</i>	Philippine bulbul	R	3
<i>Ixobrychus sinensis</i>	Yellow bittern	R	2

Continued

Table 3.12 Continued

Scientific name	Common name	Status	Abundance
<i>Lalage nigra</i>	Pied triller	R	3
<i>Lanius cristatus</i>	Brown shrike	P	3
<i>Lanius schach</i>	Long-tailed shrike	R	2
<i>Larus crassirostris</i>	Japanese gull	P/V	1
<i>Larus ridibundus</i>	Common black-headed gull	P/N	3
<i>Limicola falcinellus</i>	Broad-billed sandpiper	P/N/V	1
<i>Limnodromus semipalmatus</i>	Asiatic dowitcher**	P/N	3
<i>Limosa lapponica</i>	Bar-tailed godwit	P/N	3
<i>Limosa limosa</i>	Black-tailed godwit	P/N	2
<i>Lonchura malacca</i>	Chestnut munia	R	3
<i>Loriculus philippensis</i>	Colasisi***	R	1
<i>Monticola solitarius</i>	Blue rocktrush	P	1
<i>Motacilla cinerea</i>	Grey wagtail	R/P	2
<i>Muscicapa griseisticta</i>	Grey-streaked flycatcher +	R/P	2
<i>Nectarinia jugularis</i>	Olive-backed sunbird	R	3
<i>Numenius arquata</i>	Western curlew	P/N	3
<i>Numenius madagascariensis</i>	Far-eastern curlew	P/N	3
<i>Numenius minutus</i>	Little curlew	N/V	1
<i>Numenius phaeopus</i>	Whimbrel	P/N	2
<i>Passer montanus</i>	Eurasian tree sparrow	R	3
<i>Phalaropus lobatus</i>	Red-necked phalarope	P/N/V	1
<i>Phapitreron leucotis</i>	White-eared brown fruit dove	R	2
<i>Phylloscopus cebuensis</i>	Lemon-throated leaf-warbler	R	2
<i>Pluvialis fulva</i>	Pacific golden plover	P/N	3
<i>Pluvialis squatarola</i>	Grey plover	P/N	3
<i>Pycnonotus goiavier</i>	Yellow-vented bulbul	R	3
<i>Rallus philippensis</i>	Buff-banded rail	R	2
<i>Rallus torquatos</i>	Barred rail	R	2
<i>Rhipidura javanica</i>	Pied fantail	R	3
<i>Saxicola caprata</i>	Pied buschat	R	3
<i>Sterna albifrons</i>	Little tern	R/P	3
<i>Sterna hirundo</i>	Common tern	P/N	3
<i>Sterna sumatrana</i>	Black-naped tern	R/V	1
<i>Streptopelia bitorquata</i>	Island collared-dove	R	2
<i>Streptopelia chinensis</i>	Spotted dove	R	3
<i>Tringa glareola</i>	Wood sandpiper	P/N/V	1
<i>Tringa nebularia</i>	Common greenshank	P/N	3
<i>Tringa stagnatilis</i>	Marsh sandpiper	P/N/V	1
<i>Tringa totanus</i>	Common redshank	P/N	3
<i>Xenus cinereus</i>	Terek sandpiper	P/N	3

Legends:

- * = Endangered species
- ** = Rare, near threatened species
- *** = Needs verification, probably cage escapee
- + = Terrestrial birds not found in the Birds of the Philippines (1991)
- R** = resident, present all year
- P** = passage migrant, regularly passes through the country on its migration between its breeding and non-breeding areas
- N** = non-breeding winter visitor, presumed not to breed but remains in the country for several months and breeds elsewhere
- L** = little known, status is little known but which is recorded regularly in the country
- E** = endangered
- V** = vagrant, accidental visitor in the sanctuary
- 1** = very scarce, fewer than 5 records
- 2** = uncommon resident or annual visitor, seen fairly regularly
- 3** = fairly common to abundant

SUMMARY

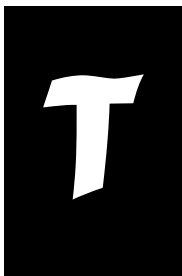
With its limited arable lands, Olango's main resource base is from the marine environment, which includes relatively extensive coral reef, seagrass, and mangrove areas as well as the surrounding municipal waters. Because of this, it is inevitable that many islanders traditionally derive their income from the sea. However, like many other areas in the Philippines, during the past years, these resources have been dwindling caused by the interactions of various factors notably:

- the increasing population *vis-a-vis* the carrying capacity of Olango
- a limited natural resource base
- worsening economic and social conditions
- policy biases which encourage resource exploitation rather than conservation.

Consequently, Olango's environment and natural resources are currently in varying states of degradation. Olango is fortunate to have the 920-ha Olango Island Wildlife Sanctuary, the first Ramsar site in the Philippines. Olango has been able to sustain itself despite being resource poor. However, until when is this possible? The answer depends on how the islanders manage and rehabilitate their remaining natural resources.

Chapter 4

SOCIOPOLITICAL PROFILE



This chapter presents an overview of the sociopolitical structure of Olango Island and its satellite islets, their demography, the people and their way of life, and the social services available to them. This information is important in the formulation of a management plan for the island. More specific details of each *barangay* are given based on the survey results of the PCRA conducted in 1998.

POLITICAL/ADMINISTRATIVE BOUNDARIES

Olango and its satellite islets are under the jurisdiction of 2 local government units (LGUs), namely, the City of Lapu-Lapu and the Municipality of Cordova. The main island of Olango is composed of 8 *barangays* as well as the island *barangays* of Pangan-an and Caohagan, which are under the administration of Lapu-Lapu City. Gilutongan and Nalusuan Islands both within Barangay Gilutongan, are under the jurisdiction of the Municipality of Cordova. Compared to many municipalities of Cebu Province, Olango Island is larger both in terms of area and population. This may be one reason why there have been proposals by some government officials and politicians to transform Olango Island and its satellite islets into a separate municipality (Santos *et al.* 1997a).

Although the main island of Olango is classified as an “urban area” because of its political setup, Remedio and Olofson (1988a) classify Olango Island as an overcrowded rural island with superficial urban characteristics and has been created by conscientious city government officials to bring it into the city administration and service network.

The City of Lapu-Lapu is represented on the main island of Olango through a “mini city hall”, which is currently headed by an Officer-in-Charge whose main function is to

ensure that government projects, such as road maintenance, are being implemented, and that appropriate licensing fees and taxes are collected. Most government works and services (i.e., land assessment, income tax collection, civil registry, etc.) are conducted on the "mainland" of Mactan Island where the seat of the city government is located. This current arrangement illustrates that politically, Olango is very much dependent on the mainland for these public services.

DEMOGRAPHICS

Population size, density, distribution

Olango and its satellite islets had a total population of 21,928, composed of 4,382 households in 1995 (NSO 1995). The average population density of Olango is 34.2 individuals per ha or 3,420 per km², with Gilutongan Island having the highest density of all the *barangays* at 96.8 individuals per ha (Table 4.1).

Table 4.1 Population, households, and area of the *barangays* of Olango Island and its satellite islets (NSO 1995 and City Health Department, Lapu-Lapu City).

Barangays	Land area (ha)	No. of households	Total population	City health population	Population density (per ha)
Cordova					
Gilutongan Island (including Nalusuan Island)	15.3	202	1,061	1,102	97
Lapu-lapu City					
Baring	91.4	422	2,393	2,686	22
Caohagan Is.	4.5	67	342	340	66
Caw-oy	42.3	199	1,002	1,218	35
Pangan-an Is.	46.1	251	1,229	1,677	24
Sabang	195.3	716	3,920	4,065	19
Santa Rosa	69.5	457	2,392	2,475	35
San Vicente	215.8	445	2,409	2,702	11
Talima	168.3	591	3,310	3,984	25
Tingo	96.3	454	2,449	2,876	26
Tungasan	86.2	271	1,421	1,686	17
Total/Average	1,031	4,075	21,928	24,811	280

Growth Rate

A 1990 survey by Flieger (1994) revealed that all *barangays* in Olango have a fertility rate that is above average for Cebu province (0.575) in terms of child/woman ratio, with Tungasan and Talima as the most fertile *barangays* in Lapu-Lapu City for that year. In terms of population growth, between 1980 and 1990, the same source revealed that none of the *barangays* exhibited high population growth due to migration. There was a significant deficit of young adults, since many left the island for Mactan, Cebu, or Manila. Only Barangays Talima and Baring were above the provincial average growth of between 25 and 30 percent for this 10-year period respectively with both *barangays* showing no net migration.

Household Information

Based on a 1988 household survey involving 10 percent of Olango's total population sampled, all household dwellings were classified as "single family houses", 86 percent of which are nuclear families, and 14 percent are extended. The inclusion of a grandparent or grandchild is the most common mode of extension (Remedio and Olofson 1988b).

Age and Gender Composition

Data gathered by the Lapu-Lapu City health workers in 1997 showed that gender composition in Olango Island is divided almost equally between the 2 sexes. This finding coincided with that of Remedio and Olofson (1988b), in which there were 98.54 males for every 100 females. The population of Olango is dominated by young adults with age ranging from 14 to 49 years old (Figure 4.1). This is followed by those whose age range is 14 years and below. Next are those belonging to the age range of 50 to 65 followed by the elderly, 65 and above. These data indicate that the majority of the population in Olango and its satellite islets belong to the workforce class and youth.

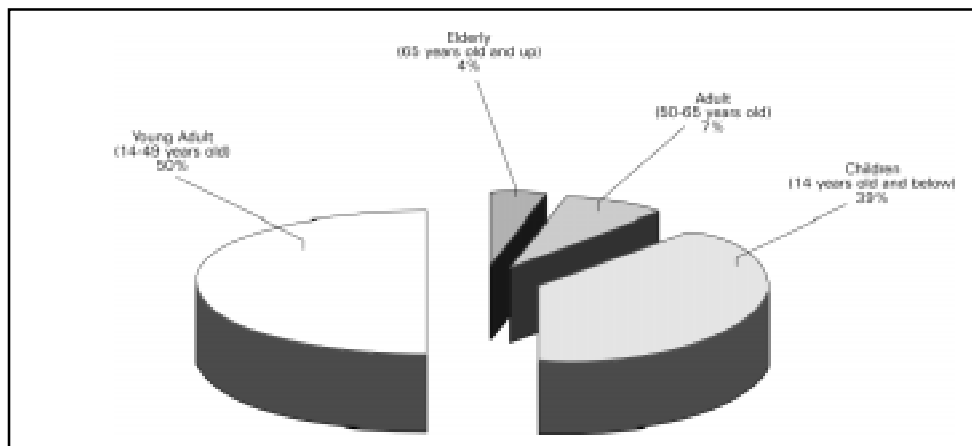


Figure 4.1. Population age structure in Olango Island and its satellite islets (Olango Health Profile 1997; Remedio and Olofson 1988b).

Education

The educational level of Olango residents can be considered typical of many of the rural areas of the Philippines. Elementary schools are found in all *barangays* and 4 high schools operating in 4 *barangays*. At present, there are no college or vocational courses being offered in the island.

Remedio and Olofson (1988b) reported a very low number of professional and technically trained individuals among the islanders and the median in terms of years of schooling is in the elementary level. Recent interviews with 172 respondents by SUML (1997) showed no improvement from 1988 in which 10.5 percent of the respondents had no formal schooling. While 70 percent were able to attend some elementary school, only

23 percent of these respondents finished grade 6, 15 percent reached high school, and 2.3 percent attended college. Only 1 percent of those interviewed had vocational education (Figure 4.2). Barangays Caw-oy and Tungasan have the highest number of respondents with no formal education or do not have any schooling.

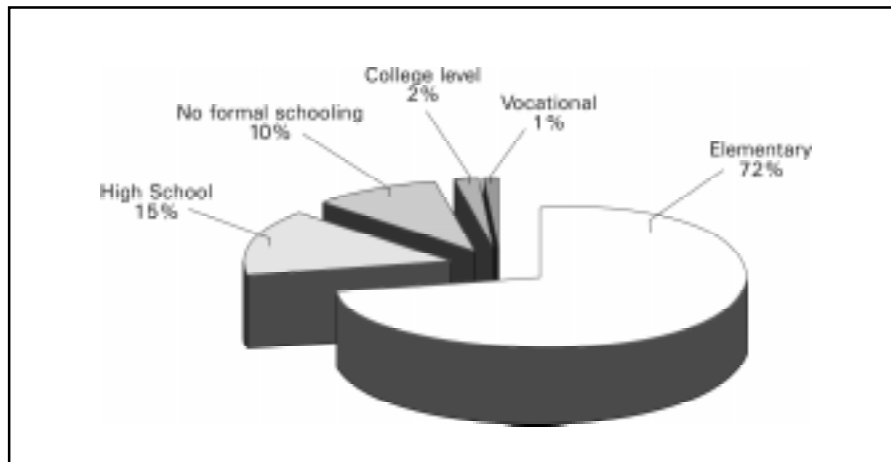


Figure 4.2. Educational profile of Olango Island and its satellite islets (Olango Health Profile 1997; Remedio and Olofson 1988b).

In contrast, data from the PCRA survey (Table 4.2) showed an improvement in the level of education among the islanders today compared to the time of their grandparents and parents. The majority of PCRA participants finished high school, but still very few reached college. This improvement is attributed to the establishment of 3 public high schools with 1 offering evening classes. College education is still beyond the reach of most Olango residents due to the distance to be travelled, high tuition fees, and other expenses. Instead, males go fishing with their fathers and females work as domestic helpers outside the island.

Table 4.2. Educational attainment in Olango Island (CRMP 1998).

Barangay	Educational attainment
Baring	Elem - 30%; H.S. - 60%; Coll. - 10%
Caohagan	Elem - old gen. 30%; H.S. - young gen. 70%
Caw-oy	Elem - elderly; H.S. level - old gen.; H.S. grad. - youth
Gilutongan	Elem grad.- 5%; elem level - 40%; H.S. grad. - 5%; H.S. level - 30%; Coll grad - 10%; Coll. Level - 10%
Pangan-an	Elem - elderly and older gen.; H.S. - youth
Sabang	Elem - elderly 10%; H.S. - old gen. 20%; Coll. - youth 70%
San Vicente	Elem - elderly; H.S. level - old gen.; H.S. grad. - youth
Santa Rosa	Elem - 20%; H.S. - 35%; Coll. - 25%; Prof. - 20%
Talima	Elem - 50%; H.S. - 35%; Coll. - 15%
Tingo	Elem - 20%; H.S. - 70%; Coll. - 10%
Tungasan	Elem - elderly 10%; H.S. - old gen. 20%; Coll. - youth 65%; Prof.- 5%

Livelihood and Annual Income

The traditional occupations of Olango residents are fishing and coastal-related activities such as shellcraft, aquarium fish collection, boat operations, and seaweed farming (Remedio and Olofson 1988b; SUML 1997; CRMP 1998). Other sources of income include rainfed farming, personnel services, livestock raising, small enterprise (*sari-sari* store) and, recently, various types of employment from tourism activities (Table 4.3).

Table 4.3. Livelihood activities in Olango Island and its satellite islets (CRMP 1998).

Barangay	Livelihood
Baring	Fishing, shellcraft, boat ferry service, labor
Caohagan	Fishing, quilting, tourist vending, shellcraft
Caw-oy	Fishing, shellcraft, farming
Gilutongan	Seaweed (<i>guso</i>) culture, tourist vending, fishing, shellcraft
Pangan-an	Fishing, <i>sari-sari</i> store, shellcraft
Sabang	Fishing, shellcraft
Santa Rosa	Fishing - 40%, shellcraft - 20%, govt. employee - 5%, farmer - 5%, boatman - 3%, laborer - 6%, business - 10%, driver - 11%
Tingo	Fishing (<i>dayo</i>) and local - 60%, shellcraft, fish vending, mat weaving, gleaning, <i>karenderia</i> - 4%
Tungasan	Fishing, shellcraft, farmer, <i>sari-sari</i> store

Remedio and Olofson (1988b) reported that about 76 percent of surveyed incomes were at or below the poverty threshold of PhP4,000 per month, with the median annual household income also well below the poverty threshold. Presented in Table 4.4 is the livelihood income range of each *barangay* gathered by SUML in 1997. The survey found that income derived from fishing is lower compared to that from salaries, business, and skilled labor (Figure 4.3).

Table 4.4. Overall income distribution (%) of some respondents in Olango Island and its satellite islets. Values in parenthesis are number of respondents (SUML 1997).

Monthly income range (PhP)	Baring (N = 27)	Caohagan (N = 6)	Caw-oy (N = 5)	Gilutongan (N = 36)	Pangan-an (N = 41)	Sabang (N = 30)	Tingo (N = 37)	Tungasan (N = 3)
< 500	12	60	20	28	33	27	23	40
501 – 1,000	18	30	80	33	23	19	32	20
1,001 – 2,000	1	10		28	33	23	16	20
2,001 – 3,000	21			25	77	19	68	20
3,001 – 4,000	6			55	38	39	68	
4,001 – 5,000	3			28		39	91	
> 5,000	3			28		39	68	

US\$1 = PhP26 in 1997.

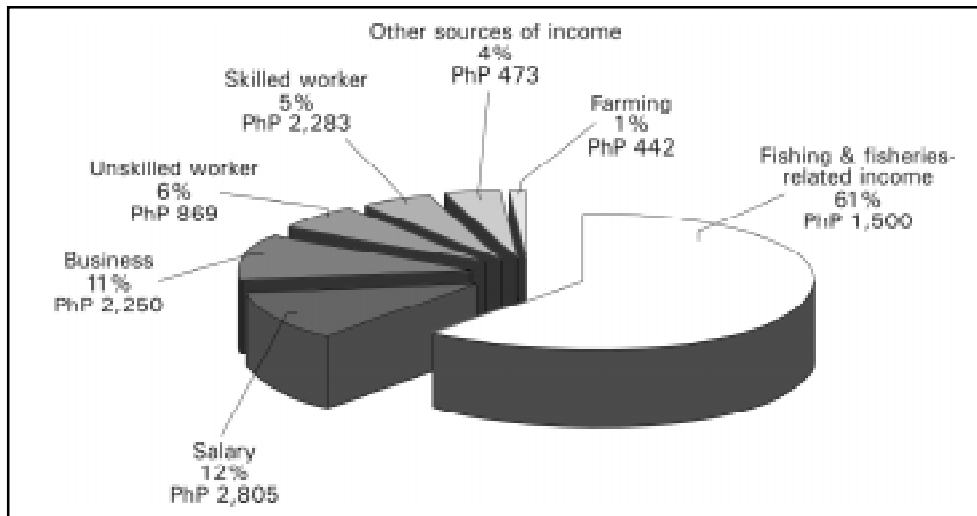


Figure 4.3. Monthly average income (in 1997 pesos) of some *barangays* in Olango Island and its satellite islets (SUML 1997).

OTHER ASSETS AND HOUSEHOLD CONVENIENCES

Acquisition of furniture (i.e., living room and dining set) can be considered an economic indicator, as the gradual acquisition of these items is parallel to an increase in income. At least 20 percent of the residents surveyed have 1 piece of furniture (Figure 4.4). The possession of an audio appliance is perceived to be a necessity rather than a luxury in most homes. Nineteen percent have radios, stereos, karaokes, and cassette players.

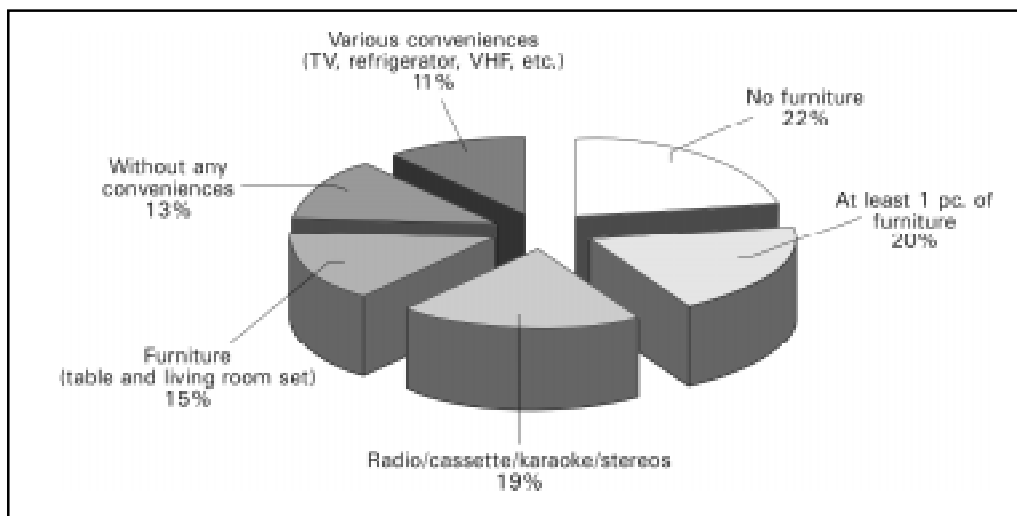


Figure 4.4. Household conveniences profile of Olango Island and its satellite islets (modified from SUML 1997).

Apart from listening to news and weather forecast, the audio appliances are also a common source of entertainment (SUML 1997). Aside from radios, 13 percent have various appliances, such as refrigerator, TV, and VCR, etc., while 15 percent are without such conveniences.

Agricultural Land and Livestock/Poultry Ownership

In Olango Island, most agricultural lots are under 1 ha in average size (Remedio and Olofson 1988b). There is inequality in landholdings; the top 25 percent of the households own 73 percent of the land while the bottom 25 percent are landless. The majority of those who farm, however, do own their respective lands. But in Barangays Tingo, Baring, Pangan-an, and Gilutongan Island, ownership of agricultural land is non-existent.

Results of the 1998 PCRA showed that 80 to 90 percent of the surveyed participants do not own land. A few prominent families in the area own most of the lands, including wealthy outsiders who have developed some areas into beach resorts or vacation houses. Of the 11 *barangays*, only the residents of Barangays Tungasan and Caw-oy own their land (Table 4.6). This percentage is higher compared to the data from the SUML (1997) study where of the 188 respondents, only 59 percent owned their residential lot, 89 percent owned their house, and 11 percent are either renting or staying with relatives.

Table 4.5. House construction materials in Olango Island and its satellite islets (CRMP 1998).

Barangay	House type
Baring	Concrete - 30%, "nipa" - 70%
Caohagan	Coco lumber with GI, concrete
Caw-oy	Coco lumber with GI, concrete
Gilutongan	Coco lumber with GI, concrete
Pangan-an	Coco lumber with GI, "nipa", "amakan"
Sabang	Concrete, "nipa"
San Vicente	Coco lumber with GI, concrete, "amakan"
Santa Rosa	Concrete - 52%, "nipa" - 48%
Talima	Coco lumber with GI - 70%, concrete - 15%, "nipa" - 15%
Tingo	Semi-concrete - 75%, "nipa" - 25%
Tungasan	Semi-concrete, "nipa"

Only 2 agricultural crops predominate, namely cassava and corn, which are seasonally grown for household consumption and are rarely sold (Remedio and Olofson 1988b). Half of the population are into livestock or poultry raising.

Settlements (Type and Ownership)

The majority of the Olango population live under very basic housing conditions with no running water or bathroom facilities. Fifty-four percent of the houses are constructed from light materials and 35.4 percent are constructed from semi-permanent materials, such as

bamboo, coco lumber, and *nipa* thatch structures. There are also a number of homes constructed of more permanent materials, such as concrete and wood with corrugated iron roofing (Table 4.5 and Figure 4.5A).

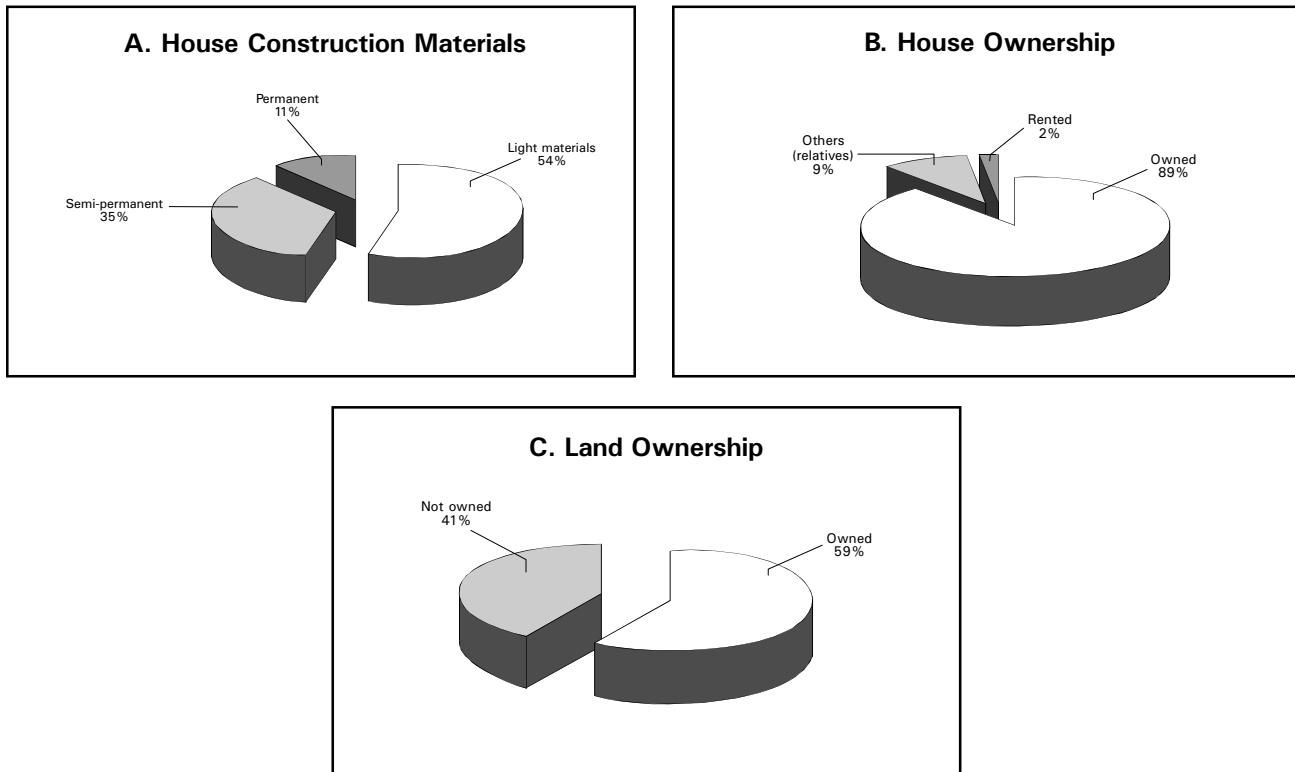


Figure 4.5. Settlement type profile: A. house construction materials, B. house ownership, and C. land ownership in Olango Island (modified from SUML 1997).

In addition to a sleeping room, most houses have a living/dining area and cooking is often done on lean structures outside. Bathing is by 'dip and pour' with no running water and again mostly done outside the house. The PCRA reported that only about 18 percent of the households in Olango have water sealed toilet facilities. Most residents use the shallow seas or mudflats for defecating (Table 4.6).

HEALTH AND MEDICAL CARE

Olango islanders are fortunate in terms of health care since most of the basic health services of the city government of Lapu-Lapu City are available to them. This includes health centers in all *barangays* and a 10-bed capacity hospital (Santa Rosa Hospital) located at Barangay Santa Rosa (Amores 1988). The current government medical personnel include 2 doctors, 2 nurses, 2 midwives, and 1 medical technician. For serious medical conditions, Olango residents go to Lapu-Lapu Hospital or Vicente Sotto Memorial Hospital (CRMP

1998). Almost all of the health programs of the government are being implemented in the island. The common illnesses among Olango residents vary with age. Children usually catch colds, fever, and diarrhea while the women's major complaints are fever, cough, and headaches. Some seek medication for arthritis, rheumatism, and tuberculosis (Table 4.7).

Table 4.6. Land and toilet facilities ownership in Olango Island and its satellite islets (CRMP 1998).

Barangay	Land ownership (%)	Toilet facilities ownership (%)
Baring	80 - landless; 20 - owned	30
Caohagan	95 - outsider; 5 - local	4
Caw-oy	majority own the lot	10
Gilutongan	70 - outsider (resort); 30 - local	3
Pangan-an	90 - outsider; 10 - local	10
Sabang	majority have no lot	30
San Vicente	80 - outsider; 15 1fam.(locals)	6
Santa Rosa	prominent families	40
Talima	5 prominent families	20
Tingo	majority have no lot, owned by few locals	30
Tungasan	75 - local; 25 - outsider	12

Table 4.7. Common health problems among children, adults, and elderly in Olango Island and its satellite islets (CRMP 1998).

Barangay	Health-related sickness
Baring	Children - cough, colds, fever; Women - cough, colds, fever; Elderly - T.B., arthritis, asthma, high blood
Caohagan	Children - cough, colds, fever, worm, diarrhea; Women - gas pains, headache; Elderly - arthritis
Caw-oy	Children - fever, measles, diarrhea; Women - fever, cough; Elderly - arthritis, rheumatism
Gilutongan	Children - fever, measles, diarrhea; Women - fever, death by birth; Elderly - rheumatism and gas pains
Pangan-an	Children - cough, colds, diarrhea; Women - asthma; Elderly - T.B., arthritis, asthma
Sabang	All - cough, fever
San Vicente	Children - asthma, diarrhea, fever; Women - arthritis, muscle pains; Elderly - arthritis, asthma
Santa Rosa	Children - cough, colds, diarrhea; Women - anemia, hypertension, gas pains; Elderly - heart failure, ulcer
Talima	Children - cough, colds, diarrhea; Women - cough, headache, goiter; Elderly - arthritis, hypertension, diabetes
Tingo	Children - cough, malnourished, fever; Women - cough, fever; Elderly - T.B., arthritis
Tungasan	Children - cough, colds, fever, diarrhea; Women - cough, colds, fever; Elderly - T.B.

Mortality rate among Olango residents is low with pneumonia as the leading cause of death (29 percent) followed by heart disease (18 percent) (Figure 4.6A). Other common illnesses include acute respiratory infections (39 percent), skin problems (17 percent), and nutritional deficiency (15 percent) (Figure 4.6B).

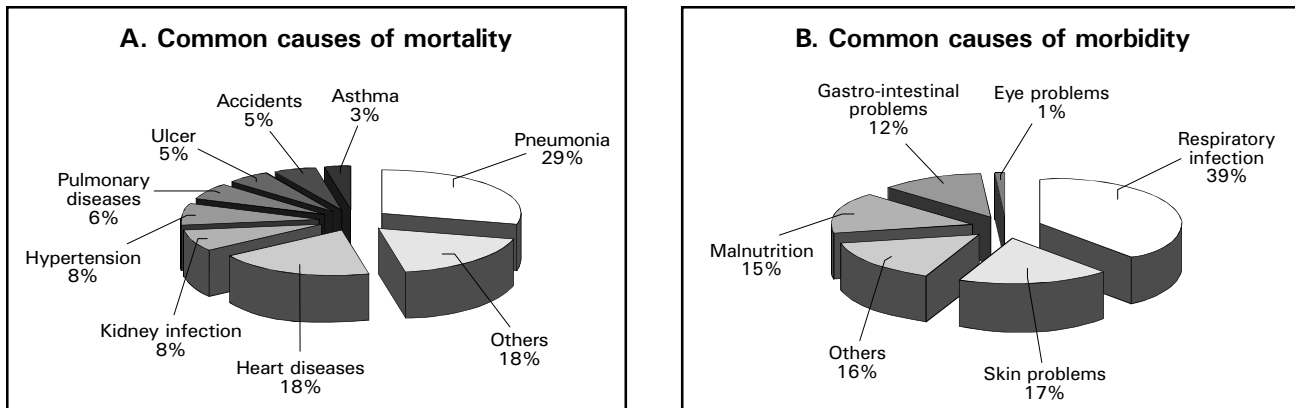


Figure 4.6. Health profile: Common causes of mortality and morbidity in Olango Island and its satellite islets (DOH-7 1997; CRMP 1998).

PHYSICAL INFRASTRUCTURE

Freshwater Resources

Olango has 2 major freshwater lenses, 1 in Barangay Talima, and the other in Barangay Santa Rosa (Chapter 2, Figure 2.1). Both are separated by a brackish water zone believed to have been connected before (Olofson 1992). Olango residents perceived that both fresh and brackish water wells are potable. Only 13 percent of Olango households own a well while 87 percent share with neighboring wells. Private and public water taps and water vendors from wells without pumps are the other major sources of residential water. Five of the 11 *barangays* depend on commercial water delivery at PhP3 per container (Table 4.8).

Table 4.8. Water sources used in Olango Island and its satellite islets (CRMP 1998).

Barangay	Water sources (distance scale from wells)
Baring	Talima commercial water delivery - P3/container, laundry use (1 km)
Caohagan	Cordova, Marigondon - P10/container (10 km), rain (20 m) - 4-5 containers/day family use
Caw-oy	Talima commercial water delivery - P3/container, deep well - P1/container (2 km), "matabana" or cistern
Gilutongan	Cordova, Maribago - P3/container (10 km), Island - P10/container, rain (20 m)
Pangan-an	Rain, brackish well - P5/container (20 m), P10/container- during summer (20 km)
Sabang	Talima commercial water delivery - P3/container, brackish well - laundry use (5 m)
San Vicente	Sta. Rosa deep well - P1/container (30 m)
Santa Rosa	Private deep well - 30 (3 to 5 m), non-owners (30 m to 1 km)
Talima	Private deep well - 67 (3 to 5 m), non-owners (30 m to 1 km)
Tingo	Talima commercial water delivery - P3/container, deep well - P1/container (2 km)
Tungasan	Talima commercial water delivery - P3/container, brackish well - laundry use (5 m)

In Barangay Talima, there are 3 commercial water stations, which supply approximately 1,970, 5-gal or 20-L containers per day. Another commercial water station in Barangay San Vicente is a solar-powered pump run as a cooperative (San Vicente Water Association) organized by the USC-WRC. Remedio and Olofson (1988a) cited that rainwater is not included as a major water source, especially during rainy season even if it is perfectly

potable. This is no longer true; today, many households have "*matabana*" or cisterns to collect rainwater for cooking, bathing, and washing.

Communication

Communication within Olango Island is mostly by radio transceivers since each *barangay* has been provided with its own base radios. But recently, it has become possible to communicate by cellular phone and even land-based telephone using microwave technology. Cellular phone signal is available in almost all parts of the island. A telecommunication company (ISLACOM) has just installed a land-based telephone in one of the private houses in Barangay Caw-oy. Household communication systems are not yet widely used, as these are expensive for the islanders.

Road Network and Transport Facility

A road network connects all *barangays* on the main island of Olango. More than 50 percent of these roads are paved, while the remaining are gravel or earth surface. The road network is approximately 21 km long, of which over 10.5 km are cemented (Table 4.9). The smaller satellite islets, except Pangan-an, have no clearly delineated road networks. The main mode of transportation is the motorized tricycle with the main terminal located in Santa Rosa wharf. A chartered trip or "*pakyaw*", to any *barangay* in Olango costs about PhP50 to 60.

Table 4.9. Road profile of Olango Island and its satellite islets (Flores 1997 with slight modification).

Barangay	Total (km)	Road density (km per 1,000 individuals)	Concrete pavement (in km)
Baring	3.6	1.4	1.3
Caw-oy	0.7	0.6	0
Gilutongan	3.2	0.9	0.3
Sabang	5.3	1.1	4.0
San Vicente	3.0	0.8	1.4
Santa Rosa	2.2	0.8	1.5
Talima	3.0	1.9	0.3
Tingo	None		1.8
Tungasan	None		0
Total	20.9	6.6	10.6

Air Transport Facility

There is no air transport facility located in Olango Island. However, the Mactan-Cebu International Airport, the country's second busiest international and domestic airport, is only about 10 km away from Olango's western coastline. The approximate time to reach the airport by boat and land is about an hour, which enhances Olango's potential as a tourist destination.

Sea Transport Facility

The Santa Rosa Wharf is the main docking station for outrigger pumpboats ferrying passengers and cargo to and from Olango and Mactan Islands. Boats generally leave every 30 minutes from 5:30 a.m. to 6:00 p.m. Another docking station without any wharf is found in Barangay Baring for the northern *barangays*. Boats typically leave every 30 minutes to Punta Engaño wharf on Mactan Island and back. These normal sea transport schedules may be disrupted during periods of strong winds and rough seas.

Electricity

Electric power is supplied by the National Power Corporation (NAPOCOR) and is distributed by the Mactan Electric Company (MECO). There are 2 generators encased in 1 powerhouse that was built by NAPOCOR in 1994 for Olango Island. Construction is underway for housing another generator. In 1997, the total number of households with electricity was 555, Barangay Santa Rosa had the most number of households served (Table 4.10). Electricity in Olango Island is available for 12 hours only from 12:00 noon to 12:00 midnight; in the satellite islets, generators or kerosene lamps are used for lighting. Recently, in Pangan-an Island, a solar-powered generator using 1,000 m² of solar panels, was completed under a Belgium-funded project making Pangan-an the first island in the Philippines powered solely by solar energy.

Table 4.10. Number of households serviced by MECO in Olango Island and its satellite islets (CRMP 1997).

Barangay	Total households	MECO-served	Remarks
Baring	414	125	MECO
Caohagan	50	40	MECO
Caw-oy	189	55	MECO
Gilutongan	151	0	Kerosene, Petromax, etc.
Pangan-an	247	0	Generator
Sabang	627	0	MECO
San Vicente	564	49	MECO
Santa Rosa	845	73	MECO
Talima	593	54	MECO
Tingo	442	138	MECO
Tungasan	260	21	MECO
Total	4,382	555	

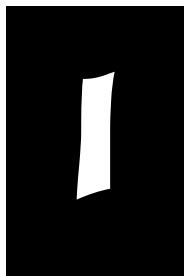
SUMMARY

Sociopolitically, Olango Island and its satellite islets are very much dependent on Lapu-lapu City and the Municipality of Cordova. For instance, their annual budget allocations, passage of laws, and ordinances have to be decided by the respective city and municipal councils. This is seen by most of the islanders as a hindrance in improving the island's infrastructure and availability of public services. While most of the basic social services are already in place in Olango Island, there is still much to be desired as its population is growing and their needs are expanding. The level and access to these public services and infrastructure vary among different parts of the island, particularly on the smaller islets.

In addition, planning and management of the 920-ha OIWS is being coordinated by DENR Region 7 and the OIWS Protected Area Management Board (PAMB) as this area is under the National Integrated Protected Areas System (NIPAS).

Chapter 5

ECONOMIC CONDITION



In general, small islands have special characteristics that typically include high diversity, limited land resources, and relative isolation. Because of these special characteristics, ecologically and economically sustainable development options are more difficult to find. In the case of Olango, some indicators have shown that the maximum limits have already been reached in terms of resource use. If Olango and its surrounding waters are considered as a closed system, its economy should have collapsed by now due to the improper and uncontrolled utilization of resources coupled with increasing population growth.

But even with Olango's already dwindling resources, the islanders are still able to sustain their economy. This is only possible by relying on outside sources to support their own needs. Among the significant island-based sources of income are small-scale fishing, fishing laborers and aquarium fish collectors, shellcraft workers, and as employees in tourism-related establishments. This chapter presents data on economic conditions and livelihood as important considerations in improving management of the coastal resources of Olango and its satellite islets.

FISHERIES

The importance of fisheries and fishery-related activities to Olango islanders cannot be overemphasized. Fishing and other fishing-related activities are traditional forms of livelihood of Olango islanders based on various small-scale surveys of Olango coastal residents (Remedio and Olofson 1988b; SUML 1997; CRMP 1998). Remedio and Olofson (1988b) reported that 73 percent of all households have fishing as their primary or secondary occupation, while SUML (1997) reported that 62 percent of their respondents are dependent on the marine environment with 83.8 percent as full-time fishers, 11.1 percent as part-

time fishers, and 5.05 percent as occasional fishers. All the respondents are considered as municipal or small-scale fishers and the majority (61.1 percent) use motorized boats. Ninety-two percent own their boats while the remaining 7.8 percent either rent or borrow pumpboats.

Trends in the Catch Levels and Species Composition

Fishing has been the traditional source of livelihood of Olango people since early times, when fishery resources were more abundant. The significant decline in fishery resources, as indicated by trends in average catch, was detailed during the series of PCRA seminar-workshops conducted in 1998 by the CRMP. The participants were able to document a sharply decreasing trend in the volume of the fish catch and over the last 50 years (Figure 5.1).

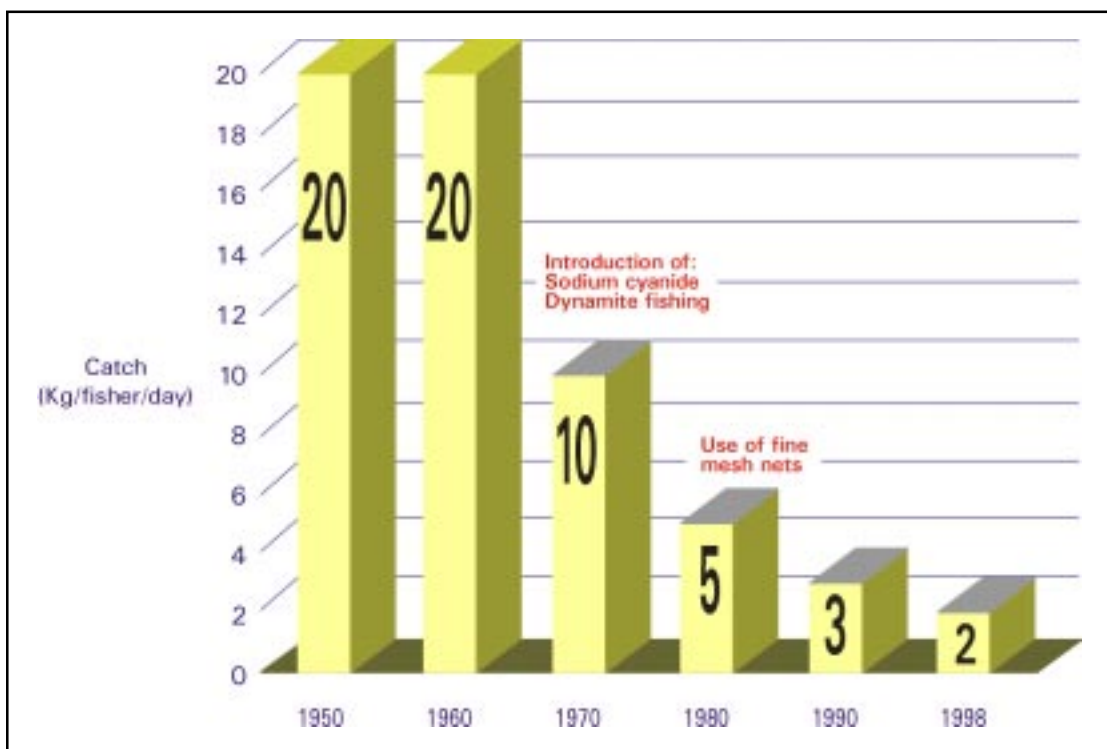


Figure 5.1. Trend diagram of fishery resources from the 1950s to 2000 in Olango Island and its satellite islets (CRMP 1998).

From the 1950s to the 1960s, the reported fish catch was still high and composed largely of pelagic, high quality fishes such as jacks and tunas and reef fishes e.g., parrotfishes, rabbitfishes, fusiliers, and mullets. During those years, there were just a few fishers and their average catch was between 20 and 25 kg per fisher per day. A sharp decline in the volume of catch was observed in the 1970s when fishers started to engage in illegal fishing methods such as the use of sodium cyanide, blast fishing, fine mesh nets, and *tubli*,

a local vine for fish poisoning. During those years, the average fish catch decreased to 16.5 kg per fisher per day.

In the 1980s, the number of fishers continued to increase while the corresponding average fish catch further declined to 10.3 kg per fisher per day. The 1990s were difficult years for the fishers as their incomes declined due to decreasing fish catch, now averaging 5 kg per fisher per day.

Today, most of the fish caught are small reef fishes (e.g., rabbitfishes, damselfishes, blennies, eels, scorpion fishes, and needlefishes, and various invertebrates such as sea urchins) and some pelagics (small mackerels). In the past, these fishes were not utilized but because of the decline in the volume of fish catch, they are now harvested.

Capture Fisheries

Olango's capture fishery is not the typical fishery found in many parts of the Philippines because Olango fishers are probably the only municipal fishers who generally do not fish within their own municipal waters. The reason for this is that the fish resources in the island are already scarce. Instead, they go fishing in the waters of Bohol, Surigao, Palawan, and even as far as Malaysia in order to catch their target species (CRMP 1998). They cannot also be classified as commercial fishers because most of their methods/gear fall under the municipal fishing gear category.

The Fishers of Olango and Their Fishing Gear/Methods

There are 2 groups of fishers in Olango based on fishing duration — the "one-day" and "many-day" fishers. These fishers use highly diversified fishing gear/methods specialized to catch certain species (i.e., octopus, abalone, etc.) that usually command a high price. There are about 16 kinds of fishing gear commonly used in Olango waters. Other gear and methods may be present but are not common, and involve mostly modifications of the 16 methods. These variations in fishing gear among Olango fishers could be a survival strategy and adaptation to their already resource-scarce marine coastal environment.

"One-day" Fishers

The "one-day" fishers fish 5 to 8 hours daily. Their usual fishing grounds are the waters of Cebu and Bohol. They provide the daily protein needs of Olango residents. However, their catch is not enough to meet the fish protein requirements of the islanders as their catch is decreasing every day. To augment this shortage of fish catch, fish vendors in Olango resort to buying 80 to 150 kg of fish daily from Pasil Market in Cebu City. A market flow diagram of a typical "one-day" fisher is presented in Figure 5.2. The usual practice is that their catch is sold offshore to the "*mamangga-ay*" (middlemen) from Cebu City and Cordova town or *lab-ase* (fish vendors) from Olango. The "*mamangga-ay*" sell the catch directly to the islanders since Olango has no wet market.

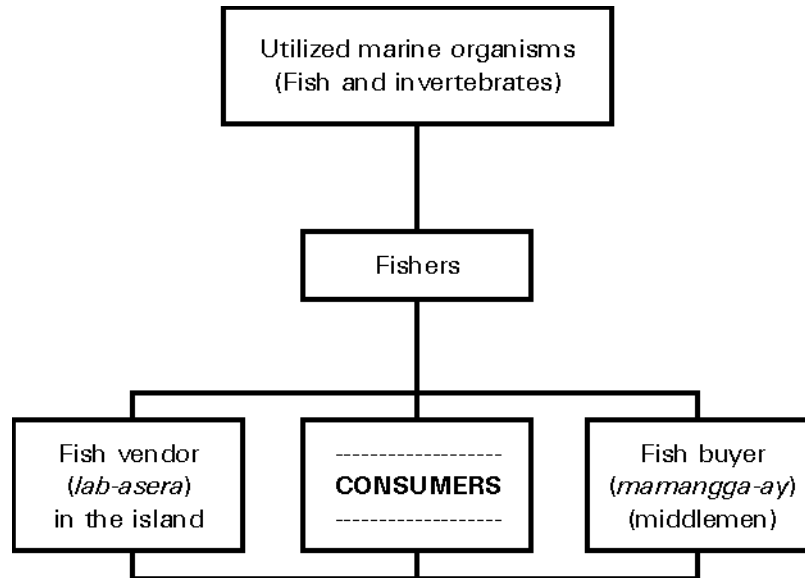


Figure 5.2. Market flow diagram of the "one-day" fishers of Olango Island and its satellite islets.

Described below are the fishing methods/gear commonly used by "one-day" fishers, with daily average earnings based on 1997 exchange rates of approximately US\$1 = PhP26.

Fishing method	:	<i>Panggal</i> or fish trap
Barangays found	:	Caw-oy, Caohagan, Gilutongan, and San Vicente
Fishing areas	:	Waters between Bohol and Cebu
Target species	:	Demersal fishes
Average CPUE	:	4-8 kg/day
Daily average earnings	:	PhP245
No. of fishers involved	:	150-200

Description: *Panggal*, or fish trap, is made of bamboo strips woven into a square basket with varying dimension depending on target species. It is said to have been introduced by Muslim fishers in Barangay Caw-oy a long time ago (Albert *et al.* 1996). A fisher retrieves, one at a time, 35 to 40 pieces of *panggal* usually from 5:30 to 8:30 a.m. Right after taking the catch, the retrieved *panggals* are set out again and are submerged for about 20 hours. Fishing duration depends on the number of *panggals* deployed and their location in the different habitats, like coral reefs and seagrass beds. Some *bobo* (larger size *panggal*) are set to a depth of 40 to 100 m using compressor diving. The cost per bamboo *panggal* bought from Bohol is PhP35 to 40 with a life span of 80 to 90 days. *Panggals* made of chicken or aluminum wire, which usually last longer, are rarely used, because they are more expensive. In the fish trap, or *panggal* fishery, it is reported that about 12 percent of the catch is kept by the fishers for their own consumption and the rest are sold within Olango (Gatus *et al.* 1997).

Fishing method	:	Multiple hook and line
Barangays found	:	Pangan-an, Caohagan, and Sabang
Fishing areas	:	Waters between Bohol and Cebu
Target species	:	Pelagic fishes
Average CPUE	:	3-4 kg/day
Daily average earnings	:	PhP90-120
No. of fishers involved	:	90-120

Description: Multiple hook and line is probably the most common fishing gear used by the municipal fishers of the Philippines. This could be due to its simple construction, affordability, and ease of use. There have been modifications made from the basic hook and line design intended to catch target species. In Pangan-an Island, fishers use multiple hooks on a single line with artificial bait made of chicken feather or a glossy, synthetic material. This is often used during *habagat* or southwest monsoon.

Fishing method	:	<i>Sudsud</i> or push nets
Barangays found	:	Sabang, Caohagan, Talima, San Vicente, and Pangan-an
Fishing area	:	Seagrass beds of Olango
Target species	:	Cowrie or <i>sigay</i> (<i>Cypraea</i> spp.) and poca (<i>nasa</i>) shell
Average CPUE	:	2-3 " <i>caltex</i> " (1 L, plastic oil container) or 2.4-3.6 kg/day
Daily average earnings	:	PhP14-21
No. of fishers involved	:	150-200

Description: This fishing gear is commonly used without boats and expensive accessories as it has been described as *pinobreng panagat* or poor man's gear. *Sudsud* is made of a simple triangular frame with a fine mesh net and is provided with a handle for pushing. Even unskilled persons, including children, can operate this simple shallow water fishing gear. It is usually deployed in seagrass beds with sandy and muddy substrate. The species caught by *sudsud* are shellfish, particularly *sigay* (*Cypraea* spp.) which is the raw material for the shellcraft industry.

Fishing method	:	Drift net or <i>pamalo</i>
Barangay found	:	Gilutongan
Fishing areas	:	Vicinity of Gilutongan Island and Olango Channel
Target species	:	Needle fish or <i>balo</i> (<i>Exocoetus</i> sp.)
Average CPUE	:	3-4 kg/day
Daily average earnings	:	PhP90-120
No. of fishers involved	:	25

Description: A drift net 50-100 m in length with a mesh size of 30 mm in diameter is used in *pamalo*. The net, equipped with a pressurized gas lamp (petromax) used to attract the fish at both ends, is set in pelagic waters using a pumpboat. The net is allowed to drift with the current, while being regularly checked for fish catch. This is done for 3 to 4 hours per setting, during both day and

night. During periods of calm weather they make 2 settings usually from 7 to 10 pm and 2 to 5 am. In between settings, the fishermen take some rest.

“Many-day” Fishers

The “many-day” fishers, locally known as *mobiyahe-ay* or *modayo*, are the Olango fishers who go fishing for many days or months in distant seas away from their families. They are out fishing for 3-6 months a year and return home when the weather no longer allows them to fish. On board a pumpboat, 12 to 22 fishers per trip set out for fishing bringing with them a *baroto* (small paddled boat) and other gear. They have no fixed fishing areas but once the group finds an ideal fishing ground, they disembark from the “mother” boat and start fishing. They come back to the mother boat to store their catch and to rest. Fishing trips are not done the entire year since there are months when the weather is not favorable. During those months, the fishers support their families by merely fishing around Olango or finding other jobs aside from fishing. Described below are examples of fishing techniques used by “many-day” fishers.

Fishing method	:	Tropical Aquarium Fish Collection
Barangays found	:	Santa Rosa, San Vicente, and Sabang
Fishing areas	:	Visayas Islands, Palawan, and Northeastern Mindanao
Target species	:	Aquarium fishes
Average CPUE	:	3-5 kg (live weight)/day
Daily average earnings	:	PhP100-160
No. of fishers involved	:	approximately 600

Description: Olango fishers are major contributors to the aquarium fish trade. Aquarium fish collectors use motorized pumpboats with a capacity of 14 persons per boat for non-compressor users and 5 persons per boat for compressor users. They collect aquarium fishes along the coast of Olango and the neighboring islands. For species that are in high demand, they have to fish as far as Camotes, Siquijor, Leyte, Bohol, Negros, and Surigao Sea at depths ranging from 1 to 20 m. Collecting techniques include the use of sodium cyanide and barrier and scoop nets or *sapyaw*, which have recently been employed after these collectors have undergone a seminar-training workshop under the Cyanide Fishing Reform Program (CFRP) conducted by the International Marinelife Alliance (IMA). Of the 52 total collectors, one-third are cyanide users who claimed that they catch 1,000 fish per day composed of 10 to 20 species, which are sold directly to the middlemen. The prices are variable, depending on the species. For example, *Hemiscyllid* sharks (banded shark) fetch a higher price compared to the damselfish *Pomacentrus* sp. These aquarium fishes are first stocked live in a storage facility in Lapu-Lapu City and Manila, prior to shipment abroad. Of the 19 aquarium fish buyers, 12 from 3 *barangays* in Olango are funding this fishing venture. The financier shoulders the expenses incurred during travel, packaging, airfreight fees, and boat maintenance.

Fishing method	:	<i>Panglapas</i> or abalone collection
Barangays involved	:	Tungasan (major), Caohagan, Pangan-an, Sabang, Baring, and Tingo (minor)
Fishing areas	:	Olango vicinity, Bohol, Palawan, Borneo
Target species	:	Abalone or <i>lapas</i> (<i>Haliotis asinina</i>)
Average CPUE	:	Palawan: 6-8 kg/day, Bohol: 3-5 kg/day, and Olango waters: 1-2 kg/day
Daily average earnings	:	Variable; pegged at PhP120-150/kg
No. of fishers involved	:	75 percent of male labor force in Brgy. Tungasan, 110-150 persons in the other <i>barangays</i> mentioned

Description: Abalone or *lapas* collection is the main fishery in Barangay Tungasan. Collecting sites are outside of Olango, preferably in Palawan and Borneo waters. Collection is done at night using pressurized gas lamp and metal hooks while at daytime they overturn rocks and pry the abalone with hooks. The duration of the trip varies from 2 to 3 months for a good catch and 4 to 6 months for a fair catch. Eighteen to 20 fishers are recruited per boat per trip with 1 captain or *arais* who directs the overall activity. Once they arrive at their collecting sites, fishers would then go their separate ways using the small outrigger boats or *baroto* to look for abalone. They would only return to the "mother" boat to rest and eat.

Fishing method	:	<i>Pandayo</i>
Barangays found	:	Talima, Baring, and Tingo
Fishing areas	:	Palawan, Mindoro, Quezon, Camarines Norte, Zambales, and Malaysia
Target species	:	<i>Kinhason</i> (shells), <i>kugita</i> (octopus), <i>balat</i> (sea cucumber)
Average CPUE	:	shell: 5-6 kg/day; octopus: 3-5 kg/day; and sea cucumber: 8-10 kg/day
Daily average earnings	:	PhP60-120
No. of fishers involved	:	400-800

Description: *Pandayo* literally means "to go to someplace". Older fishers say that *pandayo* started in the late 1950s primarily to collect *kinhason* (shellfish), *kugita* (octopus), and *balat* (sea cucumber), both for export and local consumption. Olango islanders engaged in this fishing activity go to far away places for months to collect target species which are dried on-board to allow their storage. The fishing crew is composed of 18 to 20 members, including the captain or *arais*, per boat per trip. Collection is done by hand tools e.g., scoop nets, metal hooks, bolo, spears, and bare hands. In deeper waters, collection is by "hookah diving" using improvised compressors (such as a painting compressor) equipped with spears and collecting bags. The estimated initial capital for this type of fishing is PhP150,000. From this amount the crewmembers can make cash advances of PhP3,000-4,000 to support their family while they are gone fishing. The fishing trip lasts between 3 to 6 months to a year. Most often the boat owners provide the financing of the trip and buy the catch, then sell it to buyers in Palawan while the shellfish

are sold to a buyer in Barangay Baring. Average maximum harvest is 1,000 kg of dried sea cucumber sold at a price of PhP60-500 per kg depending on the species. For dried octopus, a typical harvest reported is 300-400 kg at a selling price of PhP75-80 per kg. Shell harvests range from 200 to 500 kg at PhP100-800 per kg (for higher value shells such as *Pinctada* spp.), while the average catch of less expensive shells, like *sigay*, averages 10-20 sacks at a price of PhP2-3 per kg.

The Socioeconomic Structure of the “Many-Day” Fishing Activities

While covering extensive areas for extended periods at time, the fishing methods used by "many-day" fishers are still categorized as “small-scale” municipal fishing activities. Although most "many-day" fishers own their gear, they still depend on the financiers for the operating capital for their fishing expedition and the boat captain in marketing their catch. Because of this dependency, they have little or no control in the pricing of their catch. In short, they get less of the profit while doing most of the work.

The sharing system of costs and profits practiced by the “many-day” fishers is as follows: the financier provides the initial capital outlay, which includes the repair of the boat before the trip, initial fuel and food needs, and a cash advance or *va/e* by the fishers. The cash advance is for their families’ daily expenses during their absence.

The usual marketing practice of “many-day” fishers is to sell their catch to the boat captain who sells it to a trader/exporter stationed in Palawan or Cebu at prices up to 6 times higher than the buying price. The exporters either process the catch or sell it fresh to their respective buyers (Figure 5.3).

This system of profit sharing is based on the volume of the catch per fisher. At the end of the fishing expedition, expenses on food, gasoline, repair, and maintenance are shared equally among the crewmembers except the boat captain. In case of accident or untoward incidents (i.e., capsizing of the boat, deaths, injuries, boat damage due to typhoons, etc.), all expenses are also to be divided equally among them. After all the expenses are deducted, the net income is divided proportionate to catch. Then, each member pays for cash advances and other personal expenses incurred before and during the trip. Some opportunistic financiers add 10-20 percent interest not to the principal amount advanced for operating expenses but to the financier's share of the gross profit of the entire fishing expedition putting additional burden on the fishers. Furthermore, with the progressive implementation of the Closed Access System under the 1998 Fisheries Code (RA 8550), it is expected that these “many-day” fishers will have difficulty looking for more productive fishing grounds, making their already marginalized situation worse.

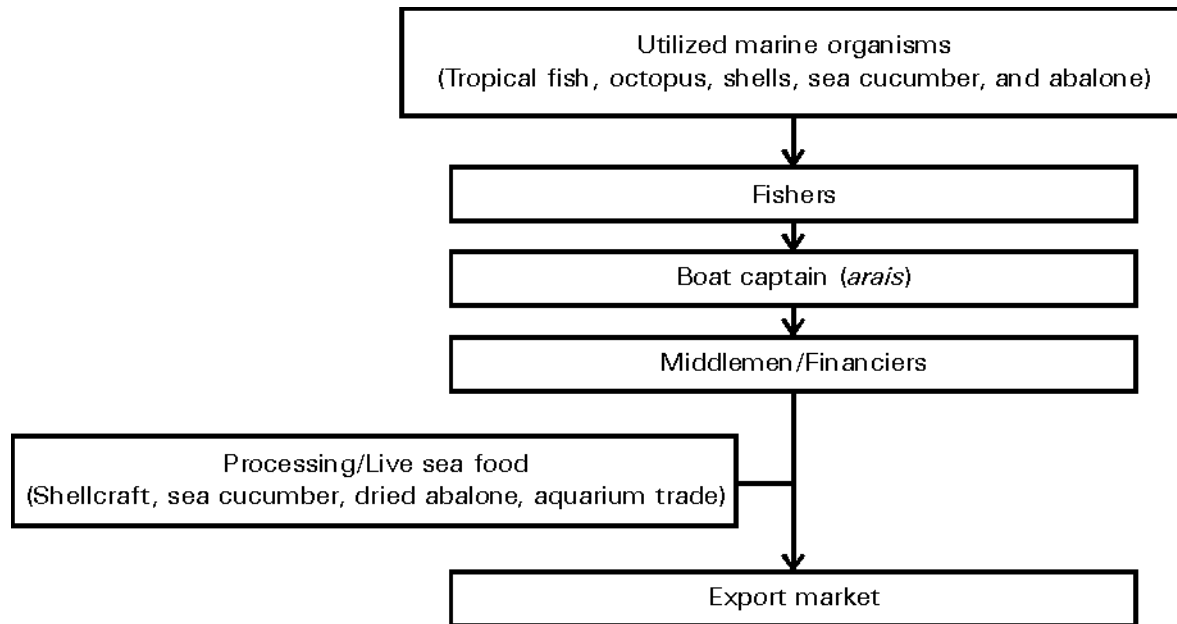


Figure 5.3. Market flow diagram of the "many-day" fishers of Olango Island.

OTHER FISHING-RELATED ACTIVITIES

Gleaning

While most of the fishing techniques practiced by the Olango islanders involve men, women and children are more active in collecting or gleaning edible marine life from the intertidal flats of Olango during low tides. The contribution of this gleaning activity to the economy of Olango is often not seen as there are no clear monetary benefits derived from it. However, gleaning is important because it supports the people's daily protein needs. This gleaning activity becomes important to the islanders during periods of strong winds and high waves when offshore fishing becomes difficult.

Mariculture

Mariculture ventures in Olango are few and some are still at the initial or pilot phase (Table 5.1). Aquaculture development is limited by the rocky, limestone condition and inadequate fresh water sources of the island. However, with its extensive intertidal zone, some mariculture activities, such as seaweed culture, look promising. In the past, seaweed cultivation was tried in some parts of Olango but this was not sustained due to financial constraints and lack of technical skills. But, in 1996, the seaweed or *guso* (*Eucheuma spinosum* and *Kappaphycus alvarezii*) was successfully grown in the reef flats adjoining Gilutongan Island. Now, former fishers are joining the venture as an income-generating project. The mariculture activities existing in Olango are described below.

Seaweed (*Guso*) (*Eucheuma spinosum* and *Kappaphycus alvarezii*) Farming

Barangays involved: Gilutongan Island, Pangan-an Island, and Caohagan Island

Description: The total seaweed farm area is about 45 ha with no approved foreshore lease for the farm by BFAR/DENR-7 or the respective local government units. At present, anybody interested to cultivate seaweed can do so. Seaweed

Table 5.1. Mariculture activities found in Olango Island.

Mariculture type	Barangay involved	Remarks
Milkfish or <i>bangus</i> cage culture	Pangan-an, Tingo	Closed because it was not profitable
Fish cages	Caw-oy, Pangan-an	Usually invertebrates and fish (i.e., abalones, giant clams, groupers, etc.) caught from the wild and fattened in the cages
Seaweed (<i>guso</i>) culture	Gilutongan	Started in 1996, approximately 45 ha total area farmed, 35 tons/month dried seaweed production
Coral farming	Caw-oy	Started in 1998, 2 ha total area with about 20,000 fragments being grown

planters use initial seedlings of 100 g *guso* which can yield 2-3 kg after 2 months of favorable growth. Harvested seaweed is dried in the sun for 2 days, with a maximum storage limit of 2 months to prevent quality degradation.

Seaweed planters produce 500 sacks averaging 70 kg per sack of dried *guso* per month when the season is good and 400 sacks when it is unfavorable. They sell the dried *spinosum guso* to any of the 6 local buyers operating in the island at PhP5 per kg. The buyers deliver the dried *guso* to the processors in Metro Cebu at a gate price of PhP7.50 per kg. About 200 families are involved in seaweed farming, with an average family farm size of 0.25 ha.

Ice-ice disease, high water temperatures, and storms are among the problems encountered in seaweed farming. A new higher valued variety of the seaweed, *Kappaphycus alvarezii* (also referred to as *cottonii*) and a new planting technique, the "net bag-monoline" method has been introduced by the CRMP. About a kilo of *guso* is placed inside a net bag made of nylon gill net materials and fastened to a monoline. This method prevents seaweed washout, minimizes grazing pressure and promotes easy harvest. The net bag method is also environmentally friendly as compared to the traditional method, as no plastic ropes are thrown during harvest time.

The primary aim of seaweed cultivation in the islands of Gilutongan, Pangan-an, and Caohagan is to reduce current pressures on increasingly limited fishery resources by providing an alternative, environmentally sound and sustainable source of coastal livelihood to fisherfolks. The seaweed farming initiatives of the Gilutongan and Pangan-an communities are being supported by the CRMP while similar initiatives of the Caohagan community is being formed by the island's major land owners. Their total combined production of 1,200 tons of dried seaweed per year is generating about US\$1,875 per family per year or US\$375,000 for all the farmers combined. This is a significant increase in the supplemental income earned from subsistence farming on depleted reefs. This income from seaweed

farming can be factored into the net revenues earned from coral reef areas while assuming the seaweed activity is controlled and not destructive to the seagrass habitat. CRMP has successfully introduced a better yielding, high value variety of *Kappaphycus alvarezii* and new planting technique that increases production. CRMP also assisted in the marketing strategy, which eventually will make seaweed farmers become independent suppliers.

Coral Farming

Barangay involved: Caw-oy

Description: The USC-MBS initiated this activity in January 1998. This pilot project is envisioned to rehabilitate degraded coral reefs, conserve biodiversity and offer an alternative livelihood for fishers who have often been using illegal fishing methods. The farming technique involves cutting of coral fragments from a "mother coral" using pliers for branching corals and a hammer and chisel for massive corals. The donor sites are the nearby Cordova and Talima reefs (Heeger *et al.* 1999). The fragments are attached to a limestone tile substrate (Mactan stones) using chicken wire and placed within a 1-m² coral nursery unit at a depth of 5-7 m. So far, the growth of corals is promising, with an 80 percent survival rate. However, the problems encountered are sedimentation and predation by the crown-of-thorns starfish, *Acanthaster planci*. It is further envisioned that these coral fragments will be marketed to local resort owners who are planning to rehabilitate the degraded corals of their beachfronts. The proceeds will be divided among the fisherfolks and the local government (Heeger *et al.* 2000).

Fish Cages

Barangays involved: Caw-oy, Pangan-an Island, and Gilutongan Island

Description: Fish cages or pens is a sort of a stocking facility of high priced species such as groupers (*Epinephelus* and *Cephalopholis* spp.), stonefish (*Synancea* spp.), snappers (*Lutjanus* spp.), and other mollusks (*Tridacna* spp., *Strombus* spp., *Pinctada* spp., and *Cassis* sp.). The method is dependent on the available natural stocks and mainly focused on fattening not production. The seed stocks are bought from other fisherfolks at a lower price and then fed with trash fish twice daily. Fattening duration is from 4 to 6 months before selling.

TOURISM AND TOURISM-RELATED VENTURES

Tourism is probably the only form of livelihood in which Olango has the most potential. Its foremost attraction is the 920-ha OIWS, white beaches, SCUBA diving, snorkeling, and swimming attraction. Olango's proximity to an international airport, major urban and tourism center is an advantage over other areas. There are already existing tourism establishments in Olango and more places are being considered. The majority of these are privately owned and mostly cater to foreign tourists (Table 5.2).

The number of visitors going to Olango Island on a daily basis for SCUBA diving and snorkeling averages about 80 persons per day travelling on 10 separate charter boats. The main input to the island economy from these visitors is the food or shellcraft bought from islanders.

Table 5.2. Tourism-related establishments in Olango Island and its satellite islets.

Tourism establishments	Location	Class	Major clientele	No. of regular employees	Facilities	Daily rate (in pesos)
Tingo by the Sea	Tingo	A	local tourists	2	4 cottages and 14 rooms	50-100
Nalusuan Island Resort	Nalusuan Island	AA	foreign and local tourists	14	200 carrying capacity	2,200
Island and Sun Beach Resort	Gilutongan Island	AA	foreigners	18	25 rooms	12,950
Caohagan in the Sun	Caohagan Island	AA	foreigners	4	7 cottages	700
Caohagan Community Resort	Caohagan Island	A	local tourists	1	5 cottages	20
Jolly's Beach Resort	Pangan-an Island	AA	mixed	6	3 cottages and 3 rooms	400 700 1,000
Malansyang Beach Resort	Baring	A	local tourists	2	6 cottages and 2 rooms	50 700

Class AAA = First class accommodation; AA = Second class accommodation; A = Third class accommodation
 US\$1 = PhP26 in 1997

Chartered Boat Services

Barangay involved: San Vicente

Description: Barangay San Vicente is a known haven for boat operators engaged in the lucrative business of diving excursion and island hopping activities for tourists. Tourism in Cebu has 2 distinct seasons: July to December as the peak months and April to June as the lean months. During lean months, Olango islanders shift to hook and line fishing and fish traps while during the peak season, they are employed as boatmen and tour guides by boat owners and or tourist operators.

Two types of sharing system are commonly used. In the first system, the boat owner sets aside from the gross earnings an amount for the actual fuel expenses and 15 percent maintenance for the boat. The rest of the earnings is divided equally between the boatman and the boat owner. In the second system, the boatman has a fixed salary of PhP4,000 per month and a supply of 1 sack of rice. Tourist agents who are at the same time boat owners with regular clientele usually adapt this system. Their services include island hopping to nearby islands and diving safaris to dive sites in Bohol, Negros Oriental, Siquijor, and Camiguin. The economic flow diagram is shown in Figure 5.4.

Tourist Vending

Barangays involved: Gilutongan and Caohagan

Description: This activity is a secondary source of income which operates sporadically. In Gilutongan Island, there is the Barangay Gilutongan Vendors Association (BGVA) with 232 members, while in Caohagan Island there is a separate cooperative association with some 60 members. Members of BGVA pay

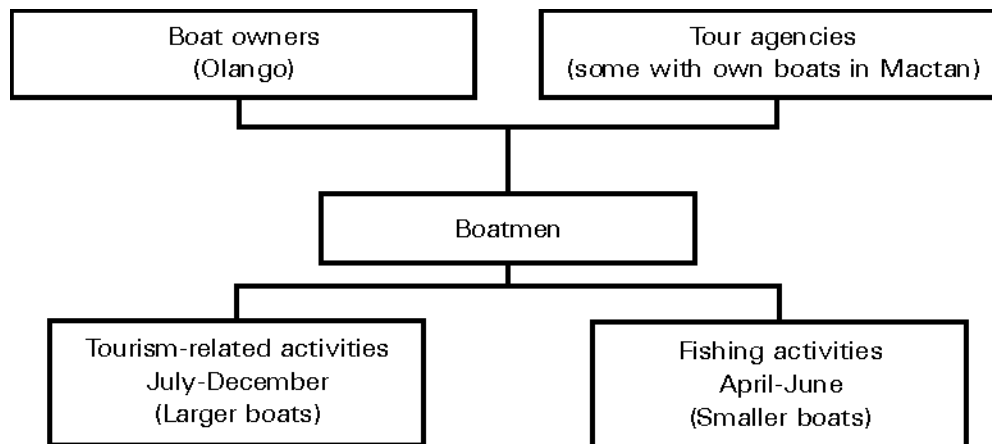


Figure 5.4. Economic flow diagram of the boat owners and tourist agencies in Olango Island.

monthly dues of PHP5 while no dues are paid in Caohagan. The procedure is that members are assigned a number (1-232 in Gilutongan or 1-60 in Caohagan), which gives them the privilege to do business with tourists visiting their island. They do this on rotation basis, each has its own strategy to convince the customers to buy their products which typically consist of shellcraft, seafood, and other souvenirs.

Olango Bird and Seascape Tour (OBST)

Barangay involved: Gilutongan Island and Sabang

Description: This project was launched in 1998 by CRMP as part of its enterprise development, with its main theme on ecotourism. The project is community-based involving Barangay Sabang and Gilutongan Island.

The tour starts with island hopping from Mactan to Gilutongan Island, where tourists learn about the island's marine sanctuary and seaweed farming (the main livelihood of the community). The tour then proceeds to Barangay Sabang where the community welcomes tourists with shell beads and coconut juice. Activities include visits to shellcraft industries, cooking, and fishing gear demonstration as well as boat paddling along the mangrove forest and birdwatching. A sumptuous lunch awaits the visitors after their busy activities. The tour highly depends on the high tide (boat paddling along the mangroves), therefore, the tour itinerary may vary either to Gilutongan Island then Sabang or vice versa.

Coral Farm Ecotour

Barangay involved: Caw-oy

Description: On May 2000, the ecotour component of the coral farm project commenced. One of the objectives in setting up the coral farm is to educate visitors through a hands-on experience on farming coral for reef rehabilitation and conservation. While in the farm the visitors participate in the coral farm

activities carried out by the local fishermen and their wives such as the tying of coral fragments to substrates before placing them in the coral nursery units. After this activity, the visitors are treated to a demonstration on various fishing gear used by Caw-oy fisherfolk and a cooking demonstration on Filipino delicacies. A nicely prepared lunch by the Caw-oy Women's Group is also part of the package.

Seafood Restaurant by the Sea

Barangay involved: Caw-oy

Description: It started with 1 restaurant in 1997 and increased to 3 in 1998. These restaurants are owned and managed by entrepreneurial Caw-oy residents catering live seafood to mostly foreign customers. Their marketing strategy consists of offering incentives and free lunch to boat operators who bring in tourists from Mactan's premier hotels and resorts. Tourists go there not only for nice food but also for a good swim. These restaurants can be reached via Mactan through a 45-minute pumpboat ride.

COTTAGE INDUSTRIES

There are no large industries found in Olango Island. There are, however, some industries existing in the island which can be considered as small-scale or cottage industries.

Shellcraft

Barangays involved: Baring, Santa Rosa, San Vicente, Sabang, Talima, Tingo, Tungasan, and Caw-oy

Description: Almost all Olango residents are involved in the shellcraft industry in Barangay Baring, where the supply of raw materials is based. Housewives and their children usually engage in this activity. For most residents shellcraft contributes significantly to their finances but to some it is only a sideline to beat boredom when husbands go on a "many-day" fishing expedition or are working.

On the average, about 5 to 8 hours per day are spent on shellcraft activity, sometimes less because of child care and household chores. Shellcraft workers can finish 2 to 6 pieces of large items (e.g., chandeliers, centerpiece, umbrella, and *plaka*) or 2 to 4 dozens of smaller items such as necklace and strands, which are the most common products and high in demand. Price ranges from PhP10 to 100 per piece for large items and PhP10 to 12 per dozen for smaller items (Table 5.3). Not all of these are made in a day, but they choose their target design for the day.

Quilting

Barangay involved: Caohagan Island

Description: This cottage industry started in 1995 under the training of the wife of the Japanese owner of Caohagan Island with 50 members to date, mostly women. The Japanese couple provides the materials (assorted cloth, foam, needles, strings, and scissors) and buy their products, while the members provide

Table 5.3. Shellcraft commodities, production rate, and their corresponding prices (in pesos) at Olango Island.

Shellcraft design	Quantity per day	Price per piece (pesos)
Chandelier "basket"	2 pcs.	10
Chandelier "comodium"	2 pcs.	10
Necklace	2 - 4 doz.	10
Centerpiece	3 - 6 pcs.	100
"Umbrella"	2 - 4 pcs.	140
"Plaka"	2 - 4 pcs.	140
Strand	3 - 4 doz.	12

US\$1 = PhP26 in 1997

the labor. Everything is hand sewn to the last detail except for the edging, which uses a sewing machine for closing. The designs vary from plants to marine organisms. Size and price range from small at PhP70 plus 20 percent of the sale, medium at PhP200 and large at PhP2,500. It generally takes a day to finish a small size and up to 2 to 3 months for large size quilt.

OTHERS (e.g., Agriculture, Forestry)

The contribution of agriculture to Olango's economy is minimal because the physical characteristics of the island render it unfavorable for commercial or large-scale agricultural production. Most of the seasonal crops planted are only for home consumption and are not income generating. As a result, most of their staple agricultural products, such as rice, corn and vegetables, are still bought from mainland Cebu.

ECONOMIC VALUES OF OLANGO ISLAND COASTAL RESOURCES

Coral Reefs and Associated Habitats

The sustainable annual net economic revenues per km² of a typical healthy coral reef in the Philippines were calculated by White and Cruz-Trinidad (1998) (Table 5.4). The outcome is a range in potential annual net revenue from US\$29,400 to 113,000 per km² of high quality coral reef and associated habitat. The calculation includes only real and potential revenues occurring directly to the island community. It does not include off-island tourism expenditures. The production range for sustainable fisheries is based on studies of fish yields from around the Philippines and qualified by the condition of the coral reef under consideration (White and Savina 1987; Alcala and Russ 1990; Russ and Alcala 1996).

Net economic revenues in 1999 from the coral reef of Olango Island based on the conditions and situation at Olango Island are shown in Table 5.5. This set of net revenues (with costs deducted) is based on the relative condition of the coral reef for fisheries, tourism, and appropriate seaweed farming. The net revenues from fisheries are lower than the better quality coral reef used to calculate the revenues of Table 5.4. In contrast, the net revenues from tourism are relatively high for Olango because of its proximity to an urban, and major tourism center, and because the calculation includes off-island tourism

Table 5.4. Sustainable annual net economic revenues (direct and indirect) per km² of a typical healthy coral reef in the Philippines with tourism potential (White and Cruz-Trinidad 1998).

Resource use	Production range	Potential annual revenue (US\$) (range)
Sustainable fisheries ^a (local consumption)	10 to 30 ton	12,000 - 36,000
Sustainable fisheries ^b (live fish export)	0.5 to 1 ton	4,000 - 8,000
Tourism ^c (on-site residence)	100 to 1,000 persons	3,000 - 30,000
Tourism ^d (off-site residence)	500 to 1,000 persons	3,000 - 6,000
Coastal protection ^e (prevention of erosion)		5,000 - 25,000
Aesthetic/Biodiversity value ^f (willingness-to-pay)		2,400 - 8,000
Total	600 to 2,000 persons	29,400 - 113,000

Assumptions:

- ^a Average market price of US\$1.50/kg of reef fish less than production cost of 20 percent (White and Savina 1987; BAS 1993)
- ^b Average market price to fishers of US\$10/kg of live reef fish less production cost of 20 percent (Barber and Pratt 1997)
- ^c Average expenditure of US\$50/day/tourist staying at the site assuming a 60 percent profit margin (Cesar 1996; Vogt 1997)
- ^d Average expenditure of US\$10/day/tourist for purchases at the site assuming a 60 percent profit margin (Vogt 1997; A. White, pers. obs.)
- ^e Physical protection value of US\$5,000 - 25,000/km/year of reef front beach (Cesar 1996)
- ^f Average expenditure of US\$4/day for entrance to marine sanctuary or for a donation to the maintenance of the area or anchor buoys with no costs assumed (Arin 1997)

expenditures. Off-island expenditures are included because of the importance of this revenue in relation to the existence of the coral reef at Olango. If the quality of the coral reef on Olango were to improve, both fisheries and tourism could benefit and provide an increase in future revenues.

The current annual net revenue range of US\$38,300 to 63,400 per km² of coral reef or US\$1.53 million to 2.54 million for the entire 40 km² Olango Island coral reef area is significant and reflects the relatively large expanse of coral reef compared to island land area. It also reflects the large amount spent to stay on Mactan Island while making day visits to Olango. It should also be noted that no "potential" or "indirect" benefits or revenues are included. Such indirect benefits and other revenue streams such as fees, taxes, donations, or simply more SCUBA divers would be possible with more active management and promotion of the area as a quality diving destination with better reefs.

Wetland Areas Other than Coral Reefs (Mangrove and Mudflats)

Olango Island is unusual because in addition to its diverse coral reef habitats, it has productive mangroves and mudflats that attract significant numbers of migratory birds travelling along the East Asia Migratory Flyway twice a year. The economic values and benefits derived from these areas are distinct from those associated with reefs and are dealt with separately.

Table 5.5. Net economic revenues in 1999 (direct) per km² of coral reef and associated habitat in Olango Island and its satellite islets (White *et al.* 2000a).

Resource use	Production range	Annual revenue (US\$) (range)
Sustainable fisheries ^a (local consumption)	4 to 6 tons	4,800 - 7,200
Sustainable fisheries ^b (live fish export)	0.2 to 0.4 ton	1,600 - 3,200
Tourism ^c (on-site residence)	25 to 50 persons	900 - 1800
Tourism ^d (off-site residence and expenditures)	500 to 800 persons	24,000 - 38,400
Tourism ^e (off-site residence - on-site expenditures)	500 to 800 persons	3,000 - 4,800
Seaweed farming ^f (farming revenue from 40 ha)	20 to 40 tons	4,000 - 8,000
Coastal protection ^g	Not available	
Aesthetic/Biodiversity value ^f	Not available	
		38,300 - 63,400
	For entire Olango Island reef area of 40 km ² =	1,532,000 - 2,536,000

Assumptions:

- ^a Average market price of US\$1.5/kg of reef fish less production cost of 20 percent; production range based on the condition of the Olango reef in relation to known fish yields from other reefs (White and Savina 1987; BAS 1993)
- ^b Average market price to fishers of US\$10/kg of live reef fish less production cost of 20 percent (Barber and Pratt 1997)
- ^c Average expenditure of US\$60/day/diving tourist staying at the site assuming a 60 percent profit margin (Nalusuan Island Resort) (Cesar 1996)
- ^d Average expenditure of US\$80/day/diving tourist staying on Mactan Island assuming a 60 percent profit margin including boat rental and gear (Cesar 1996)
- ^e Average expenditure of US\$10/day/diving for souvenirs or food on site assuming a 60 percent profit margin
- ^f Average revenue of US\$250/ton of dried seaweed production assuming 80 percent profit margin
- ^g This is not quantified because only direct net revenues are being considered
- ^h This is not quantified because no net transfers from fees and donations are yet being collected from coral reef use or visitation

In the Philippines, various studies have shown that the direct and measurable sustainable benefits from mangroves come in the form of fish catch and wood harvested. These annual net revenues are slightly more than US\$600 per ha for fairly marginal, not pristine stands of mangroves, from 2 net revenue streams from wood products (US\$90) and fishery products (US\$538) (Schatz 1991; White and Cruz-Trinidad 1998). A summary of mangrove ecosystem value averages from around the world by Costanza *et al.* (1989) is much higher at US\$3,294 per ha per year but will not be used because there is no supporting research for Philippine mangroves other than benefits measured with market values. In addition to the potential revenue derived from the mangroves on Olango is tourism supported by the bird habitat of the associated mangrove mudflats and the protected and unpopulated areas of the OIWS. This is based on the average annual number of visitors and what they spend as shown in Table 5.6. The range of annual net revenues from these wetland resources is also significant and can be factored into management planning for the island.

Table 5.6. Net revenues in 1999 per ha of wetlands (mangrove and other) on Olango Island and its satellite islets (White *et al.* 2000a).

Resource use	Production range	Potential annual revenue (US\$) (range)	
	Per ha	Per ha	Total
Sustainable wood harvest ^a (average from 424 ha of mangroves)	3 to 4 m ³	36 - 48	15,260 - 20,350
Sustainable fisheries ^b (mangrove associated species)	600 to 750 kg	480 - 600	203,500 - 254,400
Tourism ^c (for 920 ha sanctuary) (entry through DENR visitor center)	2.2 to 2.7 persons	13.2 - 16.2	12,144 - 14,904
Tourism ^d (for 920 ha sanctuary) (entry through Olango Bird and Seascape Tour)	0.4 to 0.5 persons	7.2 - 9.0	6,624 - 8,280
Tourism ^e (for 920 ha sanctuary) (off-island expenditures for bird tour guests)	2.5 to 3 persons	120 - 144	110,400 - 132,480
		656.4 - 814.2	
	Mangrove production		218,780 - 274,750
	Tourism to sanctuary		129,168 - 155,664
	Total revenue from wetland area		347,948 - 430,414

Assumptions:

- ^a Average revenue of US\$12/m³ of wood after production costs (Schatz 1991)
- ^b Average market price to fishers of US\$0.80 of mangrove associated fish after production costs (Schatz 1991)
- ^c Average expenditure of US\$10/person including fee, local transport, and food assuming 60 percent profit margin
- ^d Average expenditure of US\$30/person including boat transport and food assuming 60 percent profit margin
- ^e Average expenditure of US\$80/person/day staying on Mactan Island assuming 60 percent profit margin

SUMMARY

In many ways, Olango's economy is largely dependent on the quality of its coastal environment. It is one that can be categorized as "subsistence", an economy that provides only the basic needs of the inhabitants with little surplus for marketing, allowing only for marginal livelihood. Because of this reliance on the coastal resources, the fishers of Olango use diverse fishing gear and methods in catching their target species. Olango residents consider their economic life as average or barely enough to survive or simply contented (able to eat 3 times a day) with what they have. When in need of cash, they can have access to emergency loans usually from neighbors and relatives. Others resort to usury loans commonly referred to as "5/6" (where one borrows say PhP500 and repays PhP600 within 1 month).

For their economy to be sustainable, a basic consideration is that Olango's population growth should be controlled. The continued trend of declining marine and coastal resources is due to both increasing population pressure and a lack of management that endangers

the resource base of the island. There is no other way for the inhabitants but to look for other means of living aside from fishing and its related activities either within or outside Olango. One such alternative island-based source of income is community-based tourism. Tourism has the most potential livelihood option in Olango which at present is limited only to the OIWS. However, this is difficult to implement because Olango's tourism facilities are underdeveloped and there is a lack of trained manpower for the industry.

The islanders have to continue their dependence on outside sources of income such as remittances of their relatives working in "mainland" urban centers (i.e., Cebu or Lapu-Lapu City) or from those who are fishing in areas other than their fishing ground in Olango. And if their development is to be independent and sustainable, they have to develop their own economic base maximizing whatever available resources (natural and human) there are in the island. Among their options, this is the most difficult to do and remains as a challenge for the people of Olango.

Chapter 6

INSTITUTIONAL and LEGAL FRAMEWORK



The utilization and management of natural resources are governed by various national and local institutions through the enactment of laws. At the national level, the government agencies mandated to implement laws concerning the utilization, protection, conservation, and management of the country's coastal resources are the DENR and the Bureau of Fisheries and Aquatic Resources (BFAR).

DENR jurisdiction includes forest resources, foreshore areas, and coastal resources such as corals, seagrass, seaweeds, and mangroves, while that of BFAR covers all fisheries-related products harvested in the country's coastal areas and the open sea. These include fishes, mollusks (e.g., squids and cuttlefish), seaweeds, and other invertebrates (e.g., lobsters, sea cucumbers, and sea urchins). It is evident that even at the national level, institutional and legal structures and functions overlap.

In implementing the Philippines' Local Government Code (Republic Act [RA] 7190, 1991), most of the powers of government agencies in utilizing, conserving, and managing resources have been devolved to the LGU, which adds confusion to the already confused structures. Here we attempt to identify the different institutional and legal foundations, which are directly associated with and applicable to Olango Island.

CURRENT STATE OF THE PHILIPPINE COASTAL ZONE LAW

The previous provisions pertaining to fisheries and fisheries-related activities during the Martial Law and early post-Martial Law years were known as Presidential Decrees (PDs). At that time, the nation's fisheries was primarily guided by provisions of PD 704, sections 33 and 34. Under the new democratic setup, the national laws pertaining to fisheries and

fisheries- related activities were ratified or signed into law particularly RA 8550, otherwise known as the Philippine Fisheries Code of 1998. It should be noted that, in legal terms, there are significant differences in the 2 provisions. What is common to both provisions is its definition of what constitutes illegal fishing methods and fine mesh nets.

LOCAL GOVERNMENT UNITS (LGUs)

Most LGUs from the provincial down to the *barangay* levels have enacted very few ordinances in regard to the protection and conservation of the coastal zone and/or proper utilization of the coastal resources. For example, from July 1972 to September 1993, the Lapu-Lapu City Council passed only 6 ordinances related to the coastal zone of Olango Island. No other ordinances or resolutions were furnished in regard to coastal resource allocation, utilization, management, and implementation. Even if these ordinances are sufficient for the time being, the enforcement of said ordinances, especially the rampant use of dynamite, cyanide, and very fine mesh nets for fishing, is still a problem. Other *barangay*-enacted resolutions and ordinances related to CRM are presented in Table 6.1.

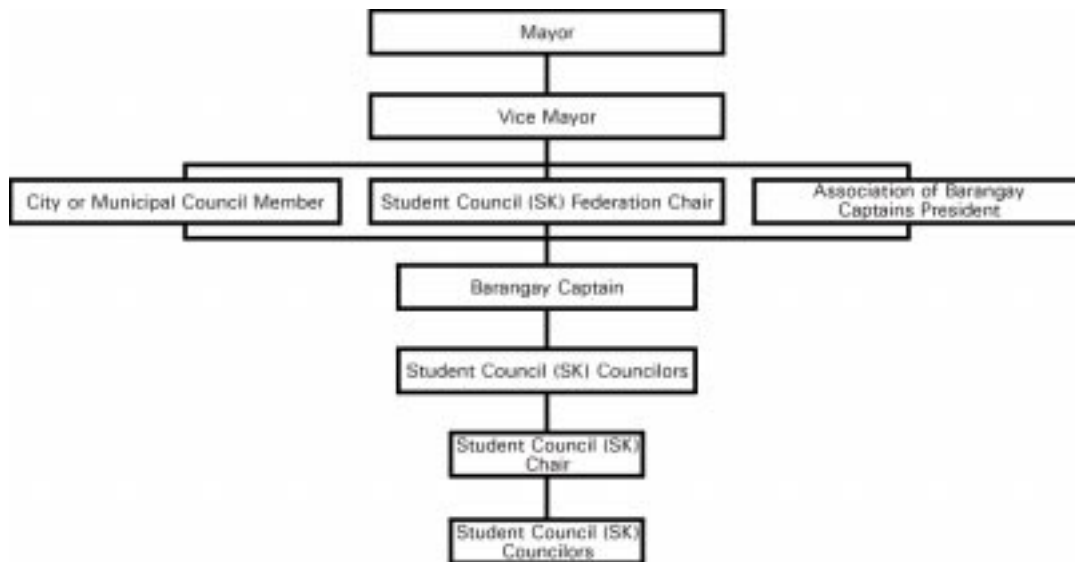


Figure 6.1. Organizational setup of the LGUs in Olango Island and its satellite islets.

LGU Organizational Structures

The generalized organizational structure of the City of Lapu-Lapu and the Municipality of Cordova as applied to administrating Olango and its satellite islets is illustrated in Figure 6. For example, the Lapu-Lapu City Council, responsible for any city legislation, is composed of the members of the *Sangguniang Panglungsod*, President of the Association of Barangay Captains (ABC) and Chairperson of the Federation of Student Council or *Sangguniang Kabataan* (SK). If a proposed legislation by the Lapu-Lapu City Council is related specifically to a certain *barangay*, the proposed legislation is communicated in writing to the *Barangay*

Table 6.1. *Barangay* resolutions and ordinances related to CRM in Olango Island and its satellite islets.

Barangay	Law and Ordinance	Date	Description
Baring	Res.# 1	07 May 89	Prohibiting the transport of sand to another <i>barangay</i> . Penalty of PhP100 per violator.
	Res.# 3	07 May 89	Prohibiting the collection of seaweed (<i>lumot</i>) at the seashore of Brgy. Baring. Penalty of PhP30 plus confiscation of seaweed.
	Res.# 07-95	09 Oct 95	Obstructing the application for preliminary approval and location clearance of Alenter Resort Hotel Corporation, relative to its foreshore lease application on the shoreline belonging to Brgy. San Vicente.
Caohagan	Res. 3	21 Oct 95	Imposing no objection on the Foreshore Lease Application of Alenter Resort Hotel Corporation over a 200-ha foreshore area situated between Sulpa Island and Gilutongan Island and within territorial waters of San Vicente, Lapu-Lapu City.
Caw-oy	Ord.# 12	02 Aug 96	Prohibiting other <i>barangays</i> to glean in the intertidal waters of Tungasan.
	Ord.# 02	10 Aug 97	Prohibiting all residents from throwing garbage inside the territorial seawater and seashore of Brgy. Caw-oy. Penalty of PhP200.
	Ord.# 10-96	March 96	Prohibiting any illegal fishing activities.
Gilutongan	Res.# 0023-S-91	6 Oct 91	Classifying the area of Gilutongan and Nalusuan Island as fish sanctuary.
	Res.# 01,S. '91	18 Oct 91	Resolving to enact the plan of establishing a marine sanctuary in Gilutongan Island, Cordova, Cebu. An ordinance providing the creation of Fish Sanctuary and eventual enforcement of fishery laws.
	Ord #1	18 Oct 91	Marine Fish Sanctuary Ordinance of 1991.
	Res.# 03,S. '91	25 Oct 91	Approving Ordinance #1, Resolution #01, s. 1991 of the Cordova Resource Management Board, Cordova, Cebu.
	Res.# 13,S. '93	3 Oct 93	Resolving to enact the implementation of users fee inside the marine sanctuary in Gilutongan Island, Cebu.
	Ord # 03	3 Oct 93	Imposing fee to all persons or group of persons swimming and snorkeling inside the established Marine and Fish Sanctuary in the Island of Gilutongan, Municipality of Cordova, Cebu.
	Res.# 07,S. '97	6 Jul 97	Beach resort application of Richelieu C. Mendoza at Nalusuan Island.
	Res.# 08,S. '97	20 Jul 97	Requesting the <i>Sangguniang Bayan</i> of Cordova, Cebu to give a copy of its resolution approving the area of marine sanctuary located at Nalusuan beach resort, and Gilutongan Island, Cordova, Cebu.
Res.# 08,S. '98	2 Aug 98	Requesting for the allocation of funds in the amount of PhP30,000 for the fishers crossway passage located at Barangay Gilutongan, Cordova, Cebu.	
Pangan-an	Res.# 5	20 Oct 95	Imposing no objection on the Foreshore Lease Application of Alenter Resort Hotel Corporation over a 200-ha foreshore area situated between Sulpa Island

continued

Table 6.1 continued

Barangay	Laws and Ordinances	Date	Description
Pangan-an	Res.# 30-94	09 Sep 94	and Gilutongan Island and within territorial waters of San Vicente, Lapu-Lapu City. Authorizing the Brgy. Chairperson to execute contract with Pangan-an constituents for the deepening of the passage boundary of the Olango Channel near Sulpa Island. Towards the extending <i>awo</i> within the jurisdiction of Brgy. Pangan-an and for other purposes.
Sabang	Res.# 1	Oct 95	Imposing no objection on the Foreshore Lease Application of Alenter Resort Hotel Corporation over a 200-ha foreshore area situated between Sulpa Island and Gilutongan Island and within territorial waters of San Vicente, Lapu-Lapu City.
San Vicente	Ord.# 06-95/ Res.# 22-95	06 Sep 95	Declaring the fishing ground of San Vicente as Fish Sanctuary and Marine Reserve and imposing penal sanctions for violating prohibitive acts thereof. 1st offense - PhP50, 2nd offense - PhP1,000 and 3rd offense - PhP1,500 or 1 month imprisonment or both.
Santa Rosa	Ord.# 03-97 Ord.# 34-96 Res.# 17-93	09 Sep 97 02 Jun 96 10 Oct 93	Levying wharfage fee to all boat owners/operators docking in causeway port for business transaction. Interposing vehement objection against application of foreshore lease by Mr. Antonio Dy, along the shore of Santa Rosa wharf. Favorably endorsing the application of Mr. Samuel Regual to the Office of Provincial Governor of Cebu to extract sand from the seawater of Santa Rosa.
Talima	none related to CRM	None	None
Tingo	none related to CRM	None	None
Tungasan	Ord.# 24 Ord.# 28 Ord.# 27 Res # 04, S. 98	18 Apr 95 Jul 95 27 Jun 95 17 Jun 98	Enforcing <i>Bantay Dagat</i> to implement rules. Landing fee. Selling of <i>kolon</i> - PhP5, <i>nipa</i> - PhP10, fruits - PhP5 and wood - PhP5 Planting of coastal trees for environmental concerns. Not allowing people from other islands to culture <i>guso</i> within the jurisdiction of Gilutongan, Cordova, Cebu

Captain who in turn communicates and consults with the Barangay Councilors and the SK Chairperson. On matters pertaining to youth development and activities, the SK Chairperson, in turn, consults the SK councilors especially. The Barangay Council examines the proposed legislation, may suggest some revisions, and sends it back to the City Council for final approval. Once approved, it becomes an ordinance and will be implemented by the LGU.

Budget Allocated for ICM

The Lapu-Lapu City Annual Budget has no funds allocated for CRM. However, the City Agricultural Officer (CAO) occasionally conducts CRM activities (i.e., lectures, field trips,

etc.) in connection with the OIWS. Most of the funding for CRM programs in Olango come from projects currently implemented by various nongovernment organizations (NGOs) operating in the island.

NONGOVERNMENT ORGANIZATIONS INVOLVED IN ICM

Several NGOs presently work on Olango Island. The International Marinelife Alliance (IMA) gathers data on live reef fish industry in the area while providing seminar workshops on Cyanide Fishing Reform Program (CFRP) - an alternative to fishers previously engaged in cyanide fishing. With the help of IMA, cyanide fishers tried to form a marketing cooperative for aquarium fish collectors, after completing training on sustainable capture practices involving aquarium fishers in November 1998.

The USC-MBS initiated several alternative livelihood projects and a literacy program for the women fishers in Barangay Caw-oy assisted by a U.S. Peace Corps volunteer assigned to Olango.

The Save Nature Society, Inc. (SNS) focuses on wetlands and wildlife conservation particularly IEC through the teacher facilitators; wetlands research and community organizing. It maintains the Field Office and Community Center located in Sitio Suba, Barangay Sabang, near OIWS.

The Philippine Wetland and Wildlife Conservation Foundation focuses on conservation with particular reference to waterfowl.

The Self-Help Foundation through SNS extends development services, particularly in Sitio Suba, Barangay Sabang, where it maintains a community center together with the CRMP and other local groups.

The Island Ventures Incorporated promotes education and mangrove rehabilitation with funding from the European Community (EC). There are groups (women in handicraft industry) in Metro Cebu wanting to extend enterprise assistance (production skills and marketing) to Olango residents.

There are 4 local NGOs in Olango Island, including the Caw-oy Women's Group, with around 50 members engaged in backyard vegetable and fruit gardening and various livelihood activities.

- Suba Women's Group has about 16 members, all residing in Sitio Suba. Newly formed, it is engaged in activities that support livelihood development of members, particularly the OIWS ecotourism product developed with support from CRMP
- Fishermen's Federation in San Vicente is a fishers' organization affiliated with PEGAMASU or *Pederasyon sa Gagmay'ng mga Mangingisda sa Sugbu*

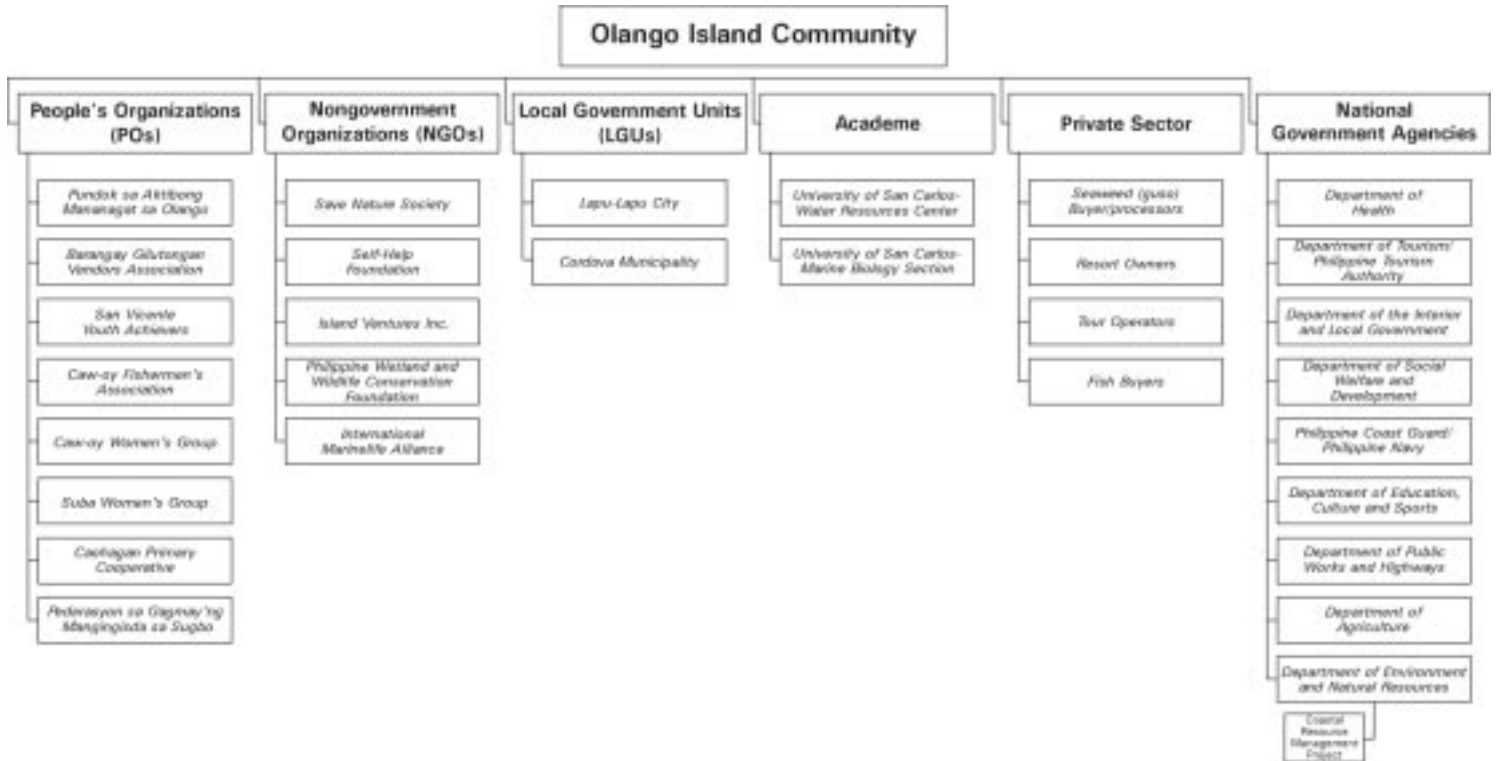


Figure 6.2. The institutional members of Olango Island community.

- Caw-oy Fishermen's Association is engaged in reef fishing (*panggal*), deep-sea fishing and sea ranching (fish pens/cages) for livelihood

The generalized institutional structure of Olango is shown in Figure 6.2.

COOPERATIVES AND PEOPLE'S ORGANIZATIONS

There are several people's organizations in Olango, including the Caw-oy Consumers Cooperative, DSWD-Livelihood Project, San Vicente Water Association, Suba Olango Ecotour Cooperative, Barangay Gilutongan Vendors Association and the Caohagan Primary Cooperative. Most of these organizations operate like a cooperative unit whose main purpose is to provide livelihood for their members. These organizations are not directly involved in CRM, but they can be tapped as the need arises.

SUMMARY

The fundamental laws and policies that guide the use, development, and management of coastal resources as embodied in the institutional and legal setups are already in place in Olango. But clearly there are overlaps in the structure and functions of the various groups and institutions mandated to enforce these laws and policies that hamper effectiveness, leaving both the implementers and the island residents more confused. There is, therefore, the need to clarify the roles and functions of these various institutions. A strong inter-agency/group linkaging and networking among those who are involved in environmental projects in the island is wanting. A multisectoral council for sustainable development and collaborative partnership could be formed which could better address Olango-wide CRM issues.

Chapter 7

COASTAL ISSUES and OPPORTUNITIES



The current issues confronting the people of Olango today are many and wide-ranging. In the island-wide PCRA conducted in 1998, the participants cited a range of environmental, socioeconomic, political, legal, and institutional problems as directly bearing on their lives. The identification of these issues by the islanders themselves indicates their awareness of and concern for their island. This is crucial in taking appropriate short and long-term measures in managing their remaining coastal resources and creating opportunities. Some of the immediate issues besetting Olango Island and its satellite islets with insights on their possible solutions, are summarized in this chapter.

ENVIRONMENTAL ISSUES

Exhaustion of Natural Resources

Fresh water resources

Adequate and affordable supplies of potable drinking water is the most common basic need reported by the Olango people during the 1998 PCRA. Since the main island has a very limited fresh water resource, this should be managed prudently; otherwise, seawater will slowly contaminate its source. Various wells in Olango have reportedly been abandoned due to depletion or contamination from too many users. The increased number of users and limited access to the existing source resulted in more well construction in the island. Modal range of well users is about 20-50 persons per well (Olofson 1992). To help address this problem, the USC-WRC organized in 1987 the Poo Community Self-help Association as part of the Olango Water Resource Management Project (OWRMP). It uses solar energy to pump water and distribute it to its constituents in Barangays Santa Rosa and San Vicente (Sitios Poo, Basdaku, and Bascoral). Members of the association are charged PhP2 per water container compared to PhP3 from the roving water vendors. The income of the association is used to maintain operation of the solar-pump system (Albuero *et al.* 1988).

The OWRMP conducted in 1998 a poll survey regarding the proposed closure of Poo Bay to establish a fresh water storage reservoir (Cusi *et al.* 1990). This was a highly debated issue, especially for the stakeholders whose livelihood depends on the bay's resources. Those who were in favor (36 percent) of the closure live far from the bay while those not in favor (49 percent) live near the bay, with 14 percent undecided and 1 percent no response. Different reasons were given by those against the closure (e.g., the bay is a resource for food and livelihood, influential people own a lot near the bay, the bay closure will lead to adverse effects such as beach erosion and flooding during high tide). Those who were undecided were described as "fence sitters" who relied on others to decide things for themselves e.g., "I will go with the majority, with my husband's decision or with the local leader's choice" (Alburo and Olofson 1988b).

Responses from those "in favor" did not seem to be keen on the issues. Most of the reasons described were shallow or with personal interest in mind. Examples include that we "want any development on the island", or we "don't use the bay as a source of living, since seawater will not enter the bay, it will be easy to walk across it". This information could help potential coastal managers and stakeholders to understand fully the significance and consequences in handling this resource.

Another proposed alternative source of water in Olango was a desalination project located at Barangay Talima, funded from the Countryside Development Fund (CDF) of a former congresswoman. Unfortunately, before the desalination plant became fully operational, it had to stop. The problem was that the deep well used as the plant's source supplied an insufficient volume of water and it was too salty for the plant specifications. They tried deepening the well but hit a solid surface and were unable to proceed without a significant increase in project cost. Recently, the desalination plant operated again but increased the price of 1 gallon of water to PhP3.

Fuelwood

Olango Island and its satellite islets with their rocky terrain, poor soil, seasonal rainfall, and high population density retain a very limited supply of a basic resource—fuelwood. This is especially prevalent during dry seasons such that even mangrove and coconut palm have already been depleted resulting in the importation of fuelwood from Bohol at a higher price. In some years, the problem is so severe that even dried roots (*tungdan*), which is a staple food, have been used as a fuel (Olofson *et al.* 1989).

Thus, it is imperative that fuelwood plantations should be expanded in Olango. These would also cool the soil surface, lessen the temperature and, evaporation, and so conserve the freshwater lens, provided that the trees to be planted have smaller leaves to lessen evaporation. A diversity of species, without reliance on any one species such as giant *ipil-ipil*, would also limit insect infestations. Leguminous species planted on large,

unused landholdings in the center could enrich soils there, and also provide feed for livestock that would, however, have to be separated from the growing resource (Olofson *et al.* 1989).

Coral Extraction

It is already common knowledge that coral extraction is illegal and punishable by law (PD 1219, as amended by PD 1698 and RA 8550). The damage caused by this activity to the environment continues particularly in the waters around Pangan-an Island and Barangay Sabang. The extracted corals are sold in the Punta Engaño area of Mactan Island for export.

Sand Quarrying

This has reportedly been going on in Barangays Baring, San Vicente, Sabang, Pangan-an Island and Tingó. The sand is reportedly sold to beach resorts as filling for their beach areas and to construction companies as material for their ongoing infrastructure projects.

Illegal Fishing Practices

Blast fishing

According to some Olango fishers, dynamite fishing is far better than cyanide fishing, because it merely fractures the corals into tiny bits and eventually those that are not directly hit grows back. But from repeated observations, this is not the case because the coral fragments apparently die from repercussion of the impact and related sedimentation. Homemade "dynamite" is made up of ammonium nitrate (NH_4NO_3) commonly used as mango fertilizers, soaked in gasoline, and supplied with a piston tube and blasting cap, costing about PhP79 per kg. Nearby Caubian Island is a well-known haven of dynamite users, where the practice is often passed from one generation to the next. For the marginalized fishers who want to increase their CPUE, dynamite fishing is usually employed.

Cyanide fishing

Olango Island, due to its proximity to Mactan-Cebu International Airport, is the traditional collection and marketing center of the marine aquarium fish trade in central Philippines. Most of the fishers engaged in this industry have at one time or another resorted to cyanide fishing due to the convenience of catching reef fishes. Sodium cyanide (NaCN) is a candy-like substance that is diluted in water and placed in a squeeze bottle. Once in contact, this chemical stupefies, disables, or kills the organism depending on the concentration. Widespread use of cyanide may also contribute to the bleaching and death of corals in collection areas. Human poisoning, especially among children eating cyanide caught fishes, has also been reported. Live reef fish collectors often use cyanide because of its higher CPUE compared to fine mesh nets, though the percentage of survival of captured fish of the latter method is higher. Cyanide can be easily bought in Olango at a retail price of PhP200 per kg or PhP15 per tablet.

Tubli

Aside from cyanide, a local vine known as *tubli* (*Derris elliptica*) which grows wild in the island is another source of chemical used for stunning fishes. This chemical is reportedly less potent than cyanide with rotenone the active ingredient of the plant's extracts.

Hookah diving

This is an innovative way to replace SCUBA as diving gear using a surface supplied air. This is made up of gasoline engine powered, air compressor used in vulcanizing shops, old beer or LPG barrel and hose. Divers usually wear heavy clothing for warmth and as added weight. Using this kind of gear can be advantageous because they can spearfish conveniently (compared to holding breath) and are able to access deeper waters where high prized fish and invertebrates are found. The disadvantage of hookah is that divers are lured by the "unlimited" supply of air, therefore ignoring bottom time, resulting to decompression sickness or the "bends". Most of the hookah divers have no basic training on deep water diving and the rules they have to follow. Already many casualties have been reported, some others were lucky enough to have survived but are paralyzed from the waist down (Santos *et al.* 1997b).

Potential diving injuries and casualties could be minimized through proper education of the hookah divers. In 1997, the USC-MBS initiated a practical education program designed to familiarize fishers on the possible physiological effects when a person dives into greater depths.

POLLUTION**Solid waste disposal**

The general lack of solid waste management policy has been pointed out by many Olango residents as having caused both health risks and aesthetic burdens. There is no common or officially established dumping area in Olango to contain the solid waste generated by its growing population. Most resort to burning, burying, and discarding of garbage directly to the sea hoping the tides and currents will wash the waste away. Enterprising individuals can venture into the recycling business collecting all re-usable waste available in Olango and neighboring islands.

Sewage and sewerage facilities

There are no drainage and sewerage facilities in Olango as in many other parts of the province. With the increasing population, this is becoming an increasingly serious health and sanitation problem. In Olango, only 18 percent of the households reportedly have sanitary toilet facilities. People without toilets defecate behind the bushes and on the shores. There have been efforts by NGOs and the Department of Health (DOH) to improve the situation. For example, the DOH has a program which provides a free toilet bowl and 2 sacks of cement for the construction of sanitary toilets. The recipient provides for the labor and the construction of the septic tank. People have the notion that the government

should provide for all their needs. Evaluations of the program revealed that many of the recipients are not using their toilets but continue to defecate outside on the beach because the use of the toilet is, unfortunately, reserved for guests.

Air pollution

Some residents complain about the foul odor generated during the drying of the *sigay* shells (*Cypraea* spp.) which are commonly used in the shellcraft trade. This odor problem could be mitigated by having the drying areas in isolated open spaces with good wind circulation away from the residential houses.

VULNERABILITY OF OLANGO ISLAND TO CLIMATE CHANGE AND SEA LEVEL RISE

On 9 to 10 December 1998, a workshop on the “Vulnerability Assessment of Olango Island to Climate Change and Sea Level Rise” was held in Costabella Resort Hotel, Mactan Island, Cebu, Philippines.

The assessment exercise was sponsored by DENR-Region 7, Wetlands International, Environmental Research Institute of the Supervising Scientist and Asia-Pacific Network for Global Climate Change and was attended by representatives from the academe, NGOs, LGUs, CRMP, and PAMB. Among others, the workshop intended to:

1. Determine the likely impact of climate change and sea level rise on Olango Island,
2. Formulate management strategies and responses including monitoring schemes on climate change and sea level rise specific to Olango Island, and
3. Incorporate these potential strategies into coastal and other management plans in the country.

Proposed Mitigating Measures of the Possible Impact of Climate Change and Sea Level Rise on Olango Island

Based on the data presented during the workshop, it was concluded that Olango Island is vulnerable to climate change and sea level rise. According to Mapalo (1999), it was predicted that by the year 2030, the sea level would rise by 8 to 30 cm and 15 to 95 cm by year 2100. This predicted sea level rise and increase in sea surface temperatures will be accompanied by an increase in typhoon intensity by up to 20 percent and increase in storm surges. Rainfall intensity and frequency will tend to increase also.

To mitigate the possible future impacts caused by climate change and sea level rise, it was recommended to integrate the concept of sea level rise in the management plans of all agencies concerned at the local, regional, and national levels. It was further suggested to incorporate strategies on sustainable use of resources, disaster preparedness, and emergency responses.

Table 7.1 summarizes the proposed measures aimed to mitigate the predicted impact of climate change and sea level rise on Olango Island. At this early stage, it is essential that

Table 7.1. A summary of proposed measures to mitigate impacts to climate change and sea level rise in Olango Island and its satellite islets (Mapalo 1999).

Attributes	Proposed measures
Fisheries	<ul style="list-style-type: none"> ● Shift to other livelihood ● Intensify law enforcement ● Establish marine sanctuary ● Install fish attracting device ● Monitor reef fish biomass ● Intensify proper solid waste disposal ● Intensify law enforcement
Coral reefs	<ul style="list-style-type: none"> ● Intensify information and education campaign ● Encourage reef tourism ● Identify more recreational dive sites ● Monitor reef destruction
Seagrass beds	<ul style="list-style-type: none"> ● Try seagrass planting ● Monitor seagrass cover
Mangroves	<ul style="list-style-type: none"> ● Enrichment planting of natural stands ● Intensify information and education campaign ● Limit access to existing mangrove areas ● Monitor mangrove cover, growth, and distribution ● Revegetate water catchment areas ● Intensify mangrove cluster planting around the OIWS Nature Center ● Intensify information and education campaign ● Update management plan ● Develop community-based ecotourism and livelihood options
Terrestrial vegetation	<ul style="list-style-type: none"> ● Enhance planting of salt tolerant species ● Encourage planting of fruit trees ● Intensify information and education campaign ● Ban the harvesting of erosion resistant vegetation ● Ban the extraction of soil along the shoreline
Bird sanctuary	<ul style="list-style-type: none"> ● Monitor bird populations, zoobenthos, storm surges ● Intensify information and education campaign
Topography	<ul style="list-style-type: none"> ● Construct wave breakers ● Review policies on mangrove establishment ● Intensify information and education campaign
Hydrology	<ul style="list-style-type: none"> ● Regulate groundwater extraction ● Intensify information and education campaign ● Review proposal to close the bays ● Install rain collectors ● Declare areas over freshwater lens as protected

an information and education campaign on the effect of climate change and sea level rise on small islands like Olango and its satellite islets be launched.

SOCIAL ISSUES

The majority of Olango islanders are financially poor, poorly educated, and lack adequate health care. Without any other livelihood option in sight, the situation becomes complicated when some fishers involve themselves in risky fishing methods like hookah diving, and

environmentally damaging activities such as dynamite and cyanide fishing. Only a few enterprising and “well-connected” individuals have gained financially from the use of the coastal resources of Olango Island. This general situation is the basis from which the following socioeconomic issues emanate.

Coastal Users

The majority of the coastal users in Olango are marginal fishers engaged in subsistence fishing, gleaning, and firewood collection just to provide daily food needs and occasionally to earn extra cash. A small group of middle-income earners rent their pumpboats to tourists to go island hopping.

Some Olango inhabitants allegedly become business partners of foreign nationals or act as dummies in acquiring properties, which could later be developed into resorts, resulting in the displacement of some residents.

Olango islanders and outsiders both have long exploited the coastal zone around Olango Island. This is due to its open access system, where all one needs is diligence and one can fish anywhere (Santos *et al.* 1997b, 1997c). The locals have observed fishers from other islands fishing within the coasts off Olango with no fishing permit or license. According to the Lapu-Lapu City agriculturist, this encroachment may be due to the majority of the inhabitants being poor and marginalized and like any other fishers are continually looking for more productive fishing grounds.

Overpopulation

The growing overcapacity of small islands due to increasing population becomes a critical issue because of the enormous pressure on the existing natural ecosystems and its significant impacts on health. During the last 25 years, Olango's population has doubled and if Olango has to foster economic growth and sustainable development, this trend has to be halted through appropriate approaches and measures to better manage population growth.

Illiteracy

The low educational level in Olango, with 80 percent of respondents reportedly attaining only elementary education, hinders them to take on opportunities aside from fishing and it limits them from participating in the island developments. For example, environmental awareness among the islanders is low. Scholarship grants to poor but deserving students could encourage interest to seek higher education. Skills training and Adult Literacy Program of the Technical Education and Skills Development Authority (TESDA) and the Department of Education, Culture and Sports (DECS) could also increase their chances of employment, business success, and the sense of well being.

Table 7.2. Population trend of the 11 *barangays* from 1970 to 1995 (NSO 1995).

Barangay	1970	1975	1980	1990	1995
Baring	1,051	1,141	1,560	2,122	2,303
Caohagan	263	205	217	256	342
Caw-oy	661	791	846	970	1,002
Gilutongan Island	440	446	514	715	1,061
Pangan-an Island	807	955	1,089	1,263	1,229
Sabang	1,937	2,411	2,845	3,212	3,920
San Vicente	fused with Santa Rosa	fused with Santa Rosa	fused with Santa Rosa	fused with Santa Rosa	2,392
Santa Rosa	2,751	2,873	3,478	4,090	2,409
Talima	1,413	1,678	2,202	3,039	3,310
Tingo	1,451	1,651	1,815	2,266	2,449
Tungasan	1,128	1,000	767	1,331	1,421
Olango Island	9,965	10,743	12,488	16,052	18,008

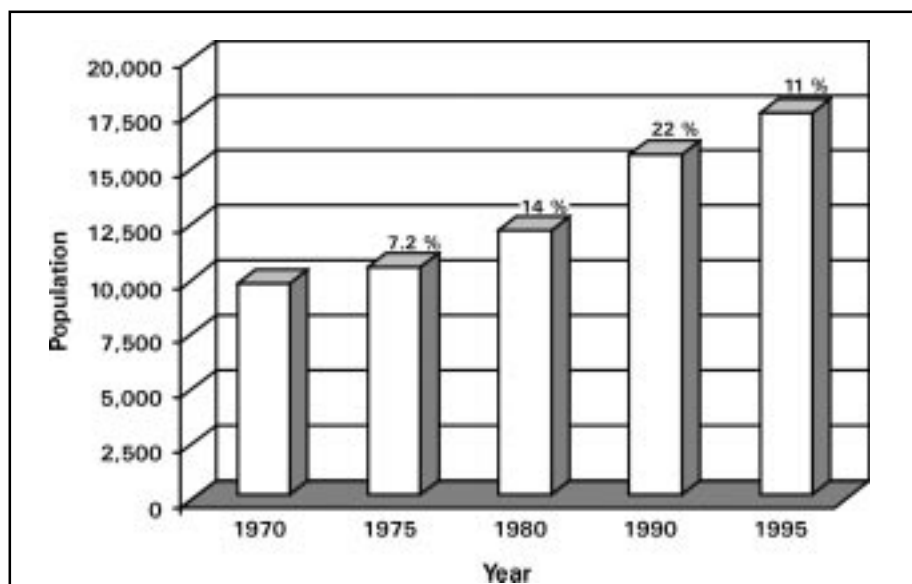


Figure 7.1. Population trend of Olango Island and its satellite islets from 1970 to 1995 showing percent growth (NSO 1995).

Gambling

This is one vice that is rampant in the island. On a visit to one *barangay* for example, the first sight that greeted the eyes was that of men, women, and children playing cards or *mahjong* under the shade of a tree or *nipa* shack. One mother interviewed said that the first and foremost reason that she gambles is due to boredom while her husband is out fishing. The second reason is to try her luck "*kay kong suwertehon makadaug*" ("if she gets lucky, she could win") and her *daug* (prize) could add to her daily budget for food, but if she loses, that is fate.

There have been attempts by the local government in the island to curb gambling activities in their respective *barangays*. For instance, the Barangay Council in Caw-oy passed a resolution banning gambling in the *barangay*. For some months, the *barangay* police, or *tanods*, made arrests and raids, but this was not sustained as some people in the *barangay* continue to defy the law enforcers.

To stop gambling, people should be provided with more productive activities. The Caw-oy Women's Group, for example, is provided with alternatives by engaging in shellcraft to augment their family income. Watching television and listening to radio drama are the other forms of entertainment.

ECONOMIC ISSUES

Livelihood Options

Several institutions have joined in proposing and providing livelihood options to the Olango islanders. For instance, in 1997, the USC-MBS started a 2-ha coral farm project in Barangay Caw-oy to provide an alternative source of income for fishers who had been using harmful fishing techniques. The basic concept involves fragmenting the natural stock of coral and transplanting it to coral-degraded areas with the active participation of fishers and the approval of the Barangay Council members. After 3 months, the coral fragments will be ready for marketing to rehabilitate degraded reefs in the beachfronts of the local resort. One could also sell the fragments abroad particularly to aquarists. The fishers and the local government get a certain percent of the proceeds. Although the concept is basically sound, the project has yet to prove its long-term viability.

Another project by USC-MBS is to grant loans to former illegal fishers with a seed money of PhP10,000 for them to invest on fish trap or *panggal* fishery, a passive, environment-friendly fishing gear. Beneficiaries are paying the loan either daily, weekly or monthly. Now the Caw-oy Fisherfolks Association has 60 members.

Enterprise development facilitated by CRMP focuses on the local resources of an area. Seaweed (*guso*) farms using a new variety and "net bag" technology in Gilutongan and neighboring islands have been started. A community-based ecotourism development in OIWS started in Barangay Sabang, to benefit the fishers, women, and youth. The setup has become a tourist attraction.

Aquarium Fish Trade

The live reef fish industry is a major source of income in Olango Island, especially for Barangays Sabang, Santa Rosa, and San Vicente. Of the 19 aquarium fish buyers based on Olango in 1997, only 12 were registered with the BFAR Region-7 (SUML 1997). The scarcity of aquarium fish in Olango Island has led fish collectors to travel to distant fishing areas to get the target fish. The IMA launched the CFRP and has since been training cyanide fishers in using environment-friendly techniques to catch aquarium fishes (i.e., barrier net, scoop net, etc.) and proper decompression of fish with bloated swimbladder.

In its 1996 report, IMA noted a substantial reduction of cyanide fishers in Olango. But despite the re-education by IMA and BFAR on the use of environmentally-correct gear in collecting live fish, some fishers are back to cyanide fishing due to the “ease” of catching the fish. Also, they reasoned that even if they had the permits certifying the use of environmentally safe techniques, they could not use these permits because many LGUs have passed resolutions banning the collection of live aquarium fish in their respective jurisdictions. Thus, the training and permits are not being fully utilized. Rather, this resolution has resulted in the loss of income for some Olango fishers who rely solely on catching aquarium fishes as their means of livelihood.

In its effort to reduce the number of fishers and operators using cyanide, IMA has set up a Cyanide Detection Test (CDT) facility in the BFAR Region-7 Office Complex. The facility monitors live fish shipments for the presence of cyanide and, if found, the shipment is confiscated and the shippers and collectors prosecuted.

Tourism

With the noted exceptions of Nalusuan and Caohagan Islands, only limited tourist facilities exist in Olango Island. Its tourism industry is still underdeveloped compared to the neighboring island of Mactan. There is still much to be desired; Olango Island needs: infrastructure development (i.e., sufficient road network to different *barangays* and causeways to accommodate the smooth flow of goods from other neighboring islands); a reliable water supply; and electricity.

Solar energy could be an alternative and if Olango has to develop its tourism sector it should not follow Mactan Island's experience because in spite of the profit generated by the industry, the benefits to local communities appear to be limited. In order to make it possible for the islanders to get a fair share of the income from tourism, the respective LGUs should adopt programs that ensure fair distribution of the income and other benefits derived from it. Community-based ecotourism is suggested and Olango Island can serve as a model for this new idea. Tourism development that is environmentally sound may not be easy to implement on Olango Island given its various limitations.

While tourism is a major source of foreign exchange and a factor in the economic development of the Philippines, there are some environmental and sociocultural trade-offs. The weak enforcement of policies on tourism development in the Philippines has resulted in disorganized development within the coastal zone. More often than not, small to medium-size resorts cannot afford to install a wastewater treatment plant. It is also unlikely that resort owners will “act” together in putting up a common sewage treatment plant. Sewage is often discharged directly to the sea during the night to avoid apprehension. As most resort owners are very influential, they use their influence to get what they want, which complicates and aggravates the situation.

Tourism Development within and near the Olango Island Wildlife Sanctuary (OIWS)

Among the islands close to Mactan Island, Olango is one of the favorite day-trip "island-hopping" and diving destinations for local and foreign tourists. One of the additional attractions of the island is the 920-ha OIWS, which receives about 2,000 visitors per year.

Several proposed and potential tourism-related developments are centered in or near the sanctuary. Community-based ecotourism has demonstrated the potential to serve both as a livelihood activity for local residents, as well as a means to strengthen their involvement and commitment to better manage and protect their environment and the OIWS (DENR-7 1998). Corollary to this potential project is the possible development of an Olango Wildlife Resort, a home stay program, which will cater to avid bird watchers and weekenders alike.

Another potential tourism development is the planned reclamation of 200 ha of shallow-water habitats near Sulpa Island into a man-made island to be known as "Dolphin Island". This development, if realized, could be environmentally destructive and financially risky. While the entire concept may appear to be beneficial to the islanders to generate jobs, it may not be sustainable and could cause severe degradation of the marine environment.

POLITICAL ISSUES

Laxity in the Enforcement of Fisheries Laws by the *Bantay Dagat*

One of the Cebu Provincial Government's thrusts to protect the coastal waters against indiscriminate fishing and garbage disposal was the creation of a task force called *Bantay Dagat* (Sea Watch) in 1979. Despite being reportedly ineffective during the initial years, it was revived in 1987. In Olango Island, the *Bantay Dagat* task force had an average of 10 arrests per year since 1992. This is very low compared to the number of illegal fishing activities observed everyday, particularly blast fishing. The age of the violators ranged from 18 to 60 years. Punishment means probation on the first offense, then 12-20 years in jail or imprisonment for the second offense. The *Bantay Dagat* team is also undermanned with only 30-40 personnel, has a monthly budget of PhP5,000-12,000 from the LGU, and lacks operational patrol boats (Santos *et al.* 1997a). The ineffective implementation of *Bantay Dagat* may be due to the lack of adequate police powers and the practice of sending violators to the respective LGU centers for case filing and not to their respective *barangays*.

Another reason is the contrasting affiliations among *Bantay Dagat* members and *barangay* officials, which hinder the efficient execution of their tasks. There were allegations that some strong political figures are coddling illegal fishers. With a low salary of PhP3,000 to 4,000 a month for *Bantay Dagat* enforcers, incidents of bribery in the form of a few *banyeras* or tin basins of fish caught illegally have been confirmed. In short, the devolution of *Bantay Dagat* functions to the respective LGUs has not created a significant impact on CRM.

Lack of Support from *Barangay* Officials

One devolved power to the LGU is the increased jurisdiction and management responsibilities of their natural resources. Conscious of this newly given power, some local government officials can make it difficult for proponents to implement some projects especially if the implementors have different political affiliations. Non-cooperation by the *Barangay* Councils could have been the result of non-consultation when the project was being conceptualized; hence, they do not fully grasp the goals and benefits to their constituents. In spite of this, it should be recognized that the involvement of the LGU is crucial to the success of any endeavor that affects its respective community, one of which is managing resources.

LEGAL ISSUES

Intrusion of Commercial Fishing Boats

This is both an environmental and political issue in Olango. The unabated trespassing of commercial trawlers within the municipal waters of Olango is one of the causes of dwindling catch as mentioned by the Olango fishers. These commercial fishers usually operate at night.

Although these illegal commercial fishing activities have been reported to the proper authorities many times, no action has been taken to eradicate or lessen this activity. It has been estimated that the one night's catch of a commercial fisher is equivalent to a month's catch for all the fishers in one *barangay*. That is why some fishers employ dynamite fishing to "outdo" their intrusive commercial fishing counterparts. Harmful fishing practices and the intrusion of commercial fishing boats can be minimized through a strict enforcement policy and stiffer penalty charges to the offenders.

Land Ownership

As the price of real estate continues to increase in Olango Island, the legal problem of land disputes in the island has become more common, to the detriment of the islanders who cannot afford to have their lands titled. As a consequence, islanders owning lands with only a tax declaration as their legal document are usually victims of land grabbing schemes.

INSTITUTIONAL ISSUES

It should be noted that many institutional issues relating to CRM are due to ineffective policies and jurisdictional capacity as well as the poor enforcement of fishery and environmental laws.

Unclear Mangrove Stewardship Contract

A decade ago, DENR launched a massive mangrove reforestation program for environmental and livelihood purposes. Mangrove plantation owners have now successfully grown the planted mangrove trees (*Rhizophora* spp.).

In the coastal areas of San Vicente and Sabang, they planted right in front of their lots, which were part of the OIWS. The problem surfaced when plot owners were stopped from harvesting because they were required to secure permits from DENR. Owners have complained why they could not harvest their planted trees without a permit. The majority of the complainants are stewardship contract holders who did not understand fully the terms in the contract while some were those who joined the “bandwagon” of planting mangroves. There is a need for DENR to clarify to the contract holders the terms of reference stipulated in the contract especially to those planters who are not well educated. A monitoring program is also necessary.

Extension of Seaweed Culture to Another *Barangay*

The fishers of Barangay San Vicente have complained that seaweed farms of Gilutongan fishers are extending into the waters off Barangay San Vicente, preventing them from fishing there. This conflict is brought about by lack of a foreshore lease agreement or permit on the part of the cultivator and the local *barangay* officials. Without this, anyone can just establish a farm anywhere. The respective LGU could issue permits prior to setting up a farm and generate revenues from it.

Nalusuan Beach Resort and Sanctuary Management

The establishment of a marine sanctuary by a private resort in Nalusuan Island needs to be reviewed in the light of the various stakeholders involved. Fishers complain that when they pass by or even fish within the waters off Nalusuan Island, the guards of the private resort fire their guns telling them to stay away from the water resort.

Table 7.3 is a summary of the above discussed issues and opportunities in the 11 *barangays* of Olango based on the PCRA (1998) results.

CONSERVATION AND MANAGEMENT PLANS FOR OLANGO ISLAND

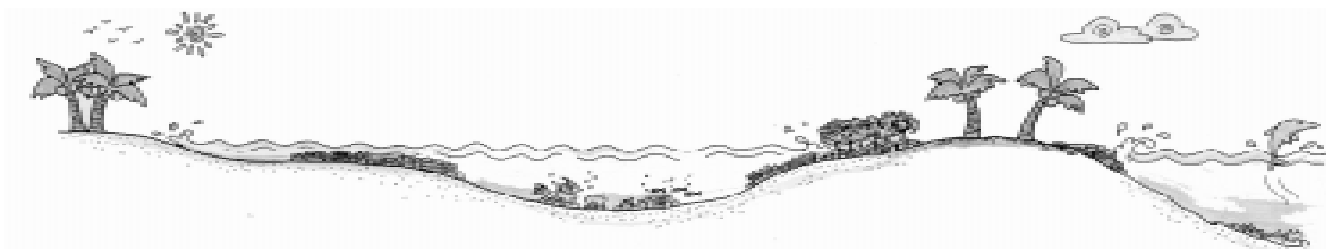
Olango Island Development and Management Plan

The City of Lapu-Lapu, Cebu Province has the political jurisdiction over the conservation and management of Olango Island. Yet, in the Mactan Island Integrated Master Plan Study (MIIMPS) prepared by Schema Konsult, Inc. in 1995, there was no comprehensive plan for the island except in the Environmental Management Section V under “Reserved Areas” where it mentions that the 920-ha OIWS has a Management Plan purposely formulated for its protection.

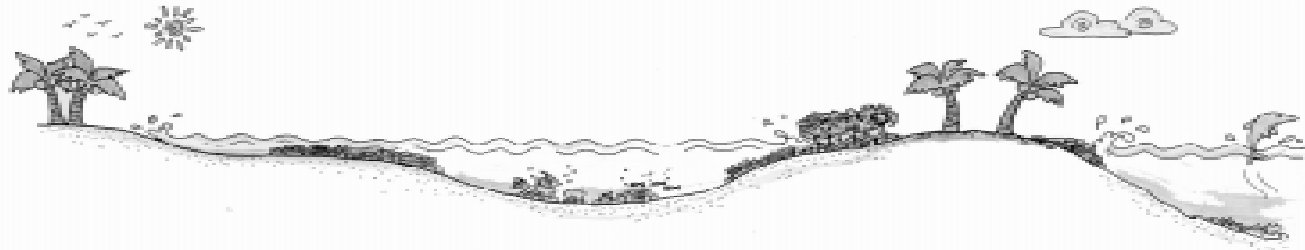
However, the Office of the Lapu-Lapu City Planning and Development prepared a land use map of Olango Island and its satellite islets (Figure 7.2) where areas are zoned with their corresponding use. Among the local development listed for Olango zone under the MIIMPS are:

- An expansion area for tourism development that considers the ecological fragility of the area and promotion of ecotourism activities

Table 7.3. Transect diagram of issues and opportunities in Olango Island (PCRA 1998).



Barangay	Land	Beach	Mangrove	Tidal Flat	Seagrass	Coral Reef	Oceanic
Issues							
Baring	livelihood, water	garbage	no mangroves present	dynamite, cyanide fishing	<i>sudsud</i> fishing	use of dynamite, cyanide and compressors	dynamite and cyanide fishing
Caohagan Island	water, electricity, garbage	garbage	no mangroves present	dynamite, cyanide fishing	overharvesting	dynamite, cyanide and compressors	trawl fishing
Caw-oy	livelihood, gambling	garbage	no mangroves present	dynamite, cyanide fishing	<i>sudsud</i> fishing	dynamite, cyanide fishing	dynamite and trawl fishing
Gilutongan Island including Nalusuan Island	water, electricity	garbage	no mangroves present	dynamite, cyanide, questionable Nalusuan sanctuary	sea urchins consuming the seaweed <i>guso</i>	cyanide fishing	dynamite and trawl fishing
Pangan-an Island	water, electricity, toilet, gambling, livelihood	sand extraction, garbage, tourism land conversion	<i>sudsud</i> prohibited, hiding place for bad elements, mosquitoes	dynamite, cyanide fishing	<i>sudsud</i> fishing	dynamite and cyanide fishing, coral extraction	dynamite and trawl fishing
Sabang	water, electricity, gambling, poor garden soil	sand extraction, garbage, closed access to beach, land dispute	mangrove cutting, unclear DENR stewardship agreement	cyanide, <i>sud-sud</i> , coral extraction, coral disturbance by abalone collectors	<i>sudsud</i> , fine mesh net, cyanide fishing	dynamite and cyanide fishing, coral extraction	trawl, commercial fishers, dynamite and cyanide fishing
San Vicente	only good side of proposed OIWS was explained, water, birds were protected more than humans, electricity	sanitation, garbage, epidemic	mangrove owners are apprehended without DENR's permit to cut	closed access to gleaners, cyanide	low harvest of <i>sigay</i> because of <i>sudsud</i>	overfishing by outsiders, coral extraction, dynamite and cyanide fishing	dynamite, cyanide fishing, use of <i>sahid</i> for <i>baló</i>



Barangay	Land	Beach	Mangrove	Tidal Flat	Seagrass	Coral Reef	Oceanic
Issues							
Santa Rosa	livelihood, gambling, garbage	reclamation, garbage, sand extraction	illegal cutting, garbage	dynamite and cyanide fishing	<i>sudsud</i> fishing	dynamite and cyanide fishing, compressor	dynamite and trawl fishing
Talima	livelihood, gambling, toilet	garbage	illegal cutting, garbage	dynamite and cyanide fishing	low harvest of <i>sigay</i> because of <i>sudsud</i>	dynamite and cyanide fishing, coral extraction	trawl, commercial fishers, dynamite and cyanide fishing
Tingo	livelihood, water	garbage	no mangroves present	dynamite and cyanide fishing	<i>sudsud</i> fishing	dynamite and cyanide fishing compressor	dynamite and trawl fishing
Tungasan	livelihood, gambling, garbage	garbage, closed access to beach	illegal cutting, garbage	dynamite and cyanide fishing	<i>sudsud</i> fishing	dynamite and cyanide fishing	dynamite and trawl fishing
Opportunities							
Baring	construction of toilets, shellcraft enhancement, cleanup/ beautification drive	cleanup/ beautification drive to attract tourists	no mangroves present	none	prohibit fine mesh nets	enforce laws on illegal fishing	enforce laws on illegal fishing
Caohagan Island	24-hr water and electricity services	look for disposal area for garbage	no mangroves present	close access inside the sanctuary	enforce laws on illegal fishing	enforce laws on illegal fishing	enforce laws on illegal fishing
Caw-oy	cleanup/ beautification drive, efficient water system	cleanup/ beautification drive to attract tourists	no mangroves present	enforce laws on illegal fishing	prohibit fine mesh nets	establish a marine sanctuary	enforce laws on illegal fishing

Barangay	Land	Beach	Mangrove	Tidal Flat	Seagrass	Coral Reef	Oceanic
Opportunities							
Gilutongan Island incl. Nalusuan Island	24-hr water and electricity services, look for disposal area for garbage	additional toilets, cleanup/ beautification drive	no mangroves present	enforce laws on illegal fishing and abolish the Nalusuan sanctuary	plant high yielding variety of <i>guso</i>	enforce laws on illegal fishing	enforce laws on illegal fishing
Pangan-an Island	solar-powered water pump, deepen the water channel, livelihood	educate the people, full support to community programs	expand DENR's mangrove stewardship program	enforce laws on illegal fishing	<i>guso</i> farming	establish a marine sanctuary	educate the people, enforce laws on illegal fishing
Sabang	efficient electrical service, community-based ecotourism	cleanup/ beautification drive to attract tourists	expand DENR's mangrove stewardship program	enforce laws on illegal fishing	prohibit fine mesh net	enforce laws on illegal fishing	enforce laws on illegal fishing
San Vicente	efficient water system, community consultation	proper sanitation, cleanup/ beautification drive develop beaches	change the system for common good (OIWS), give rights to mangrove planters	<i>barangay</i> planning together with council and community	manage habitat with community	establish a marine sanctuary, community consultation, develop areas with tourism potential	enforce laws on illegal fishing
Santa Rosa	widen the causeway, create livelihood	cleanup/ beautification drive to attract tourists	expand DENR's mangrove stewardship program	enforce laws on illegal fishing	prohibit fine mesh net	enforce laws on illegal fishing	enforce laws on illegal fishing
Talima	construction of toilets, shellcraft enhancement, cleanup/ beautification drive	proper sanitation, cleanup/ beautification drive, develop beaches		enforce laws on illegal fishing, mariculture	prohibit fine mesh net, develop mariculture	enforce laws on illegal fishing, mariculture	enforce laws on illegal fishing, develop mariculture
Tingo	construction of toilets, cleanup/ beautification drive	cleanup/ beautification drive to attract tourists	no mangroves present	none	prohibit fine mesh net	enforce laws on illegal fishing	enforce laws on illegal fishing
Tungasan	desalination plant, formation of coop, more IEC, golf course	beach resort development, more toilets	community-based ecotourism, mariculture	environment-friendly causeway	develop mariculture, implement all ordinances	establish a marine sanctuary, mariculture, implement all ordinances	enforce laws on illegal fishing, develop mariculture

- Establishment of a commercial district at the island's center in Santa Rosa to serve the needs of inhabitants
- An expansion of the environmental protection area to include portions of San Vicente and Sabang and all the smaller islands south of Olango Island
- An expansion of the residential area for employees engaged in tourism and industrial activities in Mactan
- More specific infrastructure targets reported are:
 - Full electrification of Olango Island
 - Infra support to *barangays* and mini-city hall
 - *Bantay Dagat* protection, specifically the eastern coastline of Olango
 - Allocation of annual budgets for Olango infra projects

Whether this land use map is a result of a series of consultations with the islanders it is not known.

Olango Island Wildlife Sanctuary Conservation and Management Plan

Wetland areas in Olango are comprised of mangrove forests with about 424 ha, mudflats (33 ha) and other shallow areas (53 ha) that serve as a bird habitat. The OIWS was officially declared as a protected area in May 1992, 1 month ahead of the enactment of the National Integrated Protected Areas System (NIPAS) Act (RA No. 7586). The promulgation of the NIPAS Act of 1992 made the OIWS an initial component of the Integrated Protected Area System (IPAS). As such, its conservation and management are vested in the DENR-Region 7 and the Protected Area Management Board (PAMB) with the Protected Area Superintendent handling the day to day operation of the sanctuary.

As a designated area of national and international importance, the protection and proper management of the 920-ha OIWS should be a priority because it has future implications on the ecological integrity as well as the sustainability of the entire Olango Island and its inhabitants. In the confines of the sanctuary, issues are many and the possibilities are wide.

In January 1992, even before the 920-ha OIWS was declared as a Ramsar Site, a conservation and management plan for the sanctuary was already formulated. A multisectoral group spearheaded by the DENR through the Protected Areas and Wildlife Bureau (PAWB) participated in the formulation of the plan. Listed below are the 10 conservation objectives stipulated in the 1992 OIWS Management Plan which serve as the springboard in coming up with management options for the wildlife sanctuary in Olango Island. These 10 objectives were translated into projects and implemented from 1992 to 1998.

- Habitat maintenance for bird protection
- Zoning of the wildlife sanctuary
- Identification of allowable activities
- Maintenance of buffer zone

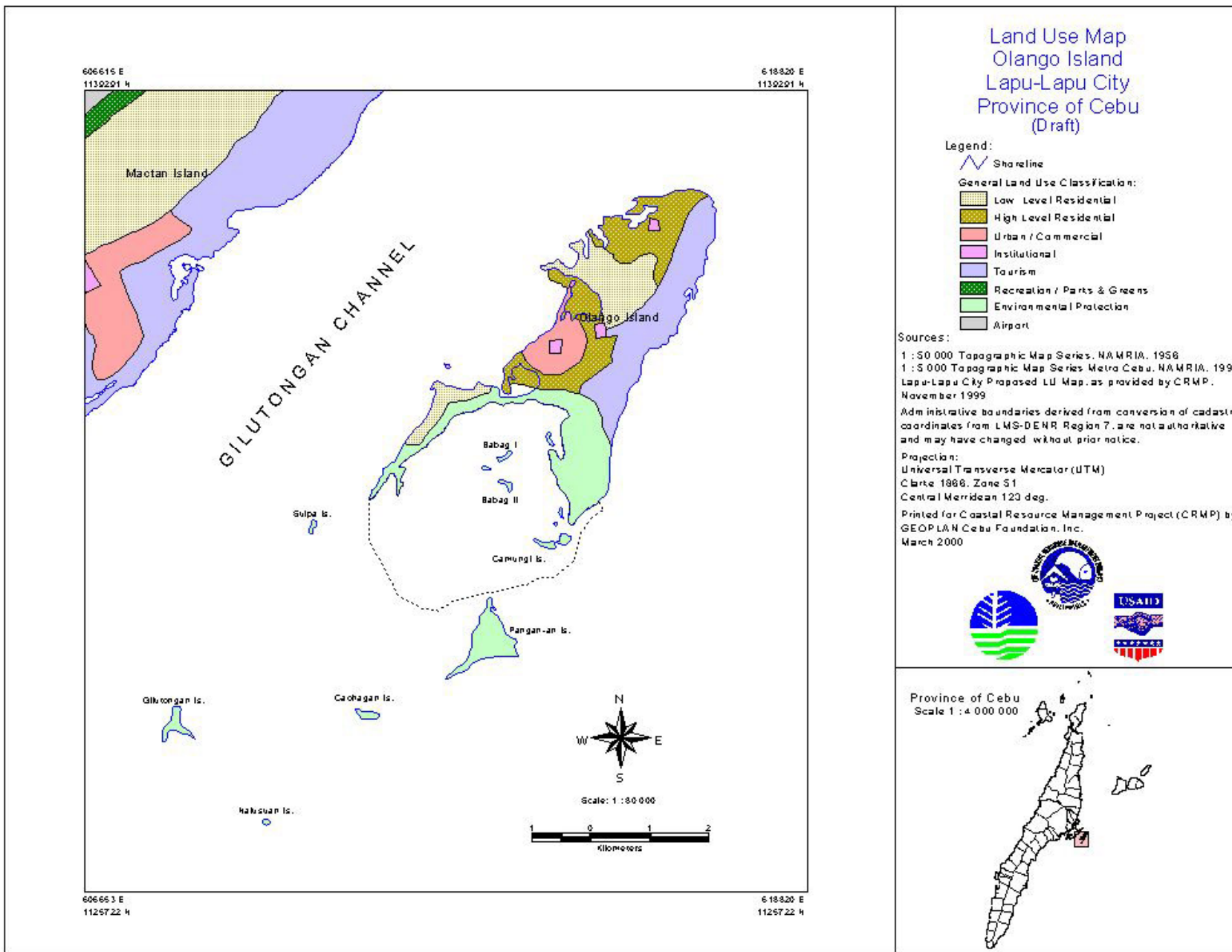


Figure 7.2. Proposed land use development plan of Olango Island and its satellite islets.

- Provision of livelihood projects
- Promotion and enhancement of ecotourism
- Creation of job opportunities for local inhabitants
- Provision of additional income to local government
- Community development
- Institutional linkages

On 23 to 24 October 1998, a planning workshop was conducted with the active participation of various government and nongovernment sectors to review the OIWS 1992 Management Plan, provide updates on the progress of implementation of the OIWS Management Plan 1992-1998 and identify management options with input from the 1998 PCRA results.

Status of the OIWS Protected Area Management Board (PAMB)

Under the 1992 NIPAS Act, a PAMB is mandated to handle the administrative jurisdiction of an established protected area. The creation of the PAMB, its functions, composition and membership, selection, and appointment of the Board members, term of office and compensation, and other provisions etc. are given in the Department Administrative Order (DENR-DAO) No. 25 Series of 1992 of the NIPAS Implementing Rules and Regulations Chapter V, Sections 18-28. The duties and functions of the PAMB and the membership are to:

- decide on matters relating to planning, resource protection, and general administration of the area in accordance with the General Management Planning Strategy (GMPS)
- approve proposals, work plans, action plans, guidelines, for management of the protected area in accordance with the approved Management Plan
- delineate and demarcate protected area boundaries buffer zones, ancestral domains, and recognize the rights and privileges of indigenous communities under the provisions of the NIPAS Act
- promulgate rules and regulations to promote development programs and projects on biodiversity conservation and sustainable development consistent with the Management Manual of the protected area
- ensure the implementation of programs as prescribed in the Management Plan in order to provide employment to the people dwelling in and around the protected area
- control and regulate the construction, operation, and maintenance of roads, trails, water works, sewerage, fire protection, sanitation systems and other public utilities within the protected area
- monitor and evaluate the performance of the protected area personnel, NGOs, and the communities in providing for biodiversity conservation and sociocultural and economic development and report their assessment to the NIPAS Policy and Program Steering Committee (NPPSC) and the Integrated Protected Area Fund (IPAF) Governing Board

The OIWS-PAMB was formed in 1996 and the present members are the following:

1. The Regional Executive Director of DENR-7
2. Representative from Philippine Tourism Authority (national government department)
3. Barangay Captain of Barangay Pangan-an, Lapu-Lapu City (Barangay Representative)
4. Philippine Wetland and Wildlife Conservation Foundation, Inc. (NGO)
5. Barangay Councilor of Barangay Sabang (Barangay Representative)
6. City Agriculturist of Lapu-Lapu City (City Representative)

The PAMB meets once a month as provided for in the NIPAS Act. Excerpts of the minutes of the monthly regular meeting and year-end report for CY 1998 of OIWS-PAMB on 3 September 1998 and 7 April 1999 are given in Table 7.4. There is a need to expand the membership of the PAMB to better reflect the current OIWS situation and management issues, particularly on the local NGO representatives due to the increasing number of groups organized working in the area.

Accomplishments of the Nature Center at Barangay San Vicente

1. The Establishment of the Nature Center at Barangay San Vicente

As claimed by the Philippine Wetland and Wildlife Conservation Foundation, Inc., the NGO representative to the Board, the most tangible accomplishment of the OIWS-PAMB to date is the construction of the nature and administration center in 1997 in Barangay San Vicente. The purpose of the nature center is to facilitate the effective management of the sanctuary and to provide conservation and recreational services to visitors, researchers, and the community in general. To visit the nature center, one has to pay an entrance fee of PhP8 for locals and PhP80 for foreigners per person. There are also binoculars and telescopes for rent.

2. Setting up of Recreation and Tourism Facilities

At present, the existing facilities provided for sanctuary users and visitors are boardwalks, observation hides, viewing decks, as well as a recreation center. Although the authority to manage the OIWS is vested on PAMB as provided for by the NIPAS Act, there are development initiatives towards the protection and management of OIWS spearheaded by other sectors. Such initiatives should be encouraged as long as they are in line with the OIWS Management Plan. Presented on Table 7.5 is a list of accomplished activities by various sectors from 1988 to 2000, which are in keeping with the OIWS Management Plan of 1992.

ISLAND ECOLOGY AND IMPLICATIONS FOR MANAGEMENT

Small islands are vulnerable because most of their resources are limited. Without subsidy from external sources, unabated and uncontrolled use of natural resources eventually leads to depletion causing importation from outside. When this happens, more capital is required for importation.

Table 7.4. OIWS-PAMB minutes of the meeting and year-end report, CY 1998.

Issues discussed	Agreement/Decisions	Remarks
<p>1. Extension of boardwalk and improvement of restrooms at the OIWS</p> <p>2. Provincial Board of Cebu Resolution # 852,S.97 appropriating PhP60,000 as financial assistance for the OIWS PAMB</p> <p>3. Use of timberland at San Vicente as water impounding dam</p> <p>4. Request letter for RTD Barangan to utilize the pumpboat of Coastal Environment Program (CEP)</p> <p>5. Transfer of OIWS income to the National Treasury</p> <p>6. Planning Workshop on the RAMSAR Small Grant Fund to be conducted by PAWB on July 17 & 18, 1998 at Olango Island.</p> <p>7. Inquiring from the City Council of Lapu-lapu City the status of the 100-m wide Environmental Protection Area adjoining the OIWS and its allowable uses for development. Stale check given by Mr. Banzon of SPPI as donation for OIWS</p> <p>8. NGOs application for membership</p>	<ul style="list-style-type: none"> ● The remaining capital outlay shall be for used the said extension as approved by PAMB. ● PASu should prepare a work program for the PhP60,000. ● Follow-up letter for the Lapu-lapu City Council. ● Follow-up letter addressed to RED signed by RTD Melana requesting RTD Barangan to let OIWS PAMB to utilize their pumpboat. ● Resolution authorizing OIWS-PASu to withdraw the amount and transfer it to the National Treasury. ● Should be participated by OIWS PAMB and PAWD staff. ● Resolution be made regarding this inquiry. ● Letter request for a stale check to be changed. ● A resolution for rejection of PAMB membership for the Save Nature Society. 	<ul style="list-style-type: none"> ● In process ● The OIWS-PAMB approved Resolution No. 02-98 in appreciation of the receipt of the amount of PhP60,000 as financial assistance from the Provincial Government of Cebu for the OIWS. ● No response from the Lapu-lapu City Council ● The pumpboat is already dilapidated. ● Approved resolution #01-98, authorizing Delia P. Batasin-in, OIWS-PASu to withdraw the account of OIWS sub-fund from the Land Bank of the Phils., Banilad, Branch and transfer the account to DENR Depository Bank. ● Seminar/workshop for the review & update of the management plan was undertaken by the PAMB, NGOs, LGUs, DENR staff, etc. on 23 & 24 Oct 1998 at St. Jude Beach Resort. Planning Workshop proceeding for OIWS under Ramsar Small Grant Fund Project was submitted to PAWB on 6 December 1998. ● Approved resolution #03-98 inquiring from the City Council of Lapu-Lapu the status of the 100-m strip Environmental Protection Area adjoining the OIWS and its allowable uses for development. ● The letter was sent last 20 July 1998 but until now no response from SPPI has been received. ● Approved resolution #05-98 for the denial of the Save Nature Society application for OIWS PAMB membership. Approved Resolution No. 05-98, authorizing Engr. Jason Baclayon of PPDO as Liaison Officer of OIWS PAMB.

Table 7.4 Continued

Issues discussed	Agreement/Decisions	Remarks
9. Presentation of the newly-designated OIWS-PASu, Mr. Michael Merilles	<ul style="list-style-type: none"> ● The outgoing PASu of OIWS should turn over all the OIWS documents to the newly designated PASu. 	<ul style="list-style-type: none"> ● Delia P. Batasin-in turned over the documents pertaining the development plan, work, and financial plan to the newly designated PASu.
10. Preparation for the RAMSAR Day	<ul style="list-style-type: none"> ● Press release for the RAMSAR Celebration free of charge. 	<ul style="list-style-type: none"> ● Press release was published in the newspaper.
11. Celebration on 7 & 8 November 1998	<ul style="list-style-type: none"> ● Donation box for the Nature Center 	<ul style="list-style-type: none"> ● Complied/Installed at OIWS.

Olango Island is no exception to this. It is small with limited physical resources in terms of arable land and majority of the islanders rely on marine resources. However, overharvesting and unregulated exploitation have led to the depletion of many economically important marine species such as fishes and invertebrates, which are utilized as food or raw materials for the shellcraft industry. As a result, over the years the marine waters around Olango became resource scarce which forced Olango fishers to travel to distant places as far as Palawan and Malaysia in search of more productive fishing grounds or to gather aquarium fishes and shells.

Meanwhile, those that remain in Olango have to be content with what is available and most often use destructive fishing techniques. Examples of these are the use of *sudsud* in collecting shells, which destroys the seagrass beds and disturbs the substrates. The use of sodium cyanide in collecting aquarium fishes not only further depletes these dwindling resources but also destroys the island's coral reefs. With the present status and ecological realities of Olango's resources it is imperative that proper management and conservation measures have to be taken to rehabilitate the depleted coastal resources.

On one hand, results of the 1998 PCRA surveys validate the studies conducted on Olango by outsiders because similar issues and problems identified still exist in Olango Island. It is hoped that all the information gathered by the participants made them see the realities of the status of their coastal resources.

With this information, they should be able to draw a realistic and implementable Integrated CRM Plan. Inasmuch as the responsibility to conserve and to manage the remaining resources are the tasks of every Olango islander, the role of the LGU in shifting these patterns of environmental degradation is equally important as well as creating opportunities for the people of Olango. Still the biggest challenge is how to reverse this pattern to a more sustainable utilization.

Table 7.5. Summary of CRM-related studies and projects implemented in Olango Island and its satellite islets.

Project title	Project leader	Duration	Funding source
1. The environmental impact of some activities on Olango Island	Alburo, R., H. Olofson	1988	USC-MBS
2. Early opinion on Olango Island with regard to the closure of the bay for fresh water conservation	Alburo, R., J. Adlawan, E. Pajaron, F. Soco, H. Olofson	1988	USC-WRC
3. Health status of Olango community and their attitude towards health	Amores, M.Y.	1988	USC-WRC
4. Water users awareness, involvement, and opinion survey: an example of participatory research	Alburo, R., H. Olofson, Self-Help Foundation	1988	USC-WRC/ Self-Help Foundation
5. Rapid Rural Appraisal of Olango Island: impression on demography, economics, education, and health	Remedio, E.M., H. Olofson	1988	USC-WRC
6. Baseline study of the marine flora and fauna of Poo and Talima bays, Olango Island	USC-MBS	1988	USC-MBS
7. Wells, well history, and water use in Olango Island	Walag, E., H. Olofson, E. Remedio	1988	USC-WRC
8. Survey of Olango Island, Philippines, with recommendation for conservation	Magsalay, P.M., R.P. Rigor, H.I. Gonzales, A.M. Mapalo	1989	AWBPF
9. Notes on ecology, history, and development on Olango Island: an approach using ideas from Bateson and Braudel	Olofson, H., E. Remedio, J. Neri	1989	USC-WRC
10. Environment and cognition: a comparative marine biological and cognitive study of two bays of Olango Island, Philippines	Cusi, M.A., R. Alburo and H. Olofson	1990	USC-MBS USC-WRC
11. Checklist and guide to bird watching in Olango Island	DENR-PAWD	1995	DENR
12. Socioeconomic profile of Olango Fisherfolks	Albert, S., F. Sotto, T. Heeger	1996	USC-MBS
13. Community profiles and site assessment surveys of Olango Island, Cebu, Bohol	IMA	1996	USAID/IMA
14. Preliminary resource scanning study of Olango	Flores, M.	1997	USAID/CRMP
15. Qualitative and quantitative analysis of fish trap or <i>panggal</i> catch in Caw-oy, Olango, Island, Cebu	Gatus, J., M. Cashman, T. Heeger	1997	USC-MBS
16. Livelihood and the environment: inextricable issues in Olango	Santos, L., F. Sotto, T. Heeger, S. Albert	1997	Barefoot Media USC-MBS

continued

Table 7.5 continued

Project title	Project leader	Duration	Funding agency
17. Status of the coastal resources of the Olango learning site	SUML	1997	Peace Corps-Phil USAID
18. Coastal environmental profile of Olango Island	Sotto <i>et al.</i> , USC-MBS	1997-2000	USAID/CRMP
19. Participatory Coastal Resource Assessment (PCRA)	Portigo, M.F.	1998	USAID/CRMP
20. Baseline assessment and annual monitoring in the Gilutongan Marine Sanctuary	Uychiaoco, A., UPMSI with USC-MBS, DENR, BFAR	1998- on going	UPMSI/DENR/BFAR USC-MBS
21. Environmental IEC caravan in Olango Island	Olango Synergy Group/ GREENCOM	1998	USAID/CRMP
22. Community farming as alternative livelihood for sustainable natural resource management and coral reef rehabilitation	Heeger, T., F. Sotto/ USC-MBS	1998-2000	GTZ, USC-MBS, CHED
23. Vulnerability assessment of Olango Island to climate change and sea level rise	Mapalo, A.M.	1999	Asia Pacific Network

COSTS OF MANAGEMENT FOR LOCAL GOVERNMENT AND COLLABORATORS

Olango Island is attracting increasing attention because of its rich resource potential. However, increasing tourism and resource use conflicts indicate the need for improved CRM. There are ongoing projects to assist the local governments with planning and conservation activities affecting both the reef and wetland systems and the people who use these resources. A framework for the CRM process in Olango includes an island-wide management committee, zoning for resource use, law enforcement, environmental education, community-level assessments and planning, and provision for sustainable tourism development. This CRM process for Olango is long-term and involves a number of parallel activities that engage local residents, their government, and other stakeholders in implementation. Although these ongoing activities do not require a large budget, they require continued support and proper technical guidance and mentoring through local and national government institutions. Investment for infrastructure is required for the OIWS to maintain the visitor center, as well as planned tourist reception areas and the necessary boats and equipment for local law enforcement.

The annual costs required for management to improve and maintain the condition of the reefs and wetland areas of Olango Island are summarized in Table 7.6. The essential activities that can easily be appraised include: resource assessments; community organizing, education and training; law enforcement and information dissemination; and various activities for macro and local planning and implementation. These costs are based on experience in other parts of the Philippines and are considered to be part of a local government basic service provided on a regular basis to maintain and improve the coastal resources for the

Table 7.6. Estimated annual costs required to support CRM in Olango Island¹ (White *et al.* 2000).

Olango Island-wide Management Costs¹	
Resource assessments and monitoring	US\$
2 reef surveys (2 x US\$2,000)	4,000
2 wetland surveys (2 x US\$2,000)	4,000
Community organizing	
4 Community Organizers full-time working with communities (US\$4,000/person/year)	16,000
Education and training	12,000
12 seminars	3,000
Education and training materials	
Law enforcement	10,000
1 full-time patrol boat, crew and maintenance	
Information dissemination	2,000
Weekly radio broadcasts	6,000
12 public meetings	3,000
Visitor centers (2) (annually over 10 years)	
Planning activities	6,000
1 full-time CRM planner and technical guide	4,000
4 planning workshops (US\$1,000/workshop)	70,000
Gilutongan Marine Sanctuary (1 km²) Operations and Maintenance Costs²	2,000
Reef surveys, monitoring, and buoy maintenance	3,500
Community organizing	3,500
Education and training	1,000
Planning and resource center (annually over 10 years)	3,000
Law enforcement (small patrol boat)	2,000
Information dissemination	
Planning and operation	3,000
1 full-time Project Director (on-site)	3,000
Honorarium for part-time community staff	1,000
Municipal LGU staff and advisory group support	21,000

¹ This amount is intended to cover the Olango Island complex and is considered to be a minimum amount to maintain the area. The actual expenditure of the 2 LGUs combined is currently about US\$6,000/year. The average CRM expenditure in the 29 LGUs that the CRMP is directly involved with in the Philippines is US\$5,000/year. The actual annual expenditure of the CRMP for Olango Island management in addition to the LGU expenditure is US\$65,000 plus overhead costs. In addition, the LGUs collect some taxes to offset expenses such as US\$500 from the Nalusuan Resort in 1999.

² This amount is intended to support active management of the marine sanctuary, an area that is more heavily used than the larger Olango Island-wide reef area.

Olango area. Although some of these activities have been started by the CRMP, they are not yet part of the local government support system.

BENEFITS AND COSTS OF REEF MANAGEMENT IN OLANGO ISLAND

We now have a good idea about the potential net revenues (benefits) derived from the island resources on Olango and a sense about the costs of maintaining and improving the resource condition. Although our information base is not perfect and constantly changing, our assumptions are conservative and the figures quoted are based on actual revenue flows. Data on tourism, documented fish yield levels, and market prices and actual costs

of management, or estimated potential revenues and costs based on other similar situations in the Philippines have been used in the benefit and cost calculations.

Benefit and Cost Analysis: Can Investment in Management be Justified?

According to 2 local governments in charge of Olango Island, they want to know how much they should spend every year to improve the resource condition and management thereof and what will be the potential returns from such spending. Through donor-assisted projects such as the CRMP that works in Olango Island, the community-based process for conserving the resources is becoming known and accepted. The big question is whether the local governments can afford to support such conservation activities in the long term through their budget planning and allocation process. Since the responsibility lies with the local governments, they need to justify their budgets in terms that taxpayers and government planners can understand. The following benefit-cost framework portrays this basic information in a manner that can be readily used by national and local planners.

The annual net revenues (benefits) derived from the resources of primary concern with and without management interventions on Olango Island are summarized in Table 7.7. These benefits are compared with the cost of management and protection. The incremental annual benefit from management are substantially more than the costs. Since there are 2 LGUs involved, each will need to make calculations about the resources and benefits within its own jurisdiction and the needs and costs for management.

One basic assumption of the above analysis is that the island coral reefs and wetlands will at least be maintained and will not deteriorate. The Olango area is targeted for tourism development with the assumption that the quality of the environment will improve. This is important in that the area has a reputation for illegal fishing and overexploited reef resources. The investment in management needs to be scaled up to reverse these trends and to bring back the quality of the environment. The graph shown in Figure 7.3 highlights the accrual of incremental benefits resulting from management of the resources compared to the estimated cost of management over a 10-year period. The incremental benefits, although based on conservative assumptions about tourism growth, show that investments in management are more than covered by the net revenues from the natural resource base for fisheries and as an attraction for tourists.

Benefits by Unit Area of Habitat and Sensitivity to Improved Management

The local governments may not be able to support such a large investment as the CRMP has contributed on an annual basis, but the analysis clearly shows that it is their overall economic benefit to increase investment more in CRM. If we assume that no investment is made and business as usual prevails with overfishing and degradation worsening, there will be a continued decline of the coastal resources upon which Olango Island communities depend. It would also lead to a decline in the off-island tourism industry based on Mactan Island. One way to illustrate this effect is to look at the potential for increased revenue

Table 7.7. Summary of annual net revenues (benefits) (1999) and potential net revenues with management from coral reef and wetland resources of Olango Island and associated costs of management (White *et al.* 2000a).

Annual Revenues			
Sources	Area	Current net revenue ¹ (US\$)	Potential net revenue with management ² (US\$)
Coral reef	40 km ²		
Fisheries		336,000	672,000 ^a
Tourism		1,458,000	2,187,000 ^b
Seaweed farming		240,000	240,000 ^c
Coastal protection		0	0 ^d
Aesthetic/Biodiversity values		0	82,000 ^e
Subtotal		2,034,000	3,181,000
Wetland (mangrove and other)			
Fisheries	424 ha	229,000	458,000 ^a
Wood	424 ha	18,000	18,000 ^f
Tourism	920 ha	142,000	214,000 ^b
Subtotal		389,000	690,000
Total		2,423,000	3,871,000
Annual Cost of Management			
Estimated island-wide management costs (Table 7.6)			70,000
Estimated Gilutongan marine sanctuary costs (Table 7.6)			21,000
Actual CRMP investment, average per year			65,000

¹ Assumes current status of Olango reef and habitat and based on calculations derived in Tables 5.4, 5.5, and 7.6.

² Potential net annual revenues with CRM interventions in place after one full year of operation

^a Assumes that reef and mangrove management can increase fish catch by 100 percent through a series of marine sanctuaries and improved law enforcement efforts; although this would take several years to take effect in reality, for simplification, it is assumed that one year is required

^b Assumes that reef and wetland management will increase the number of visitors by 50 percent

^c Assumes reef management will not significantly affect seaweed farming production

^d Not quantified

^e Assumes each visitor pays a fee of US\$3 for entrance fees based on willingness-to-pay surveys (Arin 1997) and new legislation supporting user fees

^f Assumes no significant change in wood production from mangroves

from improved and intensely managed reef areas such as the Gilutongan marine sanctuary. This sanctuary reef area is visited by up to 100 divers per day and if management improves, with implementation of anchor facilities, mooring fees, and other regulations, it will produce much more revenue than the average reef area of Olango Island. A quick calculation shows that about US\$200,000 annual net revenues can be generated from the marine sanctuary, if properly managed. Figure 7.4 indicates the levels of net revenue possible from the resources of Olango Island by unit area. If the quality of the resource base improves, so will revenues in the long term to all concerned, on and off the island.

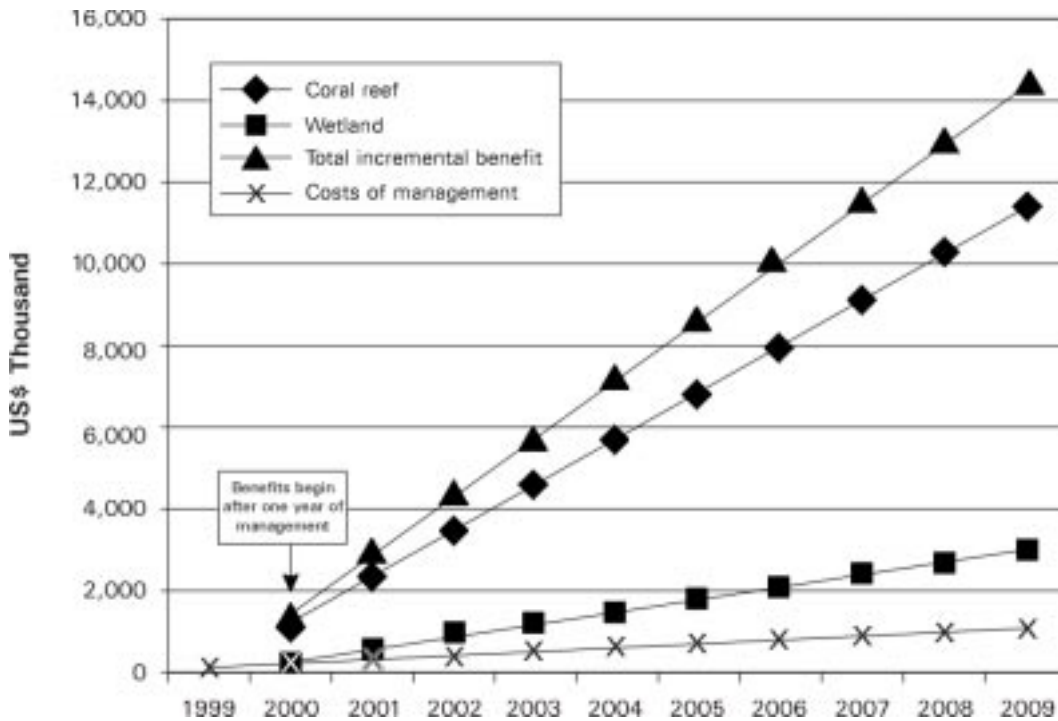


Figure 7.3. Accrued incremental benefits compared to costs of management from the sustainable use of Olango Island resources (White *et al.* 2000a).

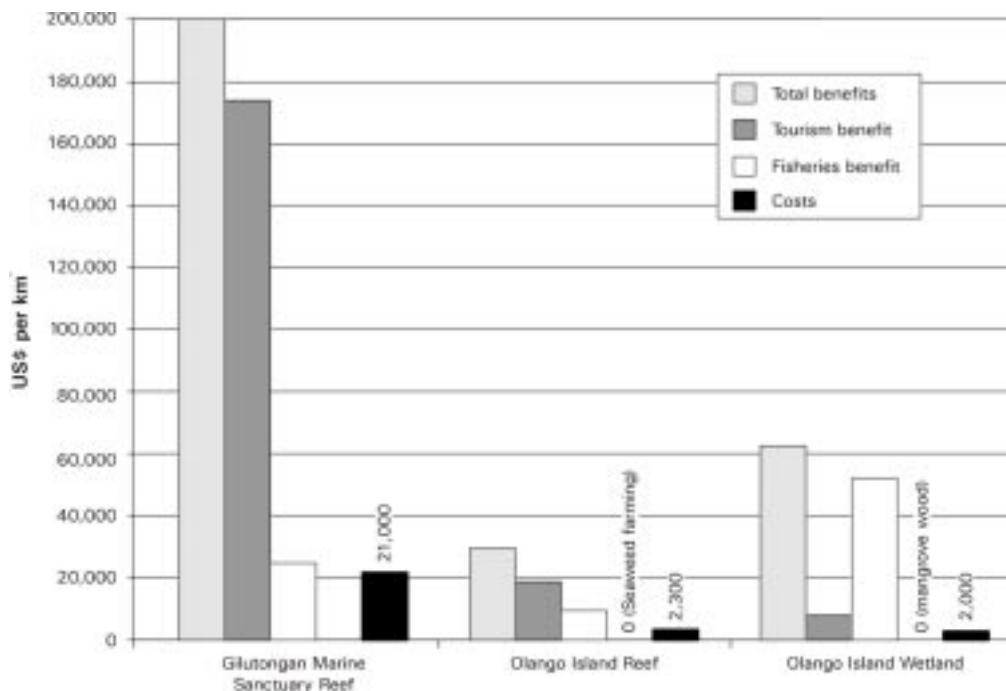


Figure 7.4. Incremental annual benefits from Olango Island resource use per km² for different management regimes and the cost of management (White *et al.* 2000a).

RECOMMENDED ACTIONS IN THE MANAGEMENT OF THE COASTAL RESOURCES OF OLANGO ISLAND

The current status of coastal resources of Olango Island is very much similar to other small islands in the Philippines. However, the solutions and the interventions may differ based on the unique characteristics of Olango, urban and tourism center and the distinctive characteristic of its people. Shifting the current use of resources to one that is sustainable entails an active community involvement and a political will on the part of the local government with the support of the various sectors working in Olango. The recommendations below are taken from some groups working in Olango Island.

Coastal Resource Management Project (CRMP) Future Plans

CRMP plans to pursue 3 goals in their efforts to sustain protection and management of the coastal resources of Olango Island (Parras *et al.* 1998):

1. To develop alternative enterprises that will benefit critical coastal resource users and reduce fishing pressure.
2. To create an island-wide CRM Council to include representatives from each *barangay*, DENR, PAMB, NGOs, youth, and private sector (resort owners, tour operators) to examine CRM issues and form resolutions to address them.
3. The creation of a zoning plan which will designate specific issues for different zones based on the most feasible economic and environmental use of the areas, e.g., seaweed farming, fish cage culture, SCUBA diving, marine sanctuary, etc. This zoning plan is a good tool to guide the coastal resource managers and planners and most especially the LGUs in the development of the island.

University of San Carlos-Marine Biology Section's (USC-MBS) Recommendations

1. The foremost challenge facing many small islands like Olango is how to curb the rapid human population growth and its destructive fishing activities. The prevalent use of destructive fishing methods by Olango fishers is a consequence of the pressure to catch more to feed the large and growing resident population. The local government should vigorously campaign for family planning and incorporate measures in the school curriculum from high school to tertiary levels. Projects and initiatives should come from government and NGOs to conserve and manage the remaining marine resources and to raise the standards of living of coastal dwellers.
2. In order to rehabilitate the degraded coastal resources and provide livelihood options for the people of Olango, an island-wide "Integrated CRM Plan for Olango Island" has to be formulated. The Lapu-Lapu City in partnership with the Olango islanders shall spearhead this with the support of the various government line agencies, NGOs, church, academe, and projects. In the formulation of the plan, the government should consider all inputs from the local resource users/communities supported by the LGUs, academe, and NGOs. The plan should incorporate all the issues identified by the islanders during the PCRA surveys according to priority, feasibility, and funding source.

SUMMARY

The main issues on CRM in Olango Island reflect the long held notion by the islanders that the marine resources surrounding their island is a common resource; hence, there is free access to these resources. This has led to "Malthusian overfishing" where massive exploitation of marine resources due to population pressure force Olango fishers to fish farther away in neighboring and even distant fishing grounds.

To reverse the present state of Olango's marine resources, short and long-term solutions should be undertaken and opportunities have to be created. The current changes in national legislation enabled the LGUs to directly manage their own resources. In fact, many LGUs are now instituting marine resource conservation and rehabilitation programs (i.e., fish sanctuaries and mangrove reforestation) in their respective territorial waters and are enacting laws to reduce the "open access" policy.

However, the areas previously available for "open access" to fishing would become smaller as more LGUs institute their own "restricted access" policy. With this new development, is a possibility that Olango fishers who presently fish outside the waters of Olango will be displaced.

To compensate for the lack of income of the fishers, external subsidies in the form of alternative income sources coupled with environmental education should be made available to them. In the long run, the success or failure of CRM in Olango will largely depend on how the fishers accept or reject the alternative livelihood program being instituted in Olango.

REFERENCES

- Albert, S., F. Sotto and T. Heeger. 1996. Socio-economic profile of Olango fisherfolks. Marine Biology Section - University of San Carlos, Cebu City, Philippines.
- Alburo, R. and H. Olofson. 1988a. Environmental cognition and resource use: A study of two bays for a community development and water-related project on Olango Island, Cebu, Philippines. Olango Water Resources Management Project, University of San Carlos - ARTC Special Studies No. 4, 20 p.
- Alburo, R. and H. Olofson. 1988b. The environmental impact of some economic activities on Olango Island. Olango Water Resources Management Project, University of San Carlos-ARTC Special Studies No. 7, 7 p.
- Alburo, R., J. Adlawan, E. Pajaron, F. Soco and H. Olofson. 1988. Early opinion on Olango Island with regards to the closure of a bay for fresh water conservation. Olango Water Resources Management Project., University of San Carlos - ARTC Special Studies No. 3, 14 p.
- Alcala, A.C. and G.R. Russ. 1990. A direct test of the effects of protective management on the abundance and yield of tropical marine resources. J. Cons., CIEM 46: 40-47.
- Amores, M.Y. 1988. Health status of the Olango community and their attitude towards health, 1988. Olango Water Resources Management Project, University of San Carlos - ARTC Special Studies No. 6, 12 p.
- Arin, T. 1997. Survey on diver valuation of coral reefs using the contingent valuation method. Coastal Resource Management Project, Cebu City, Philippines. Document No. 7-CRM/1997. 12 p.

- Barber, C.V. and V.R. Pratt. 1997. Sullied Seas: Strategies for combating cyanide fishing in Southeast Asia and beyond. World Resources Institute and International Marine Life Alliance.
- BAS (Bureau of Agricultural Statistics). 1993. Fish price wholesale price per kilogram of selected species, Philippines, 1984-1993. Bureau of Agricultural Statistics, Manila.
- Cesar, H. 1996. The economic value of Indonesian coral reefs. Environment Division. World Bank. 9 p.
- CRMP (Coastal Resource Management Project). 1998. Results of Participatory Coastal Resource Assessments of Olango Island. CRMP Documents and Maps, Cebu City.
- Costanza, R., S.C. Farber and J. Maxwell. 1989. Valuation and management of wetland ecosystems. *Ecol. Econ.* 1:335-361.
- Cusi, M.A., R. Albuero and H. Olofson. 1990. Environment and cognition: a comparative marine biological and cognitive study of two bays of Olango Island, Philippines. *Philipp. Sci.* 27: 35-60.
- DENR - DAO 25, S 1992. NIPAS ACT. R.A. No. 7586 and Implementing Rules and Regulations. 38 p.
- DENR-7. 1995. Checklist and guide to bird watching in Olango Wildlife Sanctuary. DENR Region 7 and Wildbird Society of Japan. 25 p.
- DENR-7. 1998. Proceedings: Planning workshop for the Olango Wildlife Sanctuary RAMSAR. Protected Areas and Wildlife Division-Department of Environment and Natural Resources Region 7. 20 p.
- DOH-7 (Department of Health). 1997. Lapu-Lapu annual health profile. 115 p.
- Flieger, W. 1994. Cebu: A demographic and socio-economic profile based on the 1990 Census. National Statistics Office, Manila. 668 p.
- Flores, M. 1997. Olango preliminary resource scanning report. Coastal Resource Management Project. 8 p.
- Gatus, J., F. Sotto, M. Cashman and T. Heeger. 1997. Qualitative and quantitative study of fish trap or "*panggal*" in Caw-oy, Olango, Mactan, Cebu. Proceedings of the 29th FIMFS Annual Convention, Silliman University (Abstract only).
- Gomez, E.D., A.C. Alcala and A.C. San Diego. 1981. Status of the Philippine coral reefs. Proceedings of the 4th International Coral Reef Symposium, Manila. 1:275-282.
- Gomez, E.D., P.M. Aliño, H.T. Yap and W.Y. Licuanan. 1994. A review of the status of Philippine reefs. *Mar. Pollut. Bull.* 29 (1-3): 62-68.

- Heeger, T.M., M. Cashman and F. Sotto. 1999. Coral farming as alternative livelihood, sustainable natural resource management and coral reef rehabilitation, p. 171-185. *In Proc. Oceanology International 1999 Pacific Rim.*
- Heeger, T.M., F. Sotto, J. Gatus and C. Laron. 2000. Community-based coral farming for reef rehabilitation biodiversity conservation and as a livelihood option for fisherfolk. *Proc. of ADSEA '99 (in press).*
- Hillmer, G. and J. Scholz. 1986. Dependence of quaternary reef terrace formation on tectonic and eustatic effects. *Philipp. Sci.* 23: 58-64.
- IMA (International Marinelife Alliance). 1996. Community profiles and site assessment surveys of Olango Island, Cebu and selected barangays in Bohol. 130 p.
- Magsalay, P.M., R.P. Rigor, H.I. Gonzales and A.M. Mapalo. 1989. Survey of Olango Island, Philippines, with recommendations for nature conservation. Asian Wetland Bureau Philippines Foundation, Cebu City, Philippines. Report No. 37, 37 p.
- Mapalo, A.M. 1999. Vulnerability assessment of Olango Island, Philippines to climate change and sea level rise. DENR - 7 (Unpublished Report).
- MIIMPS (Mactan Island Integrated Master Plan Study). August 1995. Draft Final Report. Schema Konsult Inc. 235 p.
- NSO (National Statistics Office). 1995. The 1995 socio-economic and demographic characteristics. 550 p.
- Olofson, H. 1992. Notes on ecology, history and development on Olango Island: An approach using ideas from Bateson and Braudel. *Phil. Quart. Cult. Soc.* 20: 170-209.
- Olofson, H., E. Remedio and J. Neri. 1989. A fuelwood survey for the seven barangays of Olango Island, Lapu-lapu City, Cebu. University of San Carlos, Cebu City. 25 p.
- PAGASA (Philippine Atmospheric, Geophysical and Astronomical Services Administration). 1997. Annual Weather Report. 185 p.
- Parras, D.A., Ma. F. Portigo and A.T. White. 1998. Coastal resource management in Olango Island: Challenges and opportunities. *Tambuli* 4: 1-9.
- Protected Areas and Wildlife Division (PAWD), Environmental Management and Protected Areas Services (EMPAS), Department of Environment and Natural Resources (DENR) - Region 7. 1995. Checklist and guide to bird watching in Olango Wildlife Sanctuary. Mandaue City, Cebu, Philippines. 25 p.
- Remedio, E.M. and H. Olofson. 1988a. Socio-economic survey of Olango Island. Olango Water Resources Management Project, University of San Carlos-ARTC Special Studies No. 5, 60 p.

- Remedio, E.M. and H. Olofson. 1988b. Rapid rural appraisal of Olango Island: Impressions on demography, economics, education and health. Olango Water Resources Management Project., University of San Carlos-ARTC Special Studies No. 1, 22 p.
- Russ, G.R. and A.C. Alcala. 1996. Do marine reserves export adult fish biomass? Evidence from Apo Island, Central Philippines. *Mar. Ecol. (Prog. Ser.)* 132: 1-9.
- Santos, L.C., F.B. Sotto, T. Heeger and S. Albert. 1997a. Livelihood and the environment: inextricable issues in Olango. *Sunstar Daily Special Report*, 27-29 January 1997.
- Santos, L.C., F.B. Sotto, T. Heeger and S. Albert. 1997b. Olango: Graveyard of coral rubble. *Inquirer Visayas* (7 February 1997):3.
- Santos, L.C., F.B. Sotto, T. Heeger and S. Albert. 1997c. Olango's bird sanctuary: Hope springs eternal. *Inquirer Visayas* (21 February 1997):1, 6.
- Schatz, R.E. 1991. Economic rent study for the Philippine Fisheries Sector Program. Asian Development Bank Technical Assistance 1208-PHI, Manila. 42 p.
- Scholz, J. 1986. Sea level data from the quaternary fringing reefs and barrier reefs of Cebu (Philippines). *Philipp. Sci.* 23: 50-57.
- SUML (Silliman University Marine Laboratory). 1997. Status of the coastal resources of the Olango learning site. USAID-CRMP Learning Site Profile. Vol. II. 224 p.
- USC-MBS (University of San Carlos - Marine Biology Section). 1988. Baseline study of the marine flora and fauna of Poo and Talima Bays, Olango Island. Technical Report. 118 p.
- Vogt, H.P. 1997. The economic benefits of tourism in the marine reserve of Apo Island, Philippines. Presented at the Eighth International Coral Reef Symposium, June 1997, Panama. 7 p.
- Walag, E., H. Olofson and E. Remedio. 1985. Wells, well history and water use in Olango island (Unpublished).
- Walters, J.S., J. Maragos, S. Siar and A.T. White. 1998. Participatory coastal resource assessment: A handbook for community workers and coastal resource managers. Coastal Resource Management Project and Silliman University, Cebu City, Philippines. 113 p.
- White, A.T. and G.C. Savina. 1987. Reef fish yield and non-reef catch of Apo Island, Negros, Philippines. *Asian Mar. Biol.* 4: 67-76.
- White, A.T. and A. Cruz-Trinidad. 1998. The values of Philippine coastal resources: why protection and management are critical. Coastal Resource Management Project, Cebu City, Philippines. 96 p.

White, A., M. Ross and M. Flores. 2000a. Benefits and costs of coral reef and wetland management, Olango Island, Philippines, p. 215-227. *In* H. Cesar (ed.) Collected essays on the economics of coral reefs. CORDIO, Department for Biology and Environmental Sciences, Kalmar University, Kalmar, Sweden. 244 p.

White, A.T., N. Sanderson, M. Ross and M. Portigo. 2000b. Co-management of coastal resources in Olango Island, Philippines. Coastal Resource Management Project, Cebu City, Philippines. 23 p.



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