COASTAL ENVIRONMENTAL PROFILE OF THE BATANGAS BAY REGION

GEF/UNDP/IMO Regional Programme
for the Prevention and Management
of Marine Pollution in the East Asian Seas

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By

The Multidisciplinary Team of Experts

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PREFACE

The primary objective of the Global Environment Facility/United Nations Development Programme/International Maritime Organization Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS) is to support the efforts of the 11 participating governments in the East Asian region to prevent and manage marine pollution at the national and subregional levels on a long-term and self-reliant bases. The Programme framework is built upon innovative and effective schemes for marine pollution management, technical assistance in the most strategic marine sector of the region, and provision of opportunities to attract other agencies and the private sector for funding and investment. The Programme has a two-pronged strategy -- achieving regional cooperation and sustainability and capacity-building. The more specific strategies to attain its objective are:

- Develop and demonstrate workable models on marine pollution reduction/prevention and risk management.
- Assist countries in developing the necessary legislation and technical capability to implement international conventions relating to marine pollution.
- Strengthen institutional capacity to manage pollution programs.
- Develop regional network of stations for marine pollution programs.
- Promote public awareness on and participation in the abatement of marine pollution.
- Facilitate standardization and intercalibration of sampling and analytical techniques and environmental impact assessment procedures.
- Promote sustainable financing for activities requiring long-term commitments.

One of the Programme's activities in articulating the above strategies is the establishment of demonstration projects. The Batangas Bay Region, located in the southern part of Batangas Province in southwestern Luzon, Philippines, is one of the three demonstration sites of the MPP-EAS. The Batangas Bay Region comprises four coastal municipalities, one island municipality, and nine interior municipalities whose catchment areas drain into the Batangas Bay.

The bay region is in the throes of industrialization, currently engaged in capital-intensive activities, like the construction of an international port for transhipment of raw and finished products, establishment of more industries along the bay coast, and settlement expansion amidst a provincial population growth rate of 2.38 percent annually. Certainly, the economic and environmental implications of these developments are clear; and now is the time to come up with mitigative measures to

cushion and control their adverse impacts while the problems are not yet severe as well as ensure the long-term sustainability of planned socioeconomic activities.

The Batangas Bay Demonstration Project (BBDP) adopts the integrated coastal management (ICM) approach in addressing the effects and potential consequences of socioeconomic activities in the bay region, particularly on marine pollution. Specifically, it aims to demonstrate how ICM can be applied to (a) prevent and manage land-based pollution sources in an area moving towards heavy industrialization; (b) encourage the active participation of industries with the city/municipal and provincial governments to minimize pollution risks from existing economic activities and future developments; and (c) involve nongovernment organizations as strong partners in the protection of the coastal and marine environments.

This Coastal Environment Profile of the Batangas Bay Region is one of BBDP's initial outputs. It is a synthesis of available information provided by or acquired from various government agencies, institutions, and groups within and outside the bay region. Various individuals, groups, agencies, and institutions provided valuable information not only during the data-collection phase but also in refining the draft versions of this profile, including the workshop held in December 14-15 1994, in Batangas City. The profile represents the assessment made by a team of multidisciplinary experts on the environmental and socioeconomic status of the Batangas Bay Region, including its institutional and legal characteristics from a multidimensional perspective. The purpose of this profile is not simply to characterize the bay region and its myriad activities but also to identify critical management issues affecting or will affect it, including significant data gaps which could shed further light on the identified management issues. From there, recommendations are made on how to address the issues and achieve the overall strategic environmental management plan for the bay region and articulate the actions to address the management issues identified by the profile. This profile is not expected to be static and will be revised accordingly as the BBDP progresses in its implementation of various activities over the next two years.

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Prevention and Management
of Marine Pollution
in the East Asian Seas

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ACKNOWLEDGEMENT

The Coastal Environmental Profile of the Batangas Bay Region was prepared through the technical and financial support of the Global Environment Facility/United Nations Development Programme/International Maritime Organization Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS), particularly the following: Dr. Huming Yu, Technical Adviser; Mr. S. Adrian Ross, Senior Technical Officer; Ms. Catalina S. Tejam, Research Associate; Ms. Corazon L. Abansi, Officer-in-Charge, Batangas Bay Demonstration Project; Ms. Dolores Ariadne D. Diamante, former Research Associate; Mr. Catalino S. de la Paz, Computer Programmer; and Ms. Socorro C. Guerrero, Administrative Assistant.

This profile has undergone many phases of editing and numerous persons, groups, institutions, and agencies have contributed in various ways by providing relevant data or information, comments, and suggestions. This profile was presented at a workshop in Batangas City in December 1994 where participants from various sectors also made relevant comments and suggestions. The multidisciplinary team which prepared this profile would like to extend sincere thanks and appreciation to those individuals, groups, institutions, and agencies within and outside of the Batangas Bay Region but are numerous to cite individually. Special appreciation goes to the Provincial Government of Batangas; Municipal Governments of Bauan, Mabini, San Pascual, and Tingloy, Batangas City; Department of Environment and Natural Resources; Marine Science Institute of the University of the Philippines; and the Batangas Coastal Resources Management Foundation. The assistance of Ms. Evelyn L. Estigoy, Head of the Provincial Government's Environment and Natural Resources Office, and her staff throughout the preparation of this profile is gratefully acknowledged.

Introduction

Chapter 1.
INTRODUCTION

RATIONALE AND OBJECTIVES

This coastal environmental profile reviews the biophysical, socioeconomic, institutional, and other important characteristics of a geographically defined section of the coastal zone located in the southern part of Luzon Island, Philippines (called the Batangas Bay Region).

The profile was specifically prepared to:

1. establish both qualitative and quantitative baseline information on the coastal environment (including the watershed), coastal resources, and socioeconomic conditions of the bay region which would form the basis for evaluating and monitoring environmental changes;

2. identify present and potential environmental management issues, problems, and concerns that need to be addressed; and

3. identify data gaps in the bay region that would be the basis to conduct further studies to address existing and potential management issues and problems.

The profile will also be used in the formulation of an integrated environmental management plan for the bay region. In turn, the management plan will serve as a blueprint for the implementation of a long-term program for the bay region's sustainable development.

APPROACH AND METHODS

The preparation of the bay region's profile was undertaken by a multidisciplinary team of experts commissioned by the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS). The team consisted of an Environmental Planner cum Institutional Expert, Dr. Candido A. Cabrido, Jr.; a Fishery Specialist, Dr. Rogelio O. Juliano; an Oceanographer cum Water Quality Expert, Dr. Gil S. Jacinto; an Economist, Dr. Danilo C. Israel; a Geographer cum GIS Expert, Mr. James Paw; and a Project Development Specialist, Ms. Bresilda M. Gervacio. The team was supervised by the MPP-EAS Programme Manager.

A series of meetings among the experts was held to develop the scheme and guidelines for the preparation of the bay region's coastal environmental profile. The first approach adopted by the team in studying the bay region was to delineate its geographic boundaries.

Since the land use activities in the bay's catchment area were found to exert significant influence on the health of the bay, the inland boundary of the study area included the bay's watershed. On the other hand, the seaward boundary covered the Maricaban and Verde Islands, since they were greatly influenced by the bay's hydrodynamics and existing coastal resource use patterns.

The team of experts directed its attention on the status of the bay region's environment and socioeconomic conditions. Specifically, the team examined the following parameters deemed important in the preparation of this profile: land resources and use; fishery resources and critical habitats; oceanography and inland water bodies; water quality; socioeconomic condition; institutional and legal aspects in the management of the bay; and natural hazards. The team also assessed the status of environmental parameters, utilization and development of coastal resources, and management of the bay. Moreover, it identified and defined the problems and issues currently and potentially affecting the bay.

Interviews of key resource persons and from reconnaissance field surveys supplemented the secondary data (i.e., maps, reports, statistical tables) gathered by the team. The team likewise identified the data gaps requiring further research. The draft profile was presented to a multisectoral audience in a two-day workshop in Batangas City for validation and agreement on the identified issues and problems. The profile was further refined, based on the comments and suggestions made by the workshop participants.

Details of the various methods used by the experts in the preparation of their respective sections are found in the succeeding chapters.

This profile will be the basis for formulating the bay region's strategic environmental management plan. More information may surface in the process of preparing the plan, which can later be used to update the profile.

GEOGRAPHICAL SETTING AND DEFINITIONS

Batangas Province

Batangas Province is situated at the southwestern tip of Luzon, facing the South China Sea on the west and bordered by the province of Cavite in the north, the province of Laguna in the northeast, Quezon Province in the east, and the Verde Island Passage in the south.

The project site is located in the southern part of Batangas Province.

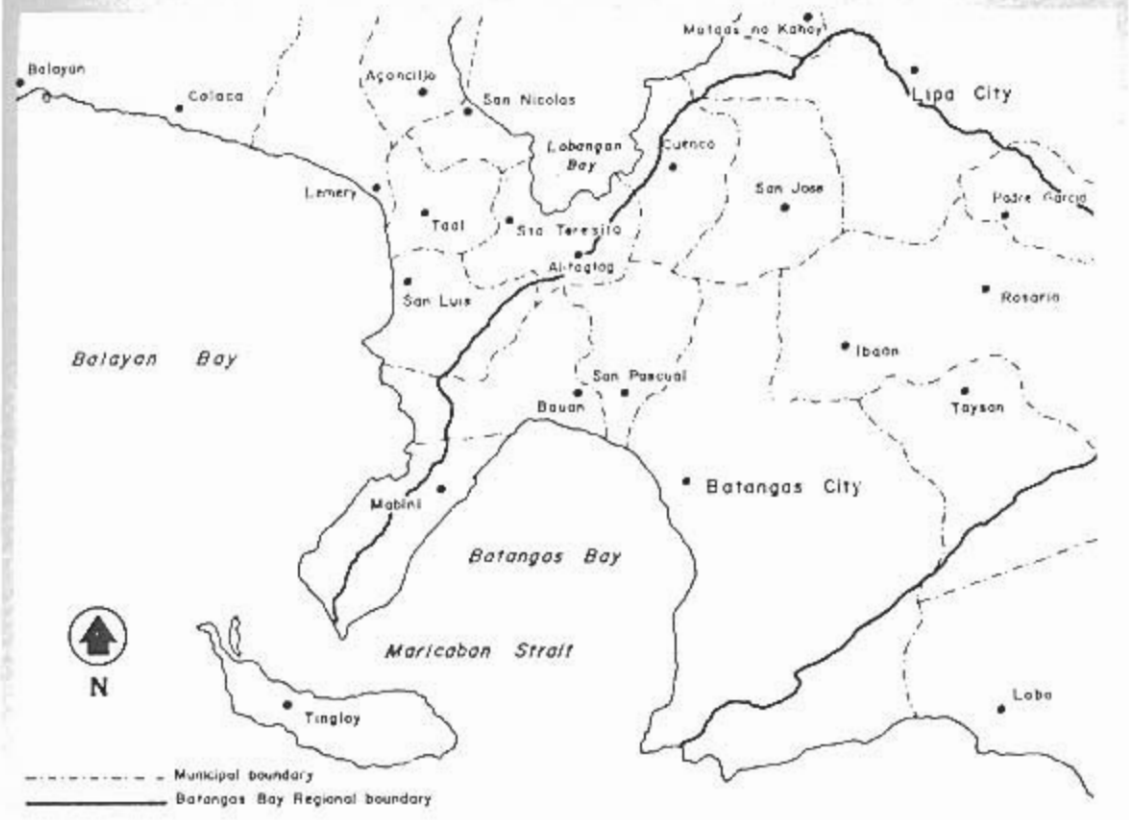
Originally, Batangas comprised not only the present province, but included the provinces of Mindoro, Marinduque, and portions of Laguna and Ambos-Camarines. It was established as a province in 1581 during the Spanish colonial period. Since 1754, its provincial capital has been Batangas City, which borders Batangas Bay and is approximately 112 km from Metro Manila.

Batangas Bay Region

The management area of the Batangas Bay Demonstration Project is the Batangas Bay Region located in the southern part of Batangas Province (*See Figure 1.1*). The southern boundary is the municipal boundary of Tingloy in Maricaban Island; while the north, south, and west boundaries are delineated by the watersheds or catchment areas that drain into the Batangas Bay. The mainland municipalities within the catchment areas are Ibaan, Rosario, Lipa City, Padre Garcia, San Jose, Cuenca, Alitagtag, Taysan, Bauan, Mabini, San Pascual, Batangas City, and portions of Lobo and the Verde Island, which is part of Batangas City.

The total land area of the bay region is estimated at 871.1 km^2, with a total coastline of 470 km.

Figure 1.1. Map of the Batangas Bay Region.



Batangas Bay

Batangas Bay is a semienclosed body of water, bordered by the mainland municipalities of Bauan, San Pascual, and Mabini. It also includes Batangas City, Verde Island, and the municipality of Tingloy in Maricaban Island. Its total water area is about 220 km^2.

Coastal Municipalities

Coastal municipalities are those areas bordering Batangas Bay. These are Mabini, Bauan, San Pascual, Batangas City, and Tingloy.

Interior Municipalities

Interior municipalities are those areas that do not border the bay but have catchment areas that drain into the bay. These include Lipa City, Alitagtag, Cuenca, Ibaan, Lobo, Padre Garcia, Rosario, San Jose, and Taysan. [The words *municipality, community,* and *area* are used alternately. Unless otherwise specified, they cover both towns and cities.]

Coastal Barangays

The coastal barangays are those that border Batangas Bay. There are 44 coastal barangays in Batangas Bay: 12 in Batangas City, 8 in Bauan, 12 in Mabini, 3 in San Pascual, and 9 in Tingloy (*See Table 1.1*).

The maps of the coastal barangays are shown in Figures 1.2 to 1.6.

Table 1.1. Coastal barangays of Batangas Bay.

A. Batangas City		
Ambulong	Malitam	Sta. Rita
Cuta	Pinamucan Proper	Simlong
Libjo	Pinamucan Ibaba	Tabangao Aplaya
Mabacong	Sta. Clara	Wawa
B. Bauan		
Aplaya	San Andres Proper	San Pedro
New Danglayan	Santa Maria	Sto Domingo
San Andres I	San Miguel	
C. Mabini		
Bulacan	Mainit	Talaga East
Calamias	Malimatoc I	Talaga Proper
Gasang	Malimatoc II	Saguing
Mainaga	Pulong Balibaguhan	San Juan
D. San Pascual		
Danglayan	Poblacion	San Antonio
E. Tingloy		
Maricaban	Poblacion I	Talahib
San Jose	Poblacion II	San pedro
Sto. Tomas	Poblacion III	Gamao

Source: OPPDC, 1991

Batangas is one of the five provinces within the Calabarzon region, a major growth area in the Philippines. It has a total land area of 316,581 ha with two cities and 32 municipalities. The whole province is subdivided into four congressional districts: District I is a sugar, aquaculture, and tourism area; District II is an industrial area; District III is a lakeshore area; and District IV is an agribusiness area. The region covers the second and fourth districts of the province.

Figure 1.2. Map of Batangas City.

Figure 1.3. Map of San Pascual, Batangas.

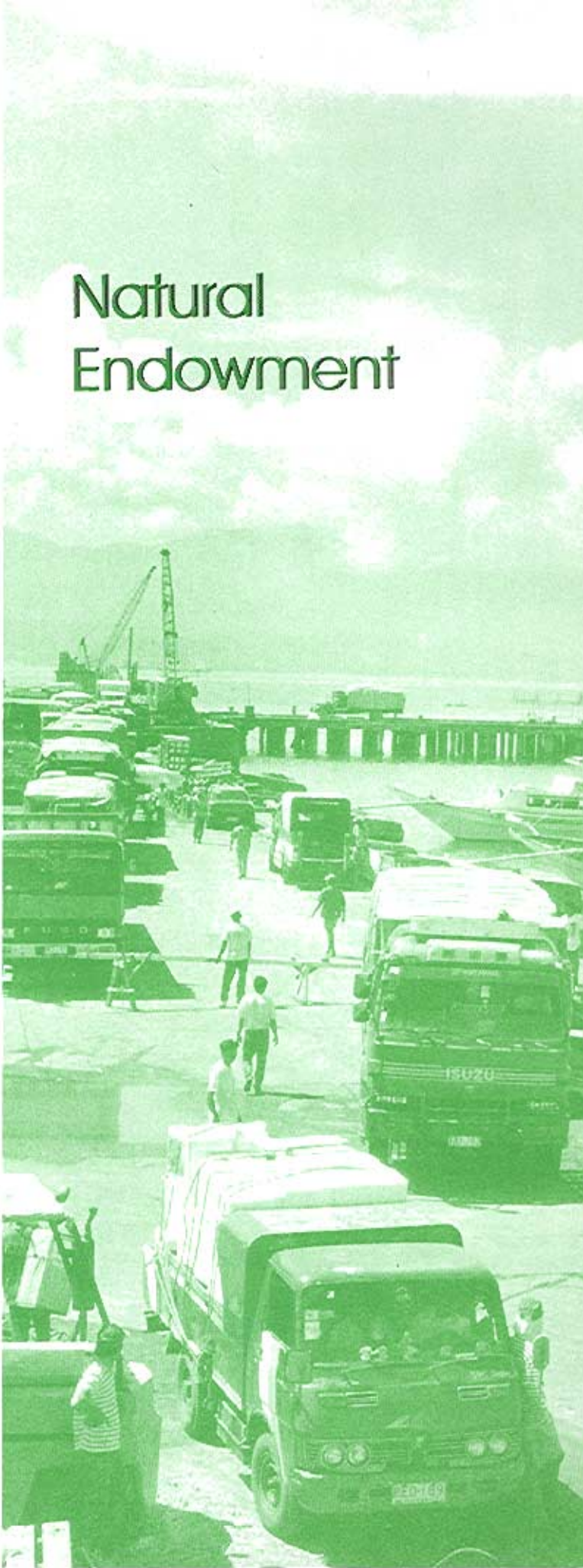
Figure 1.4. Map of Bauan, Batangas.

Figure 1.5. Map of Mabini, Batangas.

Figure 1.6. Map of Maricaban Island, Batangas.

***Note:** Tingloy is located at northern half of the island*

Natural Endowment



Chapter 2.
NATURAL ENDOWMENT

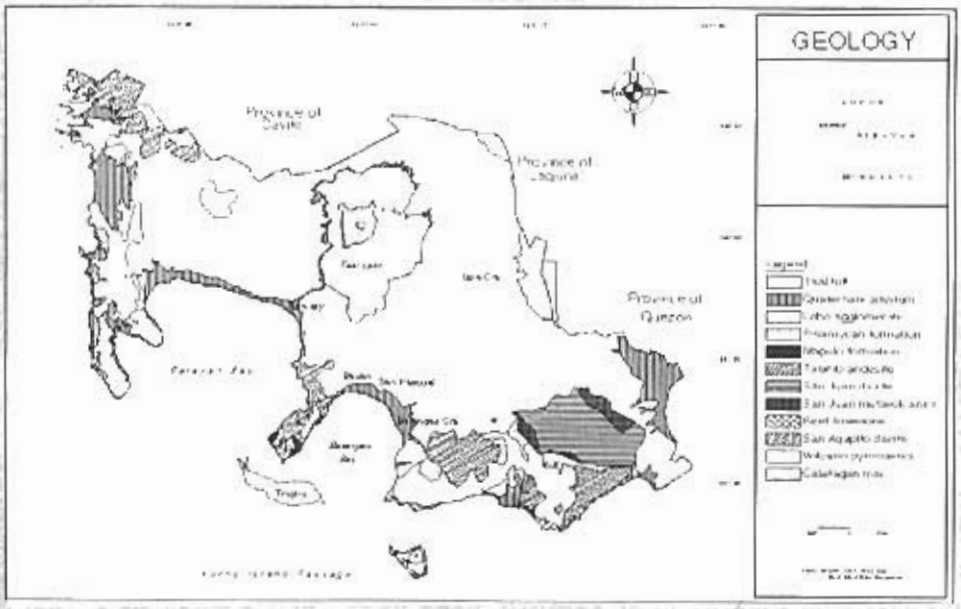
TERRESTRIAL ENVIRONMENT OF THE BATANGAS PROVINCE AND THE BATANGAS BAY REGION

Physiography

Batangas Province's geology is predominantly Tertiary to Quaternary and largely of igneous and sedimentary rocks. These rocks are widespread in the province, formed during the late Miocene to early Pliocene periods, particularly in the Calumpan Peninsula, around Mt. Banoy and Pinamucan in southeastern Batangas. The oldest formation is early Tertiary (Paleocene to Oligocene), known as the San Juan Metavolcanics, found mainly in the southern and central parts of San Juan, Batangas (BMGS, 1981). A large part of the province is overlain with volcanic *ejecta*, also known as Taal Tuff derived from previous eruptions of Taal Volcano, which is now a *caldera*.

The Batangas Bay Region, including Batangas City, is overlain mostly by the Taal Tuff; whereas, in the coastal areas and along the flood plains of large streams, rocks are largely Quaternary Alluvium. Along the Calumpan Peninsula, the dominant formation is the Talahib Andesite, which is also found from Sto. Niño to Mt. Banoy and Mt. Liguayen, east of the region. Verde Island, on the other hand, is a composite of several formations, such as the Taal Tuff and Labo Agglomerate which intercalated with the Pinamucan Formation. The latter is also found in the vicinity of upper Pinamucan, upper Calumpit, and along the Lobo rivers. The geological formations of Batangas are shown in Figure 2.1 and

Figure 2.1. Batangas Province geological map.



Source: BMGS, 1985.

Table 2.1. The geological formations of Batangas Province and the Batangas Bay Region.

Geological Formation	Period	Epoch	Age	Description
Quaternary Alluvium	Quaternary	Recent	0.001 Ma	Unconsolidated to poorly consolidated gravel, sand silt, and clay
Mt. Santiago Limestone		Pleistocene	0.01 to 1.8 Ma	Flat bedded, white to buff coralline limestone
Taal Tuff		Pleistocene		Thin- to medium-bedded, fine-grained vitric tuffs, welded volcanic breccia with tuffaceous and sandstone and shale
Lobo Agglomerate		Pleistocene		Thick sequence of unaltered fragmental andesite embedded in a tuffaceous to sandy matrix
Pinamucan Formation	Tertiary	Early to Late Pliocene	1.8 to 5.0 Ma	Interbedded sequence of well-sorted but poorly indurated conglomerate. A tuffaceous sandstone and shale
Mapulo Limestone		Late Miocene	5.0 to 22.5 Ma	Massive, white to buff, porous limestone with abundant coral fingers
Talahib Andesite		Middle Miocene		Mainly andesite flows interbedded with thin layers of pyroclastics and bedded tuff
San Juan Diorite		Early Miocene		Mainly quartz hornblende diorite with occasional quartz monzonite and dacite
San Juan Metavolcanics and Metasediments		Oligocene	22.5 to 38.0 Ma	Mainly metabalast and metaandesite intercalated with hornfels, shale, pyroclastics and marble

Note: *The epoch listed above shows only the dominant chronostrategraphic sequence.*
Legend: *Ma -- million years*

Table 2.1. Table 2.2, on the other hand, shows the various formations within the BBR.

There are several faults around and within the province that have generated earthquakes in recent times (*See Figure 2.2*). Earthquakes of volcanic origin usually occur near known volcanoes such as Taal. One notable fault is the Laiya Fault with a west-northwest strike, recognizable in the vicinity of Laiya, San Juan, and Lobo River. The Marikina Fault, which runs from the upper Marikina River in Rizal Province to Taal Lake, is still active and strongly associated with Taal Lake's formation (BMGS, 1981). Available information on the fault is limited to the Metro Manila area only, where some mapping has been accomplished.

The Marikina Fault consists of two main northeast-trending faults which are still inadequately studied. Much of the fault system has been greatly modified by urban and industrial development compounded by insufficient historical records of its past movements (Daligdig and Besana, 1991). Minor faults traverse from the eastern part of Batangas City to Mt. Banoy on a northeast-trending direction. There are also faults along the Verde Island Passage (Lubang Fault) which, together with the subduction at the Manila Trench in the South China Sea, have been responsible for most of the historical earthquakes in Southern Luzon and Mindoro (Solidum and Sabit, 1988).

Taal Volcano is one of the most destructive volcanoes in the Philippines and the only active one in Southern Tagalog. The vent is near the center of Taal Lake known as the Volcano Island (*See Figure 2.3*). The volcano erupted 33 times in the past 400 years, causing death and devastation over the surrounding areas. The quiet period ranged from about a

Table 2.2. Distribution of area by geologic formation and by general classes of rocks, Batangas Bay Region, 1985 (in hectares).

Municipality/ City	Sedimentary Rocks				Igneous Rock						Metamorphic Rocks
	Alluvium	Mt. Santiago Limestone	Mapulo Limestone	Pinamucan Formation	Taal Tuff	Volcanic Agglomerate	Andesite Basalt Series	San Juan Quarts Diorite	Quaternary Volcanics	Undiff. Volcanics	San Juan Metarocks
A. Coastal											
Batangas City	2,492	1,107			18,550	227	4,153	1,107		2,208	426
Bauan	690				3,336						
San Pascual					3,495						
Mabini	290			65	194					3,312	435
Subtotal	**3,472**	**1,107**		**65**	**25,575**	**227**	**4,153**	**1,107**		**5,520**	**861**
B. Interior											
Lipa City					17,181		3,630		129		
Cuenca					3,136				904		
Ibaan					9,900						
Padre Garcia					9,370						
Rosario					15,631			3,309			
San Jose					4,950						
Taysan			97	441	6,378	1,225	232	1,433			1,133
Lobo	1,518	1,172	103	1.728		8,687	3,525	2,110			428
Alitagtag					2,340						
Subtotal	**1,518**	**1,172**	**200**	**2,169**	**68,886**	**9,912**	**7,387**	**6,852**	**1,033**		**1,561**
C. Island Municipality											
Tingloy										3,243	
TOTAL AREA	**4,990**	**2,279**	**200**	**2,234**	**94,461**	**10,189**	**11,540**	**7,959**	**1,033**	**8,763**	**2,422**

Note: *Area was computed using a dot grid, based on 1:50,000 BSWM Present Land-use Map, 1985. The table was derived using BSWM Geology Map.*

Figure 2.2. Fault systems in Batangas Province and nearby areas.

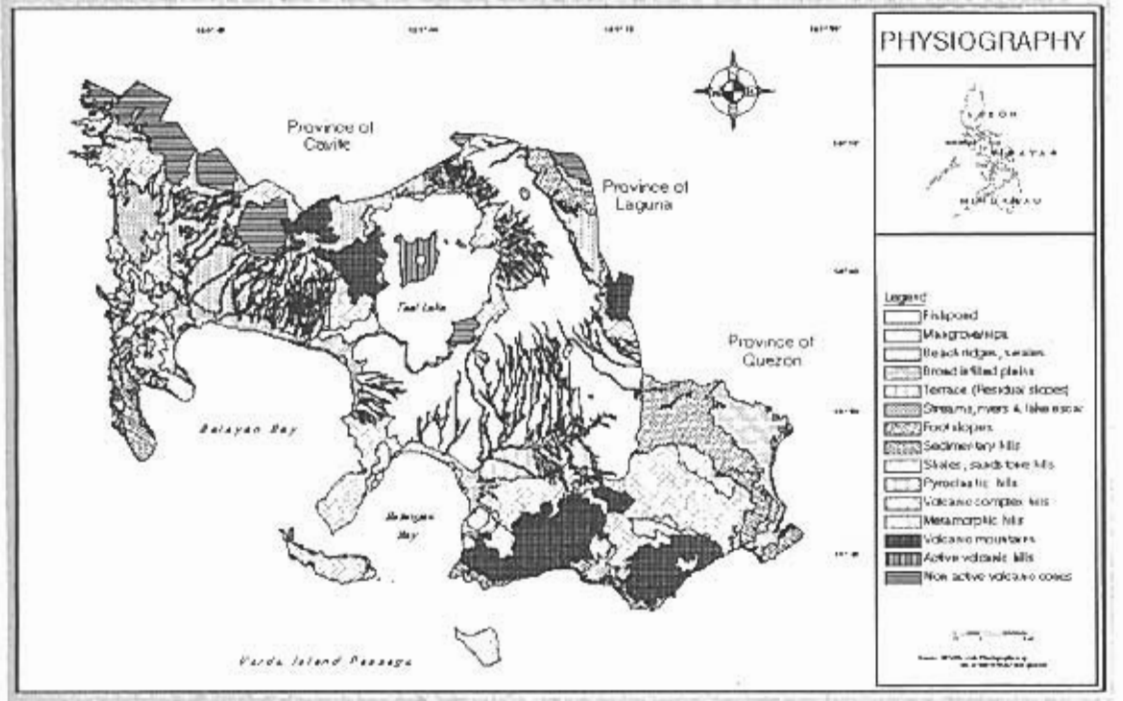
Figure 2.3. Localities and year of historical eruptions of Taal Volcano.

Source: *Arboleda and Ruelo, n.d.*

year to 62 years. Of the recent eruptions, the 1911 eruption was the most devastating, with 1,334 casualties; while the 1965 outburst displaced 55,000 people along with 200 casualties (Arboleda and Ruelo, n.d.).

The physiography of Batangas is the result of volcanic and tectonic activities. The province has relatively low mountainous areas while plateaus are extensive *(See Figure 2.4)*. Eleven major landforms have been identified and mapped in the bay region. These landforms include coastal, broad

Figure 2.4. Batangas Province's physiography map.



Source: *BSWM, 1985.*

alluvial plains, minor alluvial plains, terrace, stream, river and lake escarpment, Piedmont (footslope), sedimentary hills, volcanic hills, metamorphic hills, volcanic mountains, and volcanic cones *(See Table 2.3)*. These landform types are accounted in land use planning since they provide vital information concerning the suitability of land for various agricultural and urban uses.

Including the island municipality of Tingloy, the bay region, as a whole, is predominantly made up of terrace residual slopes and volcanic hill types of landforms, comprising about 43 percent and 21 percent, respectively, of the total land area. Coastal municipalities, however, have broader alluvial plains (4,033 ha) suitable for agriculture and/or urban development than the interior municipalities which only have 1,135 ha.

A schematic representation of the region's various landforms is provided in Figure 2.5. These diagrams also provide a summary of the attributes of the geomorphic units in terms of elevation, parent material, slope range, soil depth, texture, soil drainage, erosion class, dominant land use and vegetation, associated land uses, land capability, and land limitations. The management problems and issues associated with these geomorphic units were also assessed and included in the diagram. In effect, the schematic diagrams provide snapshots of the Batangas Bay Region's physical profile and these were translated into management issues and problems for strategic planning purposes.

Table 2.3. Distribution of area (hectares) by major landform type, Batangas Bay Region, 1985.

Municipality/ City	Coastal (GMU 01)	Broad Alluvial Plains (GMU 06)	Minor Alluvial Plains (GMU 16)	Terrace (residual slopes) (GMU 21)	Stream, River & Lake Escarpment (GMU 25)	Footslope (Piedmont) (GMU 26)
A Coastal						
Batangas City	554	1,384	554	6,922	831	
Bauan		834		2,703	210	
San Pascual		126		3,020	347	
Mabini		266	22			
Subtotal	**554**	**2,612**	**576**	**12,645**	**1,388**	
B Interior						
Lipa city				14,145	1,606	455
Cuenca				2,612	328	
Ibaan				7,244	2,601	
Padre Garcia				7,492	690	1,188
Rosario		41		8,418	949	6,130
San Jose				4,136	676	
Taysan				4,420	1,075	
Lobo	248	1,094	230			
Alitagtag	13			2,150	177	
Subtotal	**261**	**1,135**	**230**	**50,617**	**8,102**	**7,773**
C Island Municipality of Tingloy	3	286	27			
TOTAL AREA	**818**	**4,033**	**833**	**63,262**	**9,490**	**7,773**

Municipality/ City	Sedimentary Hills (GMU 41)	Volcanic Hills (GMU 51)	Metamorphic Hills (GMU 71)	Volcanic Mountains (GMU 88)	Volcanic Cones (GMU 91)	TOTAL AREA
A Coastal						
Batangas City	2,492	7,199		7,752		27,688
Bauan		2,474	439			6,660
San Pascual						3,495
Mabini	73	3,463	472			4,296
Subtotal	**2,565**	**13,136**	**911**	**7,752**		**42,139**
B Interior						
Lipa city		2,648		1,935	151	20,940
Cuenca		191			909	4,040
Ibaan		54				9,899
Padre Garcia						9,370
Rosario		3,401				18,939
San Jose		122			14	4,948
Taysan	674	2,099		2,674		10,942
Lobo	3,100	5,669	242	8,688		19,271
Alitagtag						2,340
Subtotal	**3,774**	**14,184**	**242**	**13,297**	**1,074**	**100,689**
C Island Municipality of Tingloy		2,927				3,243
TOTAL AREA	**6,339**	**30,247**	**1,153**	**21,049**	**1,074**	**146,071**

Note: *The area was computed using a dot grid, based on the Soils and Physiographic Map of the BSWM at 1:50,000 scale.*
GMU -- Geographic Management Unit

Schematic land resources diagram of selected land units, Batangas.

Land Management Unit		01	67	86	43	88	88	43	88	64	63
Geomorphic Mapping Unit	Coastal Waters	Coastal Land	Volcanic hills	Volcanic Mountain	Sedimentary Hills	Volcanic Mountain	Volcanic Mountain	Sedimentary Hills	Volcanic Mountain	Volcanic Hills	Volcanic Hills
Schematic Cross Section Elevation (meter) 600 450 300 150 0											
Parent Material	-	Fluvio Marine	Volcanic tuff	Volcanic agglomerate	Shale and Sandstone	Andesite basalt series	Volcanic agglomerate	Shale and sandstone	Metavolcanics/ Metasediments	Quartz - Diorite	Quartz - Diorite
Slope Range (%)	-	0-3	18-30	30-50	18-30	> 50	> 50	18-30	30-50	30-50	18-30
Soil Depth	-	Moderately deep	Moderately deep	Moderately deep	Moderately deep	Moderatly deep	Moderately deep	Moderately deep	Moderately deep	Shallow	Shallow
Texture	-	Heavy	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Soil Drainage (internal)	-	Very poorly drained	Well-drained	Moderately well-drained	Moderately well-drained	Moderately well-drained	Moderately well-drained	Moderately well-drained	Moderately well-drained	Well drained	Well-drained
Erosion Class	-		Slight	Severe	Slight	Severe	Severe	Slight	Severe	Moderate	Slight
Dominant Land Use/ Vegetation	Fisheries Navigation Ports/Harbors Recreation	Built up areas Fishpond	Upland rice Quarrying	Grasses	Shrubs	Secondary forest	Secondary forest	Coconut Shrubs	Grasses Coconut Shrubs	Coconut Shrubs	Shrubs
Associated Land Use		Tourism Roads	Sugarcane Coconut	Shrubs Upland Rice	Grasses Upland Rice	Grasses	Grasses	Shrubs	Shrubs Upland rice	Shrubs	Grasses Upland rice
Land Capability	-	-	De (Fairly good land)	M (Pasture land)	M (Pasture land)	M (Pasture land)	M (Pasture land)	M (Pasture land)	M (Pasture land)	De (Fairly good land)	De (Fairly good land)
Land Limitation	-	Saline Tidal inundation	Slope	Slope Erosion	Slope	Slope Erosion	Slope Erosion	Slope	Slope	Slope Erosion Shallow	Slope Shallow solum
Issues/Problems	Sedimentation Water pollution Water use conflict Depleted corals, seagrasses Declining fishery yield Illegal fishing	Coastal erosion Depleted beach vegetation, wildlife Squatters Land use conflict Solid waste pollution Tidal flooding	Quarrying Soil erosion Agricultural wastes Fertilizer and pesticide runoff	Deforestation Soil Erosion	Deforestation Soil erosion	Deforestation Soil erosion	Deforestation Soil Erosion	Soil erosion Agricultural wastes	Soil erosion Deforestation Agricultural wastes	Soil erosion Deforestation	Soil erosion Deforestation

Note: This figure was drawn using information from the BSWM Geology Map

Land Capability and Suitability

The land capability of the bay region was assessed considering three factors, namely: soil limitations, slope, and erosion. Results of the analysis showed that a bigger percentage (41%) of land in the bay region was classified as fairly good land (Class D). Crop cultivation, however, must be undertaken with extra caution since the slopes are steep and the soils are quite erodible. About 30 percent belongs to land capability Subclass Be, which is suitable for cultivation and/or urban use but susceptible to soil erosion if proper conservation or erosion control measures are not adopted. Also, about 30 percent of the land falls under Class M, which has steep slopes and is severely eroded. Lands under this capability class are suited only for pasture or forest uses. Level lands that are wet most of the time and cannot be drained economically belong to Class X and comprise less than one percent of the bay region.

Table 2.4 and Figure 2.5 present the distribution of the area by land capability class and suitability for the municipalities comprising the region.

Fifty-four percent of the coastal municipal lands fall under Class D; 45 percent under Class M; and less than one percent under Classes B and X. All the lands in Tingloy are classified under Class M. The interior municipalities have comparatively better lands for agricultural uses with about 44 percent of their lands belonging to Subclass Be. They also have a substantial hectarage (36%) of fairly good lands for cultivation.

Table 2.5 provides a key to the suitability rating of various geomorphic mapping units (GMUs) to different land uses, such as agricultural crops (annual and perennial), forest and mangrove, fishpond and saltbed, and pasture. The suitability rating, however, does not cover urban uses. A large percen-tage (43%) of the total land area in the bay region is highly suitable for the cultivation of the following crops: rice, corn, mongo, peanut, vegetables, ginger, onion, black pepper, water-melon, coffee, citrus, sugarcane, abaca, and coconut, among others.

Natural Hazards

Natural hazards refer to the probability of occurrence, within a specified period of time and within a given area, of a potentially damaging natural phenomenon (Brabb, 1984). There are several types of natural hazards that can affect the bay region and the province as a whole. These can be differentiated into seven categories: (1) earthquakes; (2) volcanic activity; (3) typhoons; (4) floodings; (5) *tsunami* and storm surges; (6) erosion and landslides; and (7) sea-level rise.

Earthquakes. The major causes of earthquakes in the province are faulting and subduction along the Manila Trench in the South China Sea. Direct effects of earthquakes are ground movements associated with main and after shocks, structural damage (i.e., buildings, roads), liquefaction (in areas like sandy beaches, muddy grounds, and deltas), ground rupture, landslides, and mortality. In coastal areas, *tsunamis* or large sea waves may occur, especially when the earthquake epicenter is in the sea, exacerbating its ground impacts. So far, the Batangas Bay is enclosed and *tsunamis* arising from earthquakes in the Verde Island passage will not have significant impact on the bay. In general, historical information on the impacts of earthquakes in the province and in the bay region, in particular, is not available.

Volcanic Activity. Among all the

Table 2.4. Distribution of area (hectares) by land capability class, Batangas Bay Region, 1985.

Municipality/ City	Class B		Class D	Class M	Class X	Total Area
	Subclass Bw	Subclass Be	Subclass De			
A. Coastal						
Batangas City	227		13,844	13,290	166	27,687
Bauan			3,945	2,715		6,660
San Pascual			3,495			3,495
Mabini			1,260	3,036		4,296
Subtotal	**227**		**22,544**	**19,041**	**166**	**42,138**
B. Interior						
Lipa City		17 336	3,156	448		20,940
Cuenca			2,382	1,658		4,040
Ibaan		134	9,620	146		9,900
Padre Garcia		8 769	601			9,370
Rosario		12,897	6,043			18,940
San Jose			4,453	497		4,950
Taysan		5,133	3,826	1,981		10,940
Lobo			4,175	15,095		19,270
Alitagtag			2,340			2,340
Subtotal		**44,269**	**36,596**	**19,825**		**100,690**
C. Island Municipality						
Tingloy				3,243		3,243
Subtotal				**3,243**		**3,243**
TOTAL AREA	227	44,269	59,140	42,109	166	146,071

Note: *The area was computed using a dot grid, based on a 1:100,000 Soil Map prepared in 1976 by BSWM.*

1. CLASS B — Good land; can be cultivated safely; requires easily applied conservation practices.
   - Subclass Bw — Nearly level, occurs in depressions. Problem: Occasional overflow. Requires protection from overflow. Observe easily applied conservation practices.
   - Subclass Be — Nearly level to gently sloping, slightly to moderately eroded. Main problem is erosion. Observe erosion control measures and easily applied conservation practices.

2. CLASS D — Fairly good land. Must be cultivated with extra caution. Requires very careful management and complex conservation practices for safe cultivation. Best-suited to pasture or forest.
   - Subclass De — Strongly sloping, severely to very severely eroded. Main problems: Erosion and fertility. Observe erosion control measures, very careful soil management, especially good crop rotation and complex conservation practices if land is to be cultivated. Suited for pasture or forest.

3. CLASS M — Steep, very severely to extensively eroded, or shallow for cultivation. Suited to pasture or forest with careful management.

4. CLASS X — Level land, wet most of the time, cannot be economically drained. Can be used for farm pond or for recreation.

Table 2.5. Land use by suitability class and by GMU/LMU.

GMU	LMU	Highly Suitable (S1)	Moderately Suitable (S2)	Marginal Suitable (S3)
	67		Upland rice, corn, peanut, eggplant, tomato squash, chayote, cabbage, ginger, maguey, cotton ramie, sugarcane	
	68	Cassava, sweet potato, citronella, pasture	Coffee maguey pasture	Paddy rice irrigated, paddy rice nonirrigated, stringbeans, ampalaya, Irish potato, ube, pineapple
71 Metamorphic Hills	71	Cassava, sweet potato citronella, and pasture	Upland rice, corn, peanut, eggplant, tomato squash, chayote, cabbage, pechay, coffee, maguey, ramie tobacco, and sugarcane	Stringbeans, ampalaya, and ginger
1 Terrace (Residual slopes)	21	Paddy rice irrigated, paddy rice nonirrigated, upland rice, corn, mongo, peanut, eggplant, tomato, stringbeans, chayote cabbage pechay, ampalaya squash cassava, sweet potato Irish potato, ube ginger onion, blackpepper, watermelon, coffee, cacao, citrus, pineapple, cashew, abaca, maguey, sugarcane, coconut, citronella and pasture	Ramie and tobacco	Cotton
	22	Upland rice cassava, sweet potato, Irish potato, ube, ginger, onion blackpepper, watermelon, coffee, cacao, citrus pineapple cashew maguey, abaca, sugarcane coconut citronella, and pasture	Paddy rice (irrigated), paddy rice (non-irrigated), corn, mongo, peanut, eggplant, tomato, stringbeans, ampalaya squash, chayote, cabbage, pechay, cassava	Cotton
01 Coastal	01	Mangrove/nipa, inland marsh, saltbed, and fishpond		
	02	Mangrove/nipa, inland marsh, saltbed, and fishpond		
	03	Mangrove/nipa, inland marsh, and fishpond		
06 Broad Alluvial Plains	09	Paddy rice (irrigated), paddy rice (non-irrigated), upland rice, corn, mongo, peanut, eggplant, tomato, stringbeans, ampalaya, cabbage, pechay, cassava, citrus, pineapple, cashew, abaca, cotton, ramie, sugarcane, and pasture	Squash, maguey and coconut	Citronella
16 Minor Alluvial Plains	16	Paddy rice (irrigated) paddy rice (non-irrigated), upland rice, corn mongo, peanut, eggplant, tomato, stringbeans, ampalaya, squash, cabbage pechay, cassava sweet potato Irish potato, ube, ginger, onion, blackpepper, watermelon, citrus, pineapple, cashew, abaca, cotton, ramie, sugarcane, coconut, and pasture	Maguey and citronella	
	23/24	Cassava, sweet potato, coffee, cacao, citrus, cashew, maguey, abaca, sugarcane, coconut, citronella, and pasture	Irish potato, ube, onion, blackpepper, watermelon, grapes, pineapple, ramie	Paddy rice (irrigated), paddy rice (non-irrigated), upland rice, corn, mongo, peanut, eggplant, tomato stringbeans, ampalaya, squash, chayote, cabbage, pechay cotton
25 Escarpments	25			
41 Sedimentary Hills	42		Maguey	Coffee and pasture stringbeans, ampalaya, ginger, pineapple
	43	Cassava, sweet potato, citronella, pasture	Upland rice, corn, peanut, eggplant, tomato, squash, chayote, cabbage, pechay, coffee, maguey, ramie, sugarcane	
51 Volcanic hills	56		Coffee, maguey, pasture	
	58		Coffee, maguey, pasture	
	62			Maguey, pasture coffee

Legend LAND MANAGEMENT UNIT (LMU)

01	Fishpond	25	Stream, river, and lake escarpment
02	Mangrove and/or nipa	42	Limestone hills - high relief
03	Beach ridges and swales	43	Shale/sandstone hills - low relief
09	Broad plains	56	Andesitic hills - high relief
16	Infilled valleys	58	Volcanic complex - hills high relief
21	Level to gently sloping terraces	62	Volcanic agglomerate - hills high relief
22	Sloping to undulating terraces	67	Tuffaceous hills - low relief
23	Undulating to rolling terraces	68	Tuffaceous hills - high relief
24	Rolling to hilly terraces	71	Metamorphic hills - low relief
88	Volcano mountain		

Source: *BSWM Geomorphology Map.*

natural hazards, volcanic activity has the greatest impact on the province due to the presence of Taal Volcano. Among the direct effects of volcanic eruptions are base surges, airfall of pyroclastic materials, lava flow, and presence of poisonous gases (Arboleda and Ruelo, n.d.). Other effects are seiches (ground oscillations), fissuring, and acid rain (*See Table* 2.6).

Base surges are turbulent volcanic debris, ranging in size from ash to blocks, rushing downslope at a speed of more than 50 m/sec traveling a distance of 6 km from the vent. In Taal Volcano's 1965 eruption, base surges affected 2/3 of the Volcano Island, uprooted trees, and knocked down houses along its path within 1 km from the vent, as well as decorticated trees. Ashfall containing fine ash and large pyroclastic materials or ballistic projectiles can reach great heights and spread over a large area, depending on atmospheric conditions. Thus far, most ashfalls (from a 3,000 m column) were in the northeast (towards Laguna de Bay) to southwest (towards Balayan Bay) directions. Other effects like poisonous gases and lava flows, including acid rain, are typically restricted within a few kilometers along Taal Lake (Phivolcs, n.d.).

Direct effects of volcanic activity are inclined to affect the coastal areas along Batangas Bay less intensively, considering existing historical records and projections (*See Figures 2.6 and 2.7*). Secondary effects, including the destruction of infrastructure (i.e., roads, buildings) and livelihood systems, tend to create environmental refugees and tax existing life-support system within the management area, including Batangas City. Also, the destruction of the main arteries into and out of Batangas City can isolate the bay region from Metro Manila and the adjacent provinces in the north and northeast. Although such isolation may be short-lived, the timely delivery of vital materials and aid to disaster-struck areas may be affected. Therefore, contingency measures need to be established to address these problems, considering that the seat of the provincial government is in Batangas City.

Other Hazards. The Batangas Province lies within the typhoon belt and is periodically affected by such weather disturbance. Typhoons, including possible storm surges in the coastal areas, create economic havoc through the loss of lives, the destruction of properties and agricultural areas, flooding (in low-lying and areas with poor drainage), landslides, and erosion (in steep slopes and areas of poor vegetation cover).

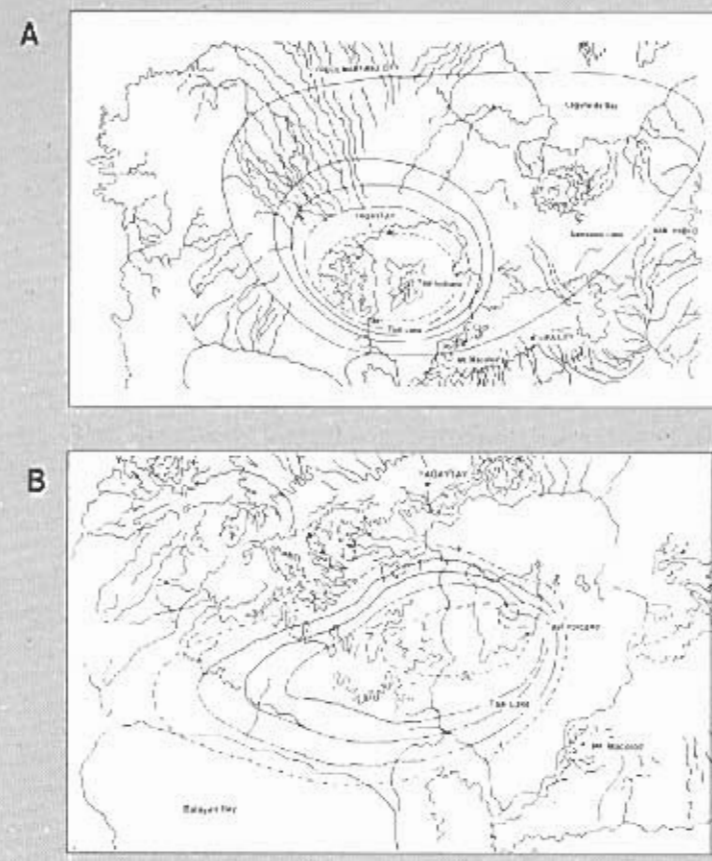
Table 2.6. Taal volcano eruption hazards.

Volcanic Hazards	Effective Distance Ave.(km)	Effective Distance Max. (km)	Area Affected Ave. (km^2)	Area Affected Max. (km^2)	Velocity Ave.	Velocity Max.	Temp. °C
Base surge	7	155	154	700	Hurricane velocity 50 m/s	> 50 m/s	>100
Lava flow	1.3	2	0.7	1.1	0.12 m/s	0.28 m/s	1,160-1,175
Ashfall	10-30	80	500	2,000	2 m/s	0.28 m/s	ambient
Ballistic projectile	1	55	3	5	50 m/s	100 m/s	<1,000
Sieches	9	12	30	130			ambient
Fissuring	6	16	30	140			
Acid Rain	10	20	140	230	2 m/s	27 m/s	ambient

Source: *Arboleda and Ruelo, n.d.*

Figure 2.6. Ashfall trajectories of the Taal Volcano.

(A) shows the extent of the 1911 ashfall while (B) in 1965 in cm.



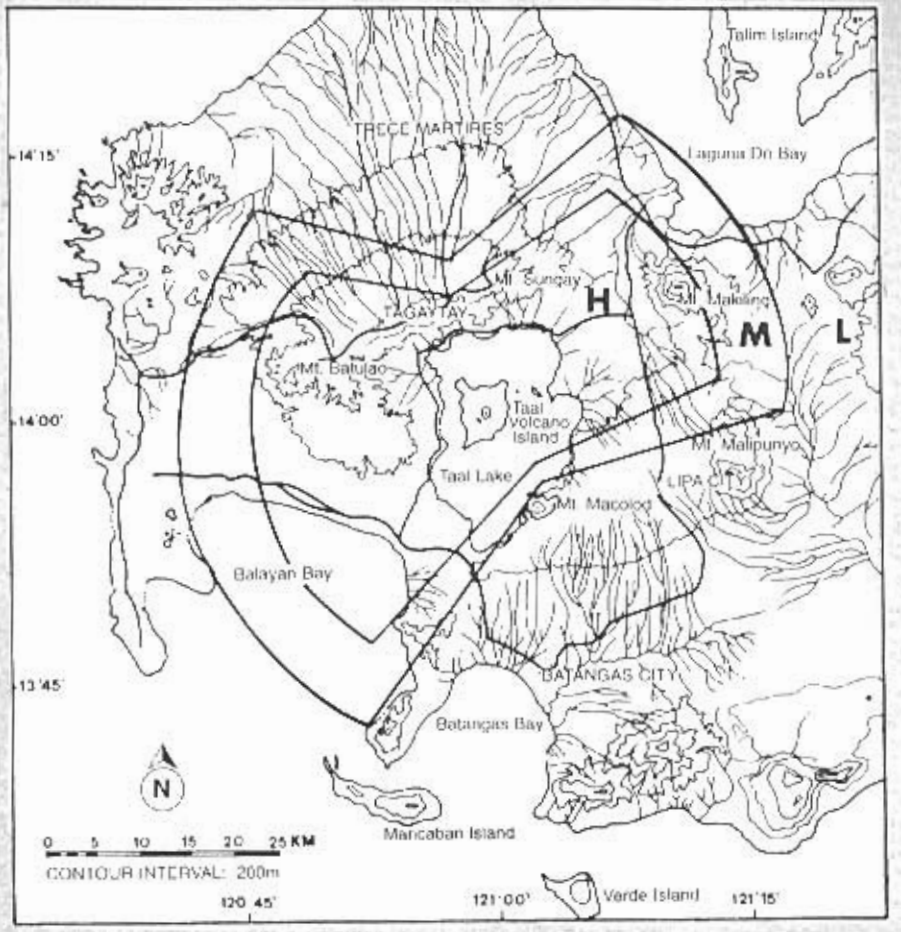
Source: *Phivolcs, n.d.*

Contingency measures exist, but they need to be assessed and improved further.

In the long term, the issue of sea-level rise associated with climate change brought about by the increase of greenhouse gases in the atmosphere must be addressed. Current international efforts (e.g., by the United Nations Environment Programme and Global Environment Facility) to address the issue on climate change are now being discussed by governments of many developing countries, including the Philippines. However, these actions remain to be integrated in economic development programs at both national and local levels. While there is still considerable ambiguity on the issue of sea-level rise (i.e., how high and the extent of impacts), contemporary natural hazard impact information can serve as benchmarks for contingency planning, particularly in the delineation of buffer zones or setback lines along the coastal areas, faults, and other potentially high-risk areas.

As such, there is a need to undertake identification, inventory, and delimitation of high-risk areas against

Figure 2.7. Hazard zonation map for airfall tephra.



Source: *Phivolcs, n.d.*

various development and/or expansion. As part of disaster management, there is also the need for increased public awareness on natural hazards and disaster management schemes to enable the public to take the precautionary measures in the event of a disaster.

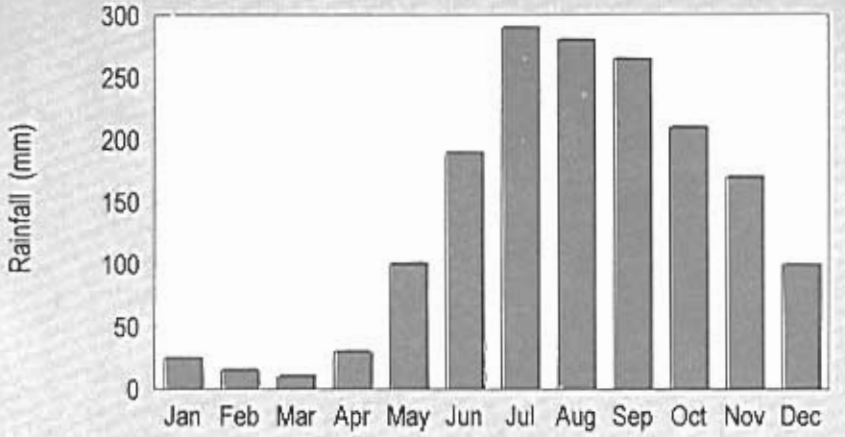
CLIMATIC AND HYDROLOGIC CONDITIONS

Climatic Conditions in the Batangas Bay Region

The bay region falls under Climate Type I of the modified Corona Classification of Philippine climate (Flores and Balagot, 1963). This is characterized by two pronounced seasons – the wet (or rainy) and dry. The rainy season lasts for about four months when the southwest monsoon prevails, while the dry season lasts from three to seven months (*See Figure 2.8*).

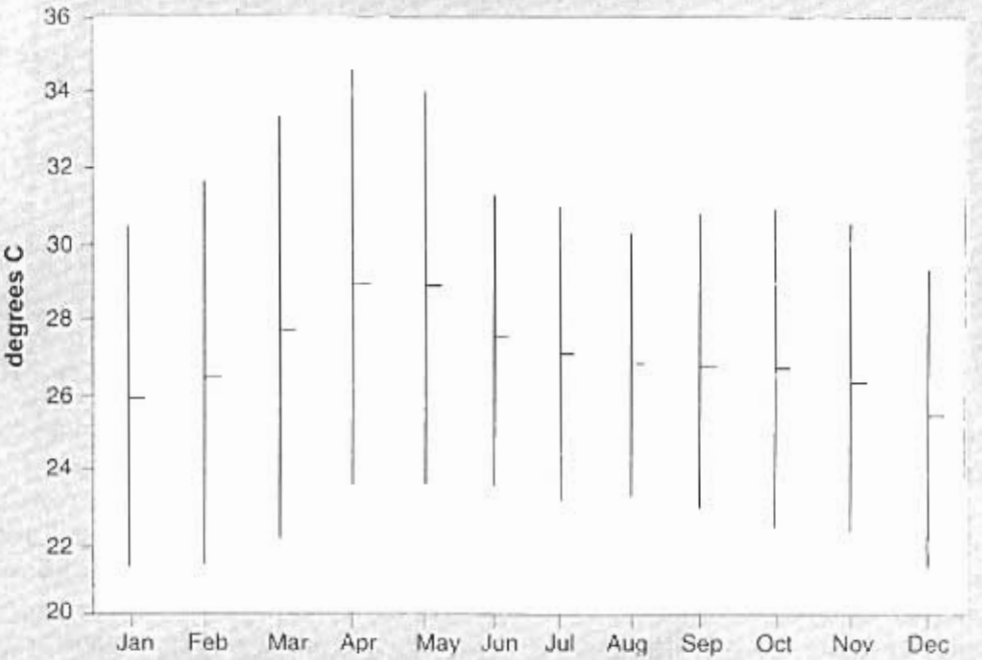
Based on Batangas City's records for 35 years, the normal annual rainfall has been 1,737 mm. The wet season occurs from the months of July to September, when the mean monthly rainfall values exceed 250 mm. July and August are the rainiest months with

Figure 2.8. Average monthly rainfall in Batangas City.



Sources: *Marine Science Institute, 1984; UP Science Research Foundation, 1991.*

Figure 2.9. Maximum, mean, and minimum air temperatures, Batangas City.



Sources: *Marine Science Institute, 1984; UP Science Research Foundation, 1991.*

average monthly values of 296 mm and 294 mm, respectively. The dry period extends from January to April with mean monthly rainfall values at less than 50 mm.

The average and range of air temperatures in Batangas City obtained also from 35 years of records are shown in Figure 2.9. The warmest months are April and May when temperatures average 29°C and range between 23° and

34°C. December and January are the coldest months, with average temperatures of 26°C and the range between 21° and 30°C.

Northeasterly to east-northeasterly winds dominate Batangas City from October to April. This coincides with the prevalence of the northeast monsoon over the country. May is a transitory period when west-southwesterly to southwesterly winds prevail until June. From July to September, southwesterly and west-southwesterly winds are dominant and are associated with the southwest monsoon.

The average wind speed throughout the year is 2 m/sec or about 7 kph. Strong surface winds associated with the passage of tropical cyclones have been observed in Batangas Bay during the months of October to December.

Hydrologic Conditions

Batangas Bay is a semienclosed body of water, connected to the oligotrophic tropical South China Sea and separated by a deep strait/trench from the island of Mindoro. The bay has a total area of about 220 km^2. The average depth of the bay is about 200 m, with a maximum depth of 457 m between Culibra Island and Matoco Point. Average depth within the bounds of one kilometer from shore is 55 m. Figure 2.10 shows the general bathymetry of the bay

Tides. Tidal characteristics in Batangas Bay are similar to those in Manila. Two types of tides prevail in the area – diurnal and semidiurnal tides. Diurnal tides, characterized by one high tide and one low tide in a lunar day (24.8 hrs), prevail when the moon approaches its maximum declination. The maximum tidal range occurs during this period. The semidiurnal type which exhibits two highs and two lows in a lunar day is manifested when the moon's declination approaches zero.

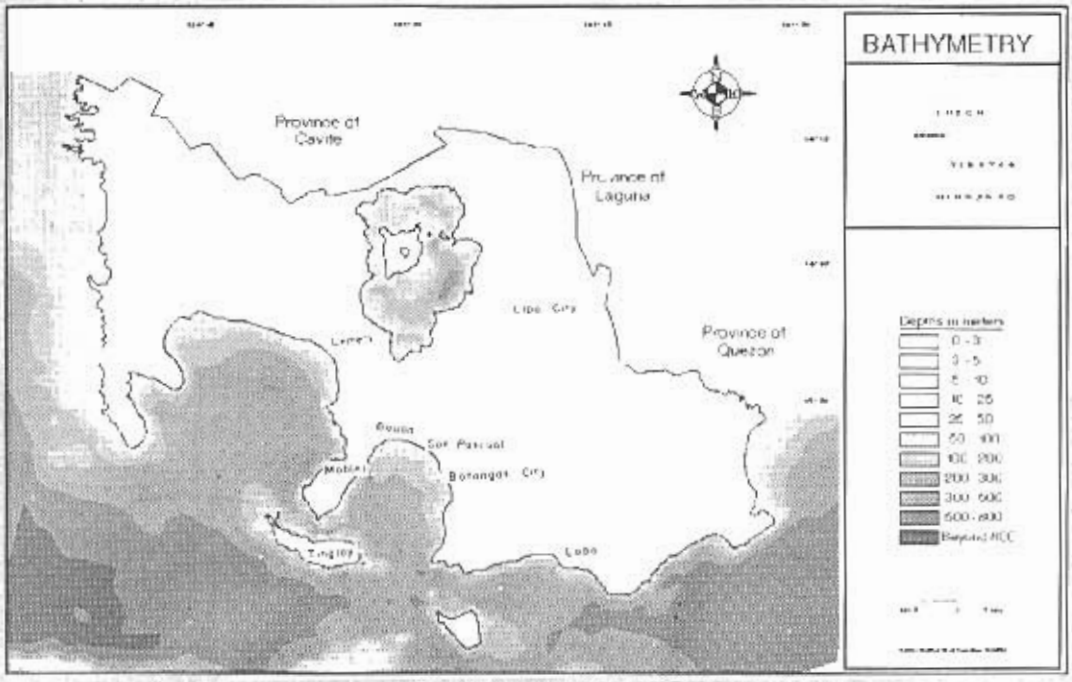
The occurrence of high and low tides at Batangas Bay takes place about 15 minutes after that in Manila, with the water level rising about 0.1 m higher than that in Manila. The diurnal range in the Bay is about 1.1 m (Bureau of Coasts and Geodetic Survey) Tide and Current Tables. Actual tidal observations yield a maximum tidal range of 1.25 m (UPSRF, 1991).

Waves. Waves generally come from the southwest direction. Wave heights range from 0.01-0.75 m, with 88 percent of these waves ranging from 0.01-0.40 m, as observed during actual recurrent one-month observations in October 1984 (DENR, 1991).

Currents. Currents in Batangas Bay result from the combined effects of tides, winds and, to a certain extent, the freshwater discharge from the rivers. The latter becomes important only during the rainy season within the mouths of rivers. Tidal currents tend to be strongest during spring tide periods, but due to the bathymetry of the bay, tidally-induced currents are expected to be less important than wind-generated currents.

Wind-generated surface currents generally range from 2-4 percent of the wind speed measured 10 m above the sea surface. Actual measurements made during the northeast monsoon and the southwest monsoon periods showed that the predominant surface current was northward to northeastward with speeds of around 8-12 cm/sec during the southwest monsoon season, and southwestward during the northeast monsoon (UPSRF, 1991).

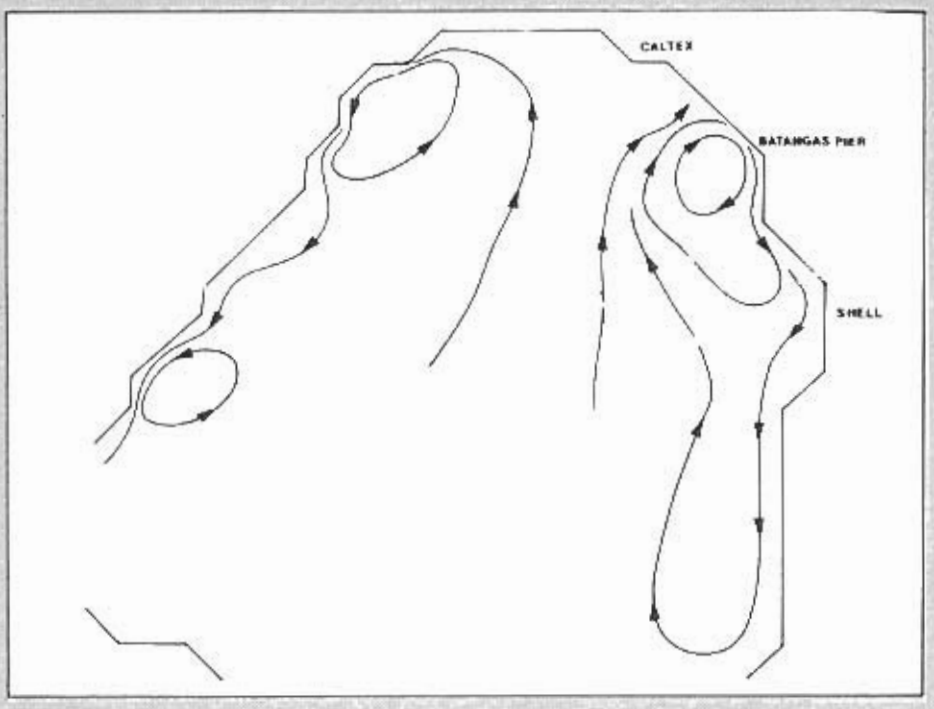
Figure 2.10. General bathymetry of Batangas Bay.



Circulation in Batangas Bay. A study was done on the numerical simulation model to predict wind-driven currents, but it focused only on nearshore areas with emphasis on the Tabangao area. The resulting surface currents for three major wind regimes (northeasterlies, easterlies, and southwesterlies) are shown in Figures 2.11-2.13. Close to the Pilipinas Shell Refinery, surface currents moved southward during the northeasterly wind regime. For both the easterlies and southwesterlies, surface currents moved northward. Current speeds varied from 3-10 cm/sec. However, the study mentioned that the results of the circulation model should be viewed with caution as results are more reliable in shallow areas (depths less than 100 m) than in deeper portions of the Bay.

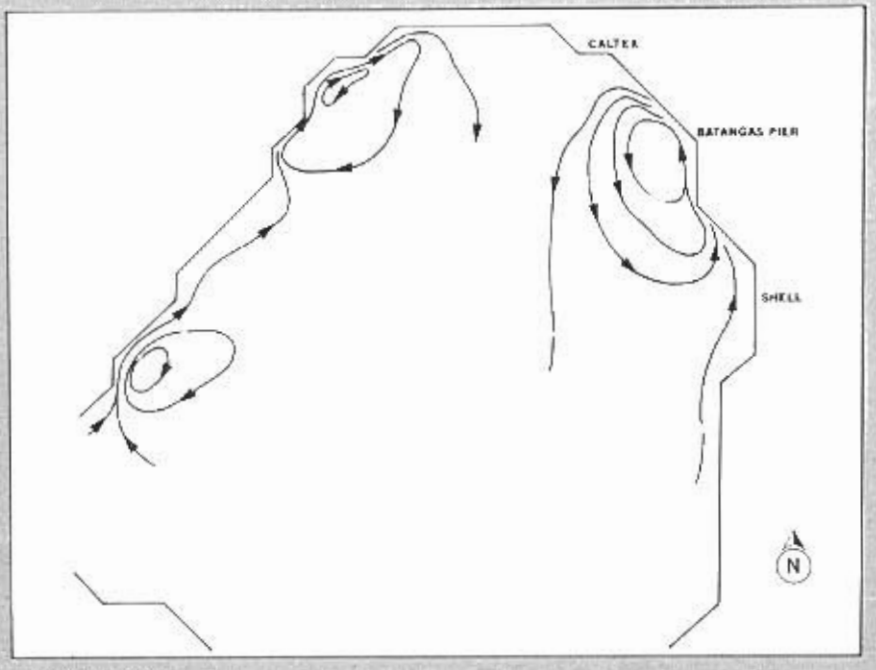
A model for predicting the aquatic dispersion of water-borne pollutants in the vicinity of the Tabangao nearshore zone was also produced by UPSRF (1991). This was combined with the circulation model for conditions of light, moderate, and strong breezes. The results showed that the computed specific concentrations along the coastlines were higher under light breeze than under moderate or strong breezes. Appreciable values were also noted at 5 km from the shore. In all cases, specific concentration values decreased exponentially with increasing distance from the source along the coastline. Nevertheless, the results of this dispersion model still need to be validated.

Figure 2.11. Predicted circulation pattern in Batangas Bay, with steady northeasterly winds of 5 m/s.



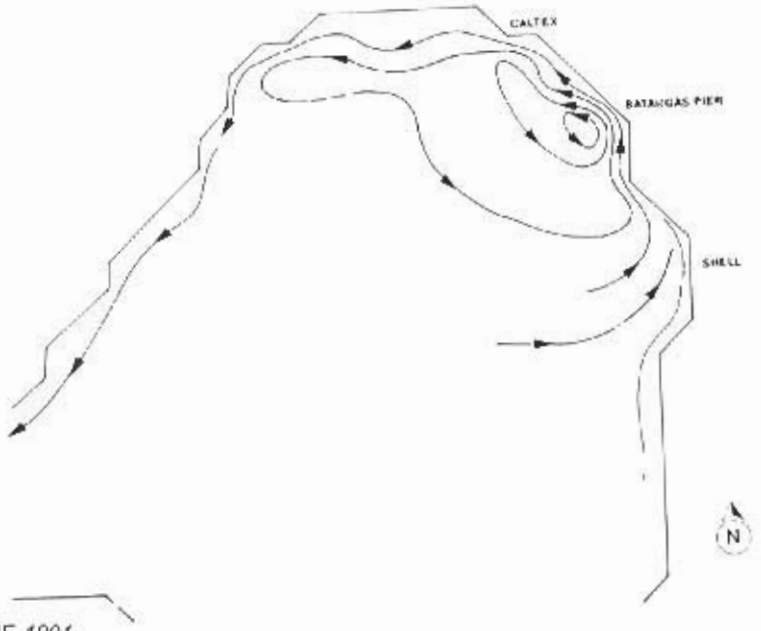
Sources: *UPSRF, 1991.*

Figure 2.12. Predicted circulation pattern in Batangas Bay, with steady southwesterly winds of 5 m/s.



Sources: *UPSRF, 1991.*

Figure 2.13. Predicted circulation pattern in Batangas Bay, with steady easterly winds of 5 m/s.



Sources: UPSRF, 1991.

LAND RESOURCES

Slope Profile

The Batangas Bay Region is generally hilly, with rolling to rough topography. About 45-50 percent of the total land area has slopes above 18 percent. The profile of coastal municipalities, especially of the landward portion, is typified by steep slopes of more than 18 percent, comprising 58 percent of their total land area. The slopes of the interior municipalities are more gentle, with about 62 percent of their total land area below 18 percent slope. The island municipality of Tingloy is also hilly with 86 percent of its area having slopes above 18 percent. Table 2.7 provides a breakdown of the municipalities by type and by slope class.

Slope acts as one of the indicators of soil erosion and sedimentation. Combined with vegetation cover and land use, slope gives an indication of the susceptibility of an area to soil erosion during heavy rainfall. It is also a major consideration in the selection of sites for urban and industrial development.

Soil Erosion

About 76 percent of the total land area of the bay region experience slight to moderate erosion. Of its total area, only 19 percent has no rill or gully erosion. Likewise, a minimal 5 percent of the area is suffering from severe erosion. Figure 2.14 provides the region's erosion profile.

Moderate erosion is taking place in 67 percent of the total land area of coastal municipalities, unlike the low

Table 2.7. Distribution of area (hectares) by slope class, Batangas Bay Region, 1985.

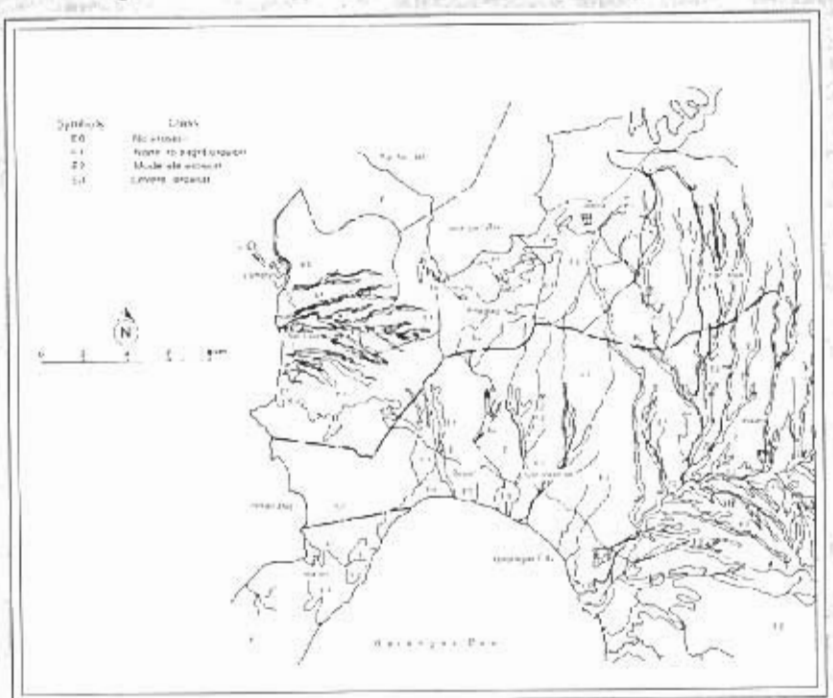
Municipality/ City	A	B	C	D	E	F	Total Area
A. Coastal							
Batangas City	2,492	5,261	2,215	8,029	4,430	5,261	27,687
Bauan	958	1,613	1,073	276	1,070	1,670	6,660
San Pascual	648	663	1,942			243	3,496
Mabini	111		681	173	1,470	1,861	4,296
Subtotal	**4,214**	**7,585**	**5,911**	**8,478**	**6,970**	**9,035**	**42,139**
B. Interior							
Lipa City	3,808	9,648	2,454	156	945	3,630	20,940
Cuenca	556	344	1,915		65	1,161	4 041
Ibaan		7,309				2,591	9,900
Padre Garcia	1,065	7,597				708	9 370
Rosario	7,409	3,753	2,526	2,189	1,195	1,868	18,940
San Jose	82	3,142	1,115			610	4,959
Taysan	535	1,564	1,935	2,378	1,494	2,614	10,940
Lobo	1,501	696		4,271	5,878	6,923	19,269
Alitagtag	1,096	140	760	96		246	2,340
Subtotal	**16,052**	**34,913**	**10,705**	**9,090**	**9,577**	**20,351**	**100,688**
c.Island Municipality Tingloy	438			421	918	1,466	3,243
TOTAL AREA	20,704	42,498	16,616	17,989	17,465	30,852	146,070

Note: The area was computed using a dot grid, based on a 1:50,000 Slope Map of the BSWM.
The total area may exceed the actual total area due to rounding off. The table was derived from the BSWM Slope Map.

Legend:

A	0-3%	Level to gently sloping
B	3-8%	Gently sloping to undulating
C	8-18%	Undulating to rolling
D	18-30%	Rolling to hilly
E	30-50%	Hilly to steeply hilly
F	> 50%	Steeply hilly to mountainous

Figure 2.14. Erosion profile of the Batangas Bay Region.



Source: *BSWM, 1985.*

Legend:

Symbols	Class	Symbols	Class
E0	No erosion	E2	Moderate erosion
E1	None to slight erosion	E3	Severe erosion

percentage of 27 percent in the interior municipalities (*See Table 2.8*). Figure 2.15 shows the distribution of area by erosion class. Although the island municipality of Tingloy is characterized by steep slopes, soil erosion in the area is quite minimal. This may be due to still adequate vegetation cover.

It can be gleaned from Table 2.8 that, among the coastal municipalities, Batangas City contributes significantly to the sedimentation of the bay.

Major Soil Characteristics

This section provides a general summary of the soil characteristics found in the region's coastal and island municipalities. The discussion is based on the United States Department of Agriculture Soil Taxonomy System, taken from the Bureau of Soils and Water Management (BSWM, 1985).

Typic Tropaquepts. These soils are fine clayey, poorly to very poorly drained and found in active tidal flats. Such drainage is attributed to its being saturated with water in most periods of the year. These soils are typically covered with mangroves and nipa or used for brackishwater aquaculture. Surface reaction ranges from 6.0 to 6.6, but subsurface can become more acidic at 5.8. In the bay region, Typic Tropaquepts are found in Batangas City.

Fluventic Ustropepts. These soils are fine loamy with moderately deep to deep and moderate to well-drained alluvia. Soil reaction ranges from 5.8 to 7.0. Many agricultural crops, such as paddy rice, are cultivated in these soils. Fluventic Ustropepts are located in the coastal areas of Bauan, San Pascual, and Batangas City.

Table 2.8. Distribution of area (hectares) by erosion class, Batangas Bay Region, 1985.

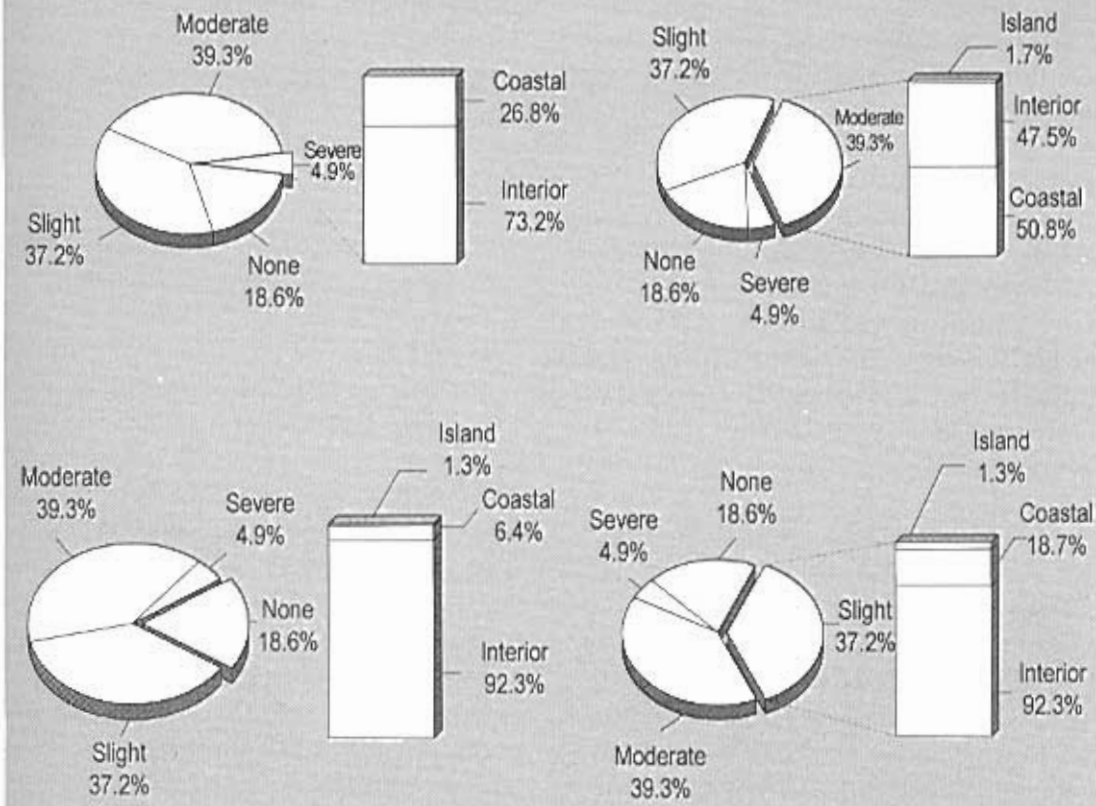
Municipality/ City	None	Slight	Moderate	Severe	Total Area
A. Coastal					
Batangas City	564	4,430	20,765	1,938	27,687
Bauan	828	2,657	3,175		6,660
San Pascual	293	2,880	322		3,495
Mabini	81	343	3,873		4,297
Subtotal	**1,756**	**10,310**	**28,135**	**1,938**	**42,139**
B. Interior					
Lipa City	8,685	8,212	4,043		20,940
Cuenca	63	1,708	1,941	308	4,040
Ibaan		6,977	2,898	24	9,899
Padre Garcia	2,777	5,764	774	55	9,370
Rosario	9,580	4,635	4,725		18,940
San Jose		4,176	625	148	4,949
Taysan	1,748	3,550	5,196	446	10,940
Lobo	2,612	6,437	6,198	4,023	19,270
Alitagtag		1,218	843	279	2,340
Subtotal	**25,485**	**42,677**	**27,243**	**5,283**	**100,688**
C. Island Municipality					
Tingloy	353	2,026	865		3,244
TOTAL AREA	**27,594**	**55,013**	**56,243**	**7,221**	**146,071**

Note: The area was computed using a grid, based on 1:100,000 Erosion Map obtained from the BSWM.

Legend:

	Rills	Gully
None	no rill erosion	no gully erosion
Slight	2-3/100 m	1/100 m
Moderate	4-5/100 m	2-3/100 m
Severe	5/100 m	4/100 m

Figure 2.15. Distribution of area by erosion class.



Source: *Table 2.8.*

Oxic Ustropepts. These are derived from volcanic and sedimentary materials occurring further inland in the bay region. These soils are moderately deep to deep, well-drained fine loamy to fine clayey and colored brown to dark yellowish brown. Soil reaction ranges from 5.3 to 6.5. Typical agricultural crops planted in these soils are sugarcane and coconut, while fallow areas are generally covered with grasses. Oxic Ustropepts are extensive soils in Batangas. In the region, fine loamy types can be seen in Bauan and San Pascual, whereas fine clayey types are located extensively in the Calumpan Peninsula in Mabini.

Lithic Ustropepts. These are very shallow, well-drained clayey soils derived from weathering of volcanic materials. Typical vegetation covers include coconut, fruit trees, and secondary growth forest. Lithic Ustropepts can be found quite extensively in Batangas City.

Lithic Ustorthents. These are very shallow, well-drained soils largely located in upland or hilly landscapes. Soil permeability is low due to clayey texture. Typical crops cultivated in these soils are coconut and tree crops. Fine clayey Lithic Ustorthents are found in Batangas City, while the clayey-skeletal types are seen in

parts of Mabini and Bauan.

Ustropepts-Ustorthents-Eutrandepts Association. This association of the three Great Groups — Ustropepts, Ustorthents, and Eutran-depts -- is extensive in the interior of Batangas City, Lobo, and Taysan. The Ustropepts and Eutrandepts have moderately deep to deep drainage; while Ustorthents are generally well-drained internally and externally. Ustorthents and Ustropepts are generally clayey solid derived from mixed volcanic materials. Eutrandepts are loamy to sandy soils developed from pyroclastic materials.

Crop Suitability. BSWM has conducted crop suitability tests of the various soils in Batangas. Most of the soils that are found in the municipalities of Bauan, San Pascual, and Batangas City are suitable for rice and other agricultural crops. It is necessary, however, to undertake management and conservation measures to improve or maintain soil fertility. On the other hand, soils found in the interior parts of Batangas City and Mabini, including Maricaban Island, are suitable for parks and wildlife reservations. Hence, these areas should be forested with maximum soil conservation measures to minimize erosion and siltation.

FOREST RESOURCES

In Batangas Province, most of the areas are classified as alienable and disposable land. Out of the total land area of 316,581 ha, only 51,162 ha or 16 percent are classified as forest land (Philippine Statistics, 1993). Twelve percent or 6,388 ha of the forest land is situated in the bay region. This represents 13 percent of the total area of the region. Details of the distribution of forest land in the region is presented in Table 2.9.

There is a rapid conversion of forest land to other land uses in the province, resulting in deforestation. Large portions of the forest land are already converted to grassland, upland agriculture, and others. The government has not yet reclassified these areas to reflect the actual use of the land. In the bay region, secondary growth is only observed in Lobo and Malarayat forest reserve. In Bauan, an area of 1,320 ha has been reported by the municipality to contain a man-made forest with plantations of ipil-ipil, nipa, and bamboo. To date, inventory of the forest resources in these areas to determine the present stock of timber and other forest products has not yet been conducted.

Table 2.9. Forest reserves and timberlands in the Batangas Bay Region, 1994.

Municipality	Area(ha)	Classification
Coastal Areas		
Batangas City	123	Timberland
Tingloy	58	Timberland
Bauan	1,320	Timberland
Interior Areas		
Lipa City	1,287	Forest Reserve
Lobo	3,336	Timberland
Rosario	264	Timberland

Reforestation and social forestry projects are being implemented in some areas, but in a limited scale. Under the integrated social forestry program of the government, a project is ongoing in Lobo covering an aggregate area of 500 ha. Tree species, such as narra, mahogany, yemane, and rain tree are being planted to restore the forest cover.

GROUNDWATER RESOURCES

The groundwater resources of Batangas Province had been assessed by the Natural Water Resources Council

(NWRC, 1982) through drilling boreholes in 34 municipalities. The assessment showed that 8 percent fall under shallow well areas, 15 percent in deep well areas, and the rest (77%) in difficult areas. Shallow well are characterized by wells within 20 m below ground surface (mbgs). Much of Batangas City (Poblacion) and the coastal areas of San Pascual and Bauan are under shallow areas. Deep well (greater than 20 mbgs) areas are found in Mabini, western part of Batangas City towards Lobo and portions of Lobo, and most of Tingloy in Maricaban Island. Groundwater sources in difficult areas are limited where groundwater movements occur only through fissures, cracks, and crevices found along fault systems and other geological discontinuities. Thus, non-productive boreholes may be encountered during well drilling. Since most of Batangas Province including the bay region, fall under this category, it is important to conserve groundwater resources by non-indiscriminate quarrying of rocks and conservation of vegetation cover, especially in rocky and hilly areas and along river systems. The projected demand based on the NWRC (1982) study for Batangas is 379.5 million liters per day (lpd) at per capita average of 190 lpd intake in the year 2000. This will consist of 1,120 shallow wells and 580 deep wells in which 11 percent of the project demand will be met by shallow wells, 45 percent by deep wells, and the remaining 44 percent by other sources like springs, rainfall, rivers, etc. For the bay region, the NWRC projection was 143,203 million lpd while recent population projection based on the 1990 census showed a projected demand of 178,174 million lpd. Additional demand from industrial and commercial development will require tapping other sources. Thus, both surface and groundwater resources need to be conserved and managed to minimize water pollution.

MINERAL RESOURCES

The mineral resources of Batangas Province are rather limited. Its major metallic mineral is copper, although commercial operation no longer exists. The Lobo Copper Mine at the Mabilog-na-Bondoc (Lobo) was operated by the Pan Philippine Corporation between 1944 and 1969. From 1966-1969, it produced 604 tons of copper, 47.18 kg of gold and 955.7 kg of silver. What remained as reserves, since the suspension of its operations in 1969, were 177,520 tons of copper ore, containing 0.42 percent copper and 90,720 tons of gold ore, containing 20.57 gram/MT gold (BMGS, 1986).

Nonmetallic minerals are mostly industrial and manufacturing materials, such as guano, phosphate rock, limestone, gypsum, silica, barite, and clay. Guano and phosphate rocks are mined largely from caves. Well-known commercial deposits are in Malabrigo, Lobo. These minerals are used as fertilizers. Minor deposits lie in Laurel and Sta. Cruz in Batangas City.

Limestone, gypsum, and silica are used in the manufacture of cement. Limestone is prevalent in Batangas, while silica is contained in various deposits associated with volcanic rocks in Mabini, Lobo, and Mt. Banog in Calatagan. Gypsum, or hydrous calcium sulphate, is mined in Dulagan, Talahib-Pandayan in Lobo, Solo, and Nagiba in Mabini, and Kawalang and Lipunpun-Pajo, and Talahib Payapa in Batangas City. The combined reserves of the Talahib deposit amount to 333,600 tons at 90 percent calcium sulphate.

Barite is used as a filler and adulterant in glass and in oil-well industries.

In the latter, it is used in drilling mud, serving as a weighing agent to counteract abnormal pressure and sloughing shale. Known deposits are in Mabilogna-Bondoc, Lobo, and are associated with gold and silver ores. Bentonitic clay used in ceramic industries can be found in Mainaga, Mabini, with reserves of 500 tons (1980) and in Luksuhin, Calatagan, at 14 million tons (BMGS, 1986).

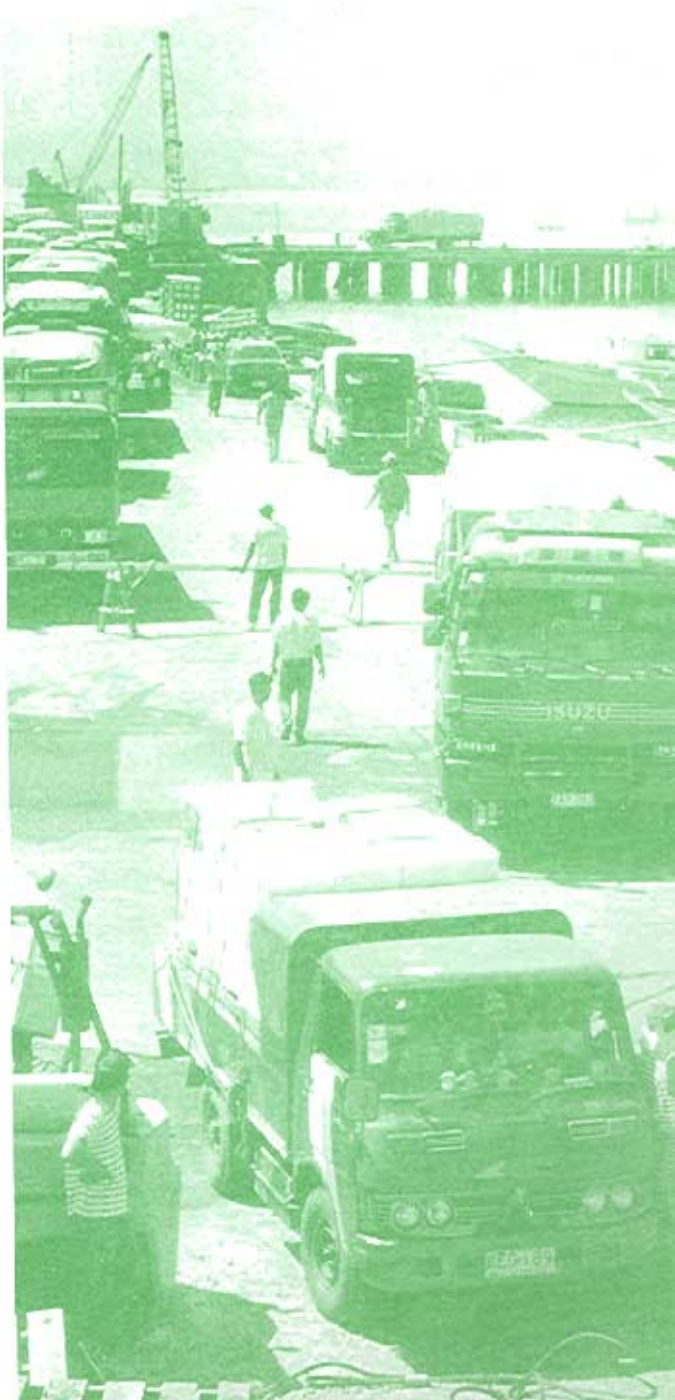
While commercial, large-scale mining is limited in Batangas, there are several medium- to small-scale operations and mining tenements. The Bureau of Mines and Geo-sciences listed a number of mining tenements (mining claims) in the Batangas Bay watershed *(See Table 2.10)*. However, the current status of these tenements is unknown. For example, mining of copper 4 km east of Lobo town took place in 1956 and in 1966, but is now nonoperational for unknown reasons. BMG records show that appreciable amounts of barite and copper with recoverable silver were also mined out of the area.

Table 2.10. Mining tenements (claims) in the Batangas Bay watershed area.

Mineral Resources	Location and No.	Area Applied (Ha)
Andesite	Batangas City - 2	1,668.36
	Lipa City - 1	0.79
	Lobo - 1	0.20
Barite	Lobo - 1	162.00
Basalt	Batangas City - 10	1,955.17
	Lipa City - 2	486.79
	Lobo - 1	0.20
	Mabini - 1	27.00
Copper	Batangas City - 6	15,478.00
	Lobo - 1	6,318.00
	Mabini - 7	2,249.3
	Taysan - 13	13,094.00
Feldspar	Batangas City - 1	162.00
Gold	Batangas City - 1	6,513.41
	Bauan - 1	20.76
	Lobo - 14	13,254.54
	Mabini - 10	4,707.00
	Taysan - 12	12,086.32
Graywacke/sand	Taysan - 4	234.00
Stone	Batangas City - 10	1,169.44
	Mabini - 7	1,133.39
Iron	Taysan - 2	358.00
Lead	Mabini - 1	62.30
Limestone	Batangas City - 10	674.93
	Lobo - 26	1,186.97
	Taysan - 5	234.00
		(141.17 approved)
Mica	Mabini - 1	no date
Pyrite		166.21
Quartz	Batangas City - 3	247.20
	Lobo - 2	81.00
		(166.21 approved)
	Mabini - 3	523.82
	Taysan - 1	45.92
Red Clay	Lipa - 2	162.00
Rock Aggregates	Batangas City - 1	79.19
	Lipa City - 1	8.82
Sand and Gravel	Batangas City - 1	47.49
Shale	Batangas City - 1	20.00
	Lobo - 5	99.93
	Taysan - 4	234.00
Silica	Batangas City - 4	964.30
	Lobo - 1	81.00
	Taysan - 1	364.07
Silica Sand	Lobo - 2	227.00
		(32.00 approved)
Silver	Batangas City - 10	3,433.32
	Lobo - 15	14,185.00
	Mabini - 9	2,249.30
	Taysan - 6	6,307.00
Soil	Mabini - 1	3.01
White Clay	Batangas City - 8	648.00
	Lipa City - 1	81.00
	Mabini - 8	470.61
Zinc	Mabini - 1	324.00

Note: *Their location, numbers of claims, and areas applied are given.*

Land Use Patterns



Chapter 3.
LAND USE PATTERNS

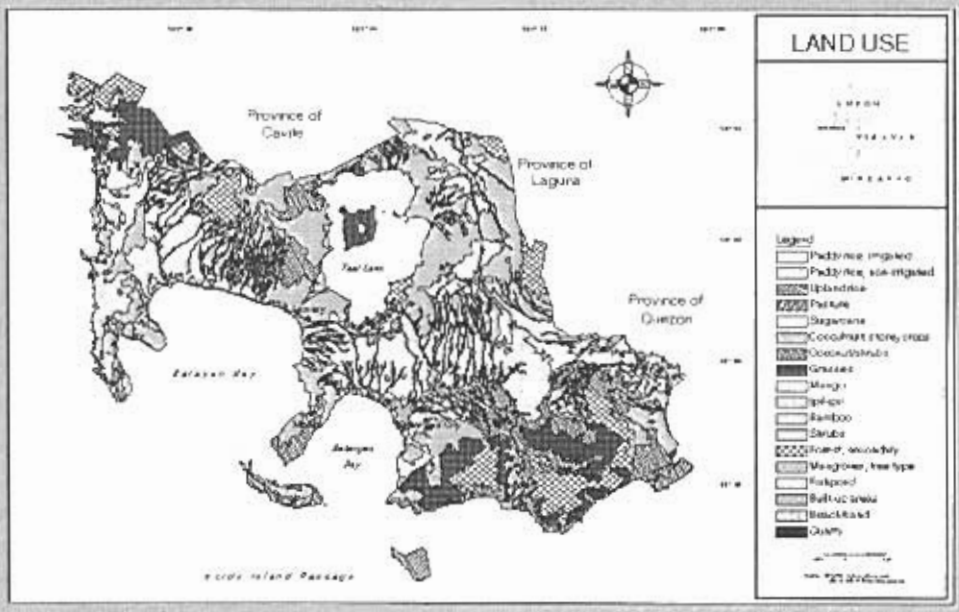
INTRODUCTION

A reconnaissance survey of the Batangas Bay Region revealed that the state of the bay's environmental quality was greatly influenced by the land use activities in its catchment and coastal areas. Thus, land use can serve as a determinant of the health of the bay and the problems it faces with regards to pollution, degradation, and coastal resources depletion.

PRESENT LAND USE

The general land use of the bay region was derived from maps prepared by the Bureau of Soils and Water Management (BSWM), which were based on the 1985 aerial photographs and satellite images with corresponding ground truth. The present general land use map depicts the major land uses in the bay region, namely: grain crops, tree crops, coconut and other crops, grass land/shrub land, forest, wetland, and built-up area (human settlements), as shown in Figure 3.1. The land use presented in this section provides an overview of the general situation in the bay region. Updated data on land use are only available for Batangas City and these are also presented in the last part of this section.

Figure 3.1. General land use map of the Batangas Bay Region, 1985.



Batangas Bay Region

The bay region, including the island municipalities, has a total land area of 146,760 ha. About 61 percent of the bay region's total land area is utilized for various agricultural uses: rice and corn -- 17 percent; coconut -- 20 percent; fruit trees -- 1 percent; and sugarcane -- 23 percent (*Table 3.1 and Figures 3.2, 3.3, and 3.4*). Grasses and shrubs comprise 26 percent, while secondary forests cover about 9 percent. The built-up area in the bay region is only about 3 percent.

Tables 3.1a and 3.1b also provide a breakdown of specific agricultural and nonagricultural land uses in the region by municipal level of data aggregation. A summary of general land use in the bay region is provided in Table 3.2. Figures 3.2, 3.3, and 3.4 show the distribution of agricultural and nonagricultural land uses, respectively. Of the total land area utilized for agricultural uses, coconut in combination with other crops cover about 30 percent; sugarcane, 38 percent; fishponds, 1 percent; upland rice, 14 percent; nonirrigated paddy rice, 12 percent; banana and atis, 1 percent; and corn, 2 percent. Of the total land area utilized for nonagricultural uses, about 31 percent is shrub lands, 25 percent grasslands, 23 percent secondary forest, 11 percent bamboo, 8 percent built-up areas, and 1 percent river/river bed.

Coastal Municipalities

In 1985, 43 percent of the total land area of the four coastal municipalities (Batangas City, Bauan, Mabini, and San Pascual) was covered with grasses and shrubs. Built-up areas accounted for only 6 percent or about 2,865 ha. Since 1985, the extent of built-up areas might have increased; but no reliable estimates are available. Fishponds originally occupied 431 ha (as of the 1985 survey); but this number has now dwindled to less than a hundred hectares. All the fishponds are located in the rapidly industrializing Batangas City. Rice, corn, coconut, fruit trees, and sugarcane accounted for an aggregate area of 21,492 ha or about 45 percent of the total land area of the four municipalities. The coastal municipalities apparently have depleted forest cover, with an estimated 4 percent left.

The coastline of Batangas Bay is presently being utilized for various purposes. The strip of coastal lands within Batangas City supports various uses, including ports/piers, fishponds, industries, residential/commercial establishments, and agriculture. Squatter colonies can also be found in the area. Land use in Bauan and Mabini follows the same pattern, except that these two municipalities have also tourism and recreational land uses. San Pascual occupies only a small coastal strip whose land use is basically settlements and industries.

Presently, there are about 19 ports, located along the Batangas Bay coast (*See Table 3.3*), three of which are government-owned. The government-owned ports are the Ports of Mainaga, Bauan, and Batangas; while the privately-owned ports include the following: Philippine National Oil Company (PNOC) Energy Supply Base, Atlantic Gulf and Pacific Babcock (Hitachi), Engineering Equipment, Inc., Batangas Bay Terminal, Inc., Keppel Philippines, PNOC Marine Corp., AG&P Batangas Marine Fabrication Yard, Caltex Refinery, Caltex Shipway, PNOC Shipping and Transport Corp., Shell Refinery, National Food Authority, Purefoods Flour Mills, Pacific Flour Mills, and Himmel Industries.

Table 3.1a. Distribution of area (hectares) by agricultural land-use, Batangas Bay Region, 1985.

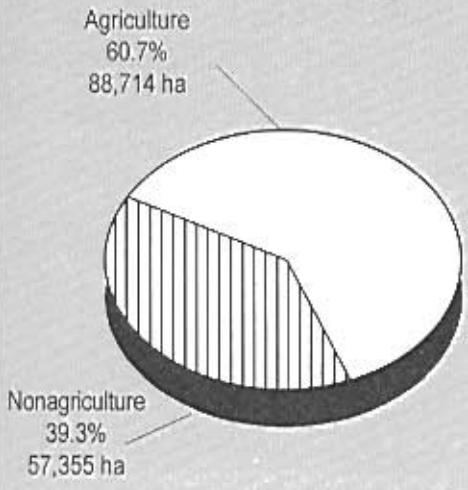
Municipality/ City	Non-Irrigated Paddy Rice	Upland Rice	Corn	Banana	Atis	Sugar Cane	Coconut (mono-crop)	Coconut (multi-storey)	Coconut banana	Coconut shrubs	Fish-pond	TOTAL AGRI-CULTURAL AREA
A. Coastal												
Batangas City	138	2,215	138	111		6,368	28	28		1,689	498	11,213
Bauan	345	329	52	26	9	2,324		250		65		3,400
San Pascual	42	285	57	16		2,505						2,905
Mabini	32	66			227		194	68		1,697		2,284
Subtotal	**557**	**2,895**	**247**	**153**	**236**	**11,197**	**222**	**346**	**0**	**3,451**	**498**	**19,802**
B. Interior												
Lipa City		1,712	662	72		4,556	195	8 156				15,353
Cuenca		519	82	7		1,053		832		148		2,641
Ibaan		1 026	134	131		5,965	9					7,265
Padre Garcia	1,150	1 411	660	34		4,264	305	608	146			8,578
Rosario	6,806	1,302	265	93		2,898	114	269	2,349	677		14,773
San Jose		257	62	27		1,591	16	2,373				4,326
Taysan	1,587	2,804		51		989	69			1,177		6,677
Lobo	307	109					2,062			3,332		5,810
Alitagtag		567	92	331		1,118						2,108
Subtotal	**9,850**	**9,707**	**1,957**	**746**	**0**	**22,434**	**2,770**	**12,238**	**2,495**	**5,334**	**0**	**67,531**
C. Island Municipality												
Tingloy		234		72						1,075		1,381
TOTAL AREA	**10,407**	**12,836**	**2,204**	**971**	**236**	**33,631**	**2,992**	**12,584**	**2,495**	**9,860**	**498**	**88,714**

Note: *Area was computed using a dot grid, based on 1:50,000 Present Land-use Map from BSWM*

Table 3.1b. Distribution of area (hectares) by nonagricultural land-use, Batangas Bay Region, 1985.									
Municipality/ City	Grasses	Bamboo	Shrubs	Secondary Forest	Built-up	River/ River Bed	Quarry	TOTAL NONAGRI-CULTURAL AREA	GRAND TOTAL
A. Coastal									
Batangas City	6,091	1,107	5,814	1,661	1,662	138		16,473	27,686
Bauan	266	305	2,216		437	37		3,261	6,661
San Pascual		184	95		287	22		588	3,493
Mabini	374		1,492		147			2,013	4,297
Subtotal	**6,731**	**1,596**	**9,617**	**1,661**	**2,533**	**197**		**22,335**	**42,137**
B. Interior									
Lipa City	125	833	451	2,998	933	100	147	5,587	20,940
Cuenca	50	227	49	782	281	10		1,399	4,040
Ibaan		1,527	790		134	184		2,635	9,900
Padre Garcia		410	212		121	50		793	9,371
Rosario	382	1,074	2,049	439	92	130		4,166	18,939
San Jose		311	160		115	38		624	4,950
Taysan	1,672	584	1,320	407	76	70	134	4,263	10,940
Lobo	4,760		1,867	6,760	73			13,460	19,270
Alitagtag			18		215			233	2,341
Subtotal	**6,989**	**4,966**	**6,916**	**11,386**	**2,040**	**582**	**281**	**33,160**	**100,691**
C. Island Municipality Tingloy	505		1,355					1,860	3,241
TOTAL AREA	**14,224**	**6,562**	**17,888**	**13,047**	**4,573**	**779**	**281**	**57,354**	**146,069**

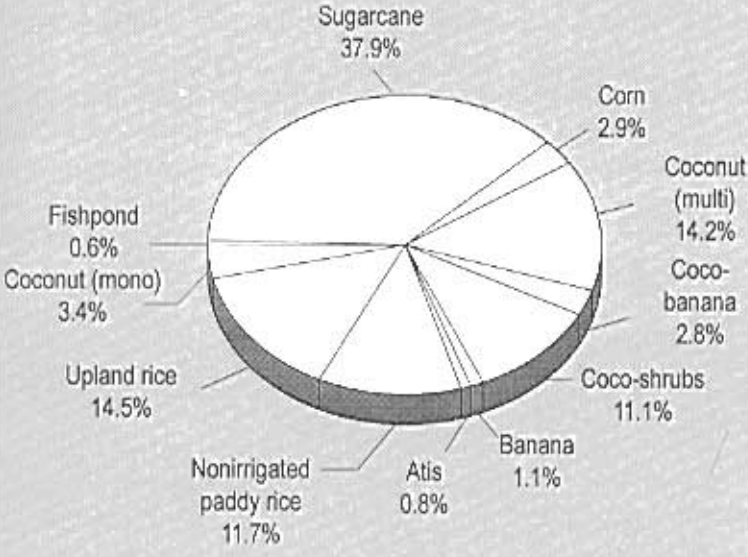
Note: *Area was computed using a dot grid, based on 1:50,000 Present Land-use Map from BSWM.*

Figure 3.2. Present land use, 1985.



Source: Table 3.1.

Figure 3.3. Distribution of area by present land use, 1985.



Source: Table 3.1.

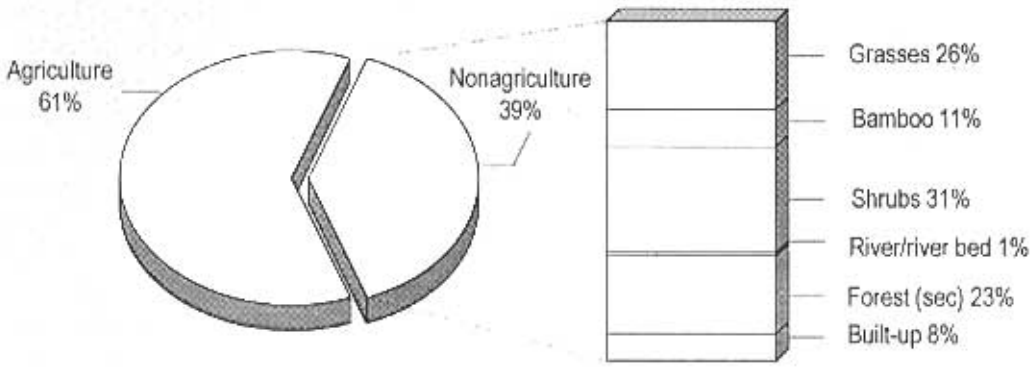
percent of the total area of the coastal municipalities. Many of the commercial and industrial establishments located along the Batangas Bay area are within Batangas City, which is the only one with an updated, complete, and reliable land use plan. Being a rapidly urbanizing area and the biggest in terms of land size, it is important to closely examine the present land use allocation of the city. Based on its 1993 land use classification, the city has about 23 percent of its total land area composed of the following: residential -- 1,995 ha (7%); commercial -- 509 ha (2%); industrial — 3,036 ha (11%); institutional -- 367 ha (1%); parks/open spaces/cemetery -- 200 ha (1%); and infrastructure -- 420 ha (2%). The city's built-up area has doubled since 1981, reflecting a rapid pace of urbanization which led to encroachment in some paddy rice fields and coastal lands.

Agricultural lands, which now stand at 49 percent (13,447 ha), recorded a reduction of about 20 percent from its 1981 figure. Conscious of maintaining ecological balance, the city has allotted 26 percent of its total area for forestry use. However, half of this allotted area is presently denuded and mostly covered with cogon, patches of trees, and agricultural crops.

1. *Batangas City.* Batangas City is the largest municipality in terms of area among the four coastal municipalities along Batangas Bay. The total land area is 27,687 ha, comprising 66

2. *Bauan.* Bauan's land use is dominated by sugarcane and shrubs occupying 33.5 percent and 33.2 percent, respectively, or 6,661 ha of its to-

Figure 3.4. Present land use, 1995.



Source: *Table 3.1.*

Table 3.2. Summary of Land Use, Batangas Bay Region, 1985.

Land Use	Coastal	Interior	Island	Region
Rice and corn	9	22	7	17
Coconut	9	23	33	20
Fruit trees	1	1	2	4
Sugarcane	26	22	0	23
Fishpond	1	0	0	0.003
Grasses and shrubs	43	18	57	26
Secondary forest	4	11	0	9
Built-up area	6	2	0	3
River/river bed	1	1	0	0.003

Source: *BSWM 1985 land-use map*

	Total Area (Hectares)
Coastal municipalities:	42,137
Interior municipalities:	100,691
Island municipality:	3,241
Total Bay Region	146,069

tal land area (BSMW, 1985). Other agricultural crops planted in the area include rice (674 ha), corn (52 ha), banana (26 ha), and coconut (250 ha) (*See Table 3.1*). In 1985, about 437 ha were reported to be occupied by settlements and infrastructure.

3. Mabini. About 53 percent of the total land area of Mabini is agricultural, with coconut as the most dominant crop. Other crops in the area include rice (98 ha) and atis (227 ha). The most dominant nonagricultural vegetation cover in Mabini is shrubs, comprising about 33 percent of its total land area of 4,297 ha.

4. San Pascual. San Pascual is predominantly an agricultural area.

Table 3.3. Ports of the Batangas Bay Region, 1994.		
Name of Port	Location	Ownership
1. Port of Batangas	Sta. Clara, Batangas City	National Government
2. Terminal of Bauan	Aplaya, Bauan	Municipal Government
3. AG & P (BMFY)	San Roque, Bauan	Private
4. AG & P (Pole Creosoting)	San Roque, Bauan	Private
5. Batangas Bay Terminal	Bolo, Bauan	Private
6. Caltex Philippines	Danglayan, San Pascual	Private
7. Engineering Equipment, Inc.	Sta. Maria, Bauan	Private
8. Himmel Industries	Pinamucan, Batangas City	Private
9. Keppel-Philippines Shipyard	San Miguel, Bauan	Private
10. LMG Chemicals	Poblacion, San Pascual	Private
11. National Food Authority	Tabangao, Batangas City	Provincial Government
12. Pacific Flour Mill	Tabangao, Batangas City	Private
13. Pilipinas Shell Petroleum Co.	Tabangao, Batangas City	Private
14. PNOC Coal Authority	Tabangao, Batangas City	Private
15. PNOC Dockyard and Engineering Corp.	San Miguel, Bauan	Private
16. PNOC Energy Supply Base	Mainaga, Mabini	Private
17. PNOC Shipyard and Transport Co.	Danglayan, San Pascual	Private
18. Purefoods Flour Mills	Bulacan, Mabini	Private
19. United Coconut Chemicals, Inc.	Aplaya, Bauan	Private

Source: *OPPDC, 1991.*

About 83 percent of its total land area of 3,493 ha is planted with various crops, such as rice, corn, banana, and sugarcane. Seventy-one percent of its agricultural area is sugarcane plantation. Like the municipalities of Bauan and Mabini, San Pascual does not have any forest cover. Its built-up area as of 1985 was estimated to be about 287 ha (*See Table 3.1*).

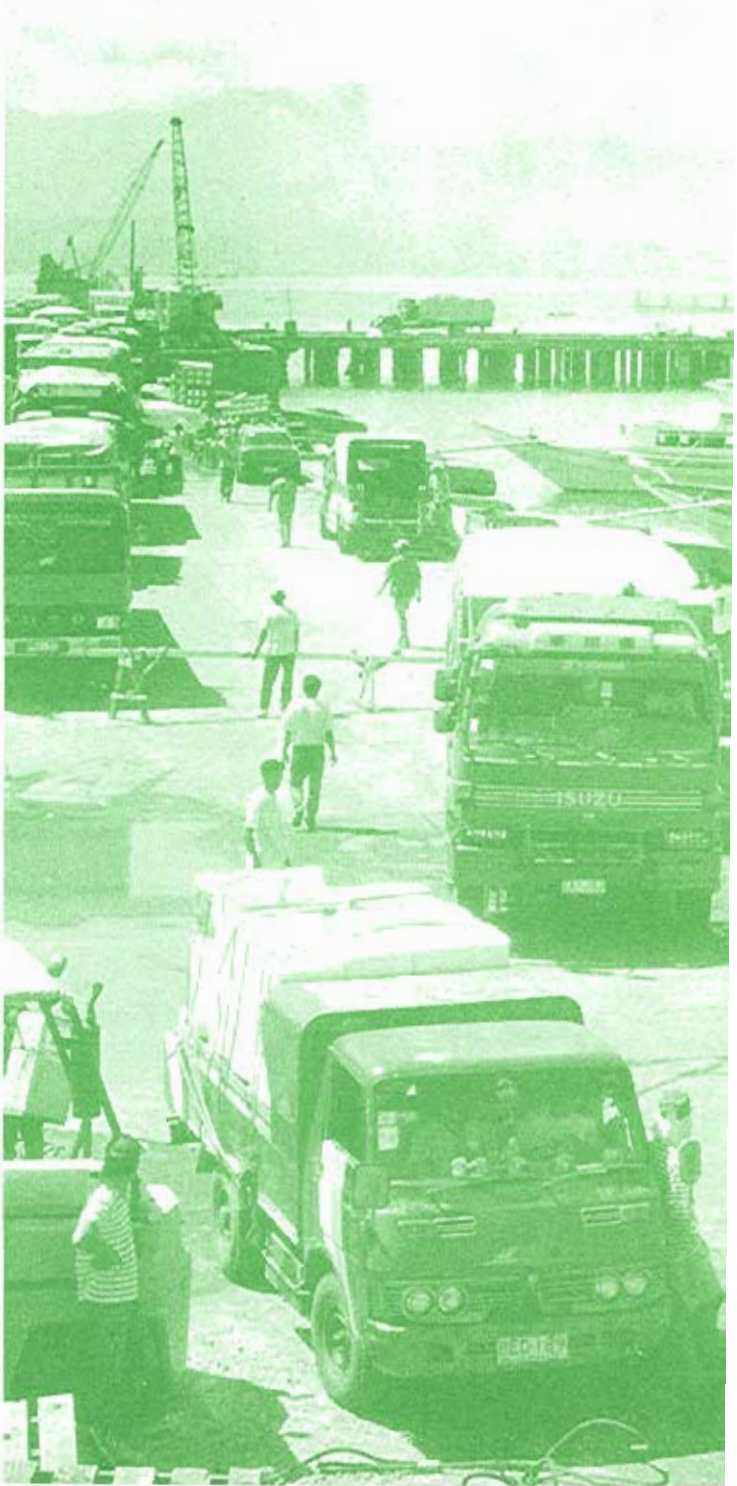
Interior Municipalities

A large portion (68%) of the land located in the interior municipalities of the bay region is used for agricultural purposes. The total area occupied by grasses and shrubs is about 18 percent or 18,124 ha. Secondary forest was reported to be about 11 percent of the total land area; but this might have decreased considerably at present. Conversely, the built-up area of only 2 percent (2,000 ha) in 1985 might also have expanded since then. The absence of updated survey data (aerial photographs and satellite imageries) made it difficult to make estimates of existing built-up areas in the interior municipalities of the bay region.

Island Municipality: *Tingloy*

Tingloy is located in Maricaban Island, with a total area of 3,240 ha. Fifty-seven percent of the island is covered with grasses and shrubs and the rest (43%) is agricultural. Agricultural land comprises the following crops: coconut, rice, corn, and fruit trees (*See Table 3.2*). There is no forest cover and a very small built-up area.

Coastal Resources and Water-use Patterns



Chapter 4.
COASTAL RESOURCES AND WATER-USE PATTERNS

INTRODUCTION

The coastal resources in the Batangas Bay Region are limited. Mangroves exist but are very patchy and found mostly in the islands. There is no reliable estimate of mangrove cover in the bay region. Coral reefs, on the other hand, are relatively abundant, especially in the island of Maricaban. Coral reefs and fisheries are the bay region's most important coastal natural resources.

In terms of water-use, fishing and shipping are the primary sectors in the Batangas Bay, followed by coastal tourism and brackishwater aquaculture. At present, the bay is also the dumping area for some of the domestic and industrial wastes generated within the region. It is also being used as a source of industrial cooling/heating water. About 15,000 m^3 to 22,500 m^3 of seawater per day is being used for such purpose by the Shell Refinery at Tabangao, Batangas City. Figure 4.1 shows the general zonation of water use for Batangas Bay. This zonation is based on the assessment of current activities operating within the bay.

CORAL REEFS

Coral reefs occur in the western and southwestern parts of Batangas Bay and in Maricaban Strait where stronger currents prevent heavy siltation. The southwestern coasts are in the vicinity of Mabini and Tingloy (including Sombrero Island). The coral reefs of the southwestern part of the Bay along the Calumpan Peninsula is contiguous with those on the Balayan Bay side. Figure 4.2 shows the coralline areas of Batangas Bay.

Figure 4.1. General zonation of water uses of Batangas Bay.

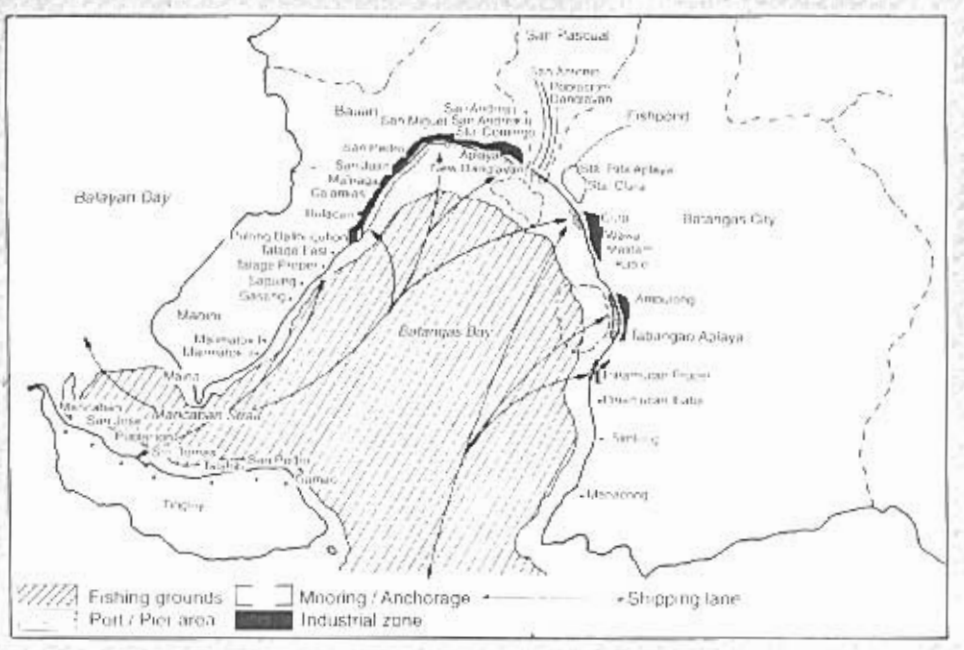
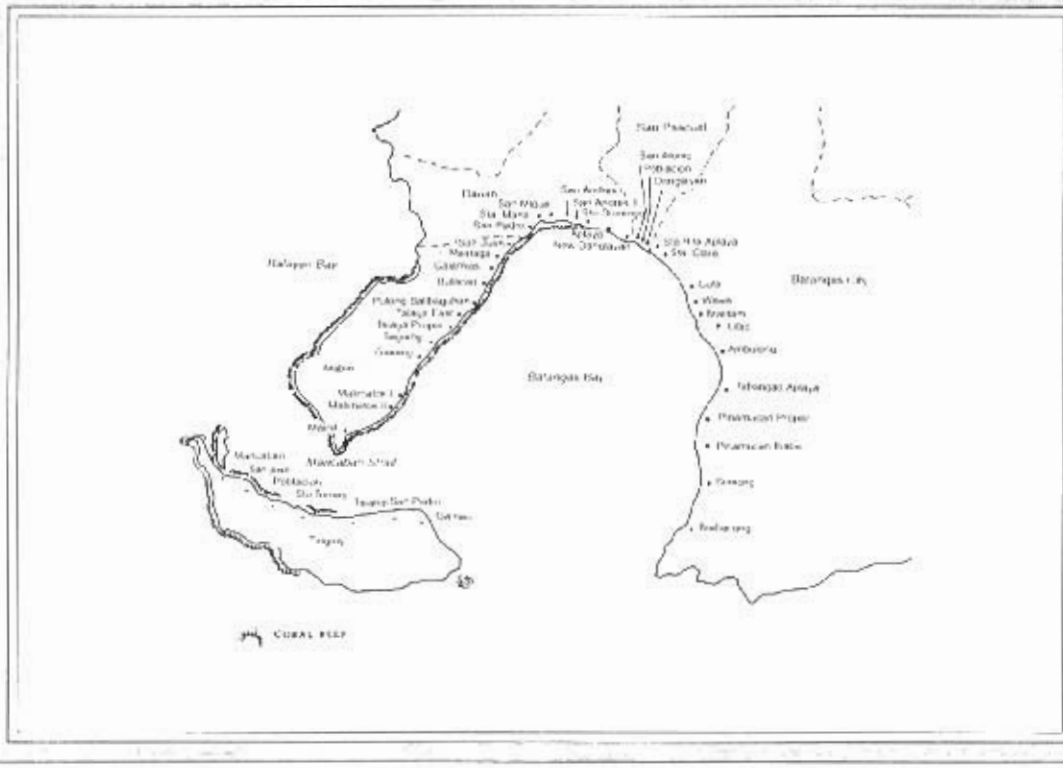


Figure 4.2. Coralline areas of Batangas Bay.



According to Gomez (1990), a survey made in 1981 showed that live coral cover in Batangas was 24 percent good, 44 percent fair, and 32 percent poor. This survey appeared to cover only the Balayan Bay. About 10 years later in 1991, live coral cover showed 37.1 percent good, 40 percent fair, and 22.9 percent poor, which indicated some marked improvement. Balayan Bay has a number of resorts that cater to SCUBA diving. The benefit of tourist activity of this type complemented the ordinances enacted by the municipal government of Mabini against the destruction of coral reefs. These might have contributed to the improvement of the coral cover.

Corals and Reef Fishes of Napayong Point, Batangas City

Napayong Point is at the southeastern part of Batangas Bay. From UPSRF (1991), 19 genera have been identified. The largest and dominant is *Acropora* followed by *Porites*. Soft coral constituted 10 percent, indicating that the area is subject to frequent physical disturbance from waves and currents. The other components of the coral community at Napayong Point were algae (8.33%), sponges (2.19%), and zoanthids (0.42%).

Thirty-nine species (39%) of reef fishes have been identified with *Anthias mortonii* as the dominant species, followed by *Cirrhilabrus cyanopleura*. The most represented fish groups were the damsel fishes (*Pomacentridae*) and the wrasses (*Labridae*). Table 4.1 shows the relative abundance of reef fishes at Napayong Point. The presence of butterfly fishes (*Chaetodontidae*) suggests poor hard coral cover. Commercially important fish species were absent during the survey at Napayong Point.

Table 4.1. Reef fishes and their abundance observed at Napayong Point	
Taxon	Abundance
Family Acanthuridae (surgeon fishes)	
Ctenochaetus striatus	3
C. binotatus	2
Naso lituratus	1
Zebrasoma scopas	1
Family Apogonidae (Cardinal fishes)	
Apogonids (juveniles)	20
Cheilodipterus quinquelineatus	3
Family Chaetodontidae (butterfly fishes)	
Chaetodon kleinii	4
C. trifascialis	1
Family Cirrhitidae (hawk fishes)	
Cirrhichthys falco	2
Family Labridae (wrasses)	
Cheilinus diagrammus	1
Cirrhilabrus cyanopleura	40
C. temminchi	15
Hemigymnus fasciatus	23
Labroides dimidiatus	8
Macropharyngodon meleagris	1
Thallasoma lunare	2
Family Mugiloidadae (sand perches)	
Parapercis cephalopunctata	1
P. cyclophthalma	2
P. cylindrica	1
P. polypthalma	1
P. tetracantha	2
Family Mullidae (goat fishes)	
Parupeneus barberinoides	1
P. barberinus	1
Family Nemiptendae (threadfin bream)	
Scolopsis bilineatus	6
S. cancellatus	1
Family Ostraciontidae (box fishes)	
Ostracion cubicus	1
Family Pomacanthidae (angel fishes)	
Centropyge bicolor	2
C. urolichii	2
Family Pomacentridae (damsel fishes)	
Abudefduf vaigiensis	4
Dascyllus trimaculatus	18
D. reticulatus	12
Glyphidodontops rex	1
Pomacentrus amboinensis	3
P. vaiuli	2
Paraglyphidodon nigrosis	4
Family Serranidae (sea basses/groupers)	
Anthias mortonii	185
A. squammipinnus	2
Family Synodontidae (lizard fishes)	
Saurida gracilis	4

Coral Reefs of Sombrero Island

Sombrero Island lies on the northwestern part of Maricaban Island. Its corals, assessed by McManus et al. (1981), consisted of 40 genera in 90 classes and occupied about 25 percent of the area around the island. Less than two-thirds of the genera (64%) belonged to the top 10 classes. The most dominant species was *Acropora* in its arborescent (18%) and corymbose (13%) forms. At shallower depth to 10 m, corals consisted of the following: arborescent *Acropora* (27%), corymbose *Acropora* (15%), caepitose *Pocillopora* (8%), massive *Porites* (7%), caepitose *Acropora* (7%), and 11 other genera (1-5%). Beyond 10 m depth, the major corals were corymbose *Acropora* (10%), encrusting *Montipora* (9%), massive *Porites* (8%), massive *Pachyseris* (6%), and en-crusting *Porites* (6%).

There are three dominant fishes associated with corals in the Sombrero Island. These were *Pomacentrus brachialis, Anthias squamipinnis* (26%), and *A. mortoni* (14%). At 10 m depth and shallower, the dominant species were *A. mortoni, A. squamipinnis,* and *Pomacentrus brachialis;* while at over 10 m depth and steeper slopes, *A. squamipinnis* is the most dominant species.

CAPTURE FISHERIES

There are two fishing sectors within the Batangas Bay region: municipal and commercial fisheries. The first sector refers to fishing within the municipal waters which is a 15-km zone from the shore with boats of three gross tons or less and using passive or less mobile fishing gear types. This sector also includes fishing activities without the use of boats, like trapping, fry gathering with scissor nets, and other passive or non-mobile gear types. Municipal fishing gear types are the following: drift gill net, set gill net, hook and line (single or multiple hooks), scissor net (*salap* - fine mesh or *sakag* - bigger mesh size), and spear. The scissor nets are used for catching anchovy of various sizes. On the other hand, commercial fisheries involve fishing beyond the municipal waters with boats of more than three gross tons, using highly mobile gear types. Purse-seining operations used to occur in Batangas Bay some ten years ago; but now, commercial fishing operations use mainly the bagnet or *basnig*. There are 31 commercial boats based in the region, of which 30 are from Batangas City and 1 from Bauan. Not all of them are operating exclusively in the Batangas Bay.

Under Republic Act 7160, known as the Local Government Code, the territorial waters of the municipal governments have been enlarged from three nautical miles (5.56 km) to 15 km from the shore. As a result, the whole of Batangas Bay is effectively classified as municipal waters under the jurisdiction of the local governments of Mabini, Bauan, San Pascual, Batangas City, and Tingloy. Thus,

Table 4.2. Local and scientific names of fishes caught by fisherfolk in Batangas Bay.

English/Local Name	Scientific Name	Family
Scad/*galunggong*	*Decapterus sp*	Scombridae
Anchovy/*dilis*	*Stolophorus sp.*	Engraulidae
Alumahan	*Rastrelliger sp.*	Scombridae
Tambakol	*Kishinouella tonggol*	Thunnidae
Gulyasan	*Thunnus obesus*	Thunnidae
Yellowfin tuna	*Neothunnus macropterus*	Thunnidae
Frigate tuna/*tulingan*	*Auxis sp.*	Thunnidae
Skipjack	*Katsuwonus pelamis*	Thunnidae
Spanish mackerel/*tanguigui*	*Scomberomerus sp.*	Scombridae
Slipmouth/*sapsap*	*Leiognathus sp.*	Leiognathidae
Cavalla/*talakitok*	*Caranx sp.*	Carangidae
Caesio	*Caesio sp.*	Caesionidae
Grouper/*lapu-lapu*	*Epinephelus sp.*	Serranidae
Barracuda	*Sphyraena sp.*	Sphyraenidae
Mullet	*Mugil sp.*	Mugilidae
Threadfin bream/*bisugo*	*Nemipterus sp.*	Nemipteridae
Moonfish	*Mene maculata*	Menidae
Sardine	*Sardinella sp.*	Clupeidae
Round herring	*Dussumieria sp.*	Dussumieriidae
Torsillo	*Sillago sp*	Sillaginidae

Source: *Office of the Provincial Agriculturist, Batangas Province, n.d.*

commercial fishing operations are banned in Batangas Bay. However, commercial fisheries have often encroached on the operational areas of the municipal fisheries, generating resource use conflicts between the two sectors and intensifying exploitation of stocks. Except for San Pascual which has the shortest coastline, the rest of the coastal municipalities operate commercial fishing fleets.

Fish Production and Trend

In 1993, municipal fish production in Batangas Bay, excluding Tingloy, was 3,634 MT of which 1,864 MT came from motorized fishing boats and 1,770 MT from non-motorized fishing boats with estimated value at 181.7 million pesos. The major species landed by the municipal fishing boats are shown in Table 4.2. For commercial fisheries, the 1993 catch that landed in Wawa, Batangas, was 184 MT. Fish caught for home consumption by the fisherfolks was not well-documented. However, estimate based on per-family fish consumption (30 kg per fishing family/month) is about 1,561 MT per year which is about half of the catch in 1993.

There appears to be some decline in the catches of certain species landed by municipal fishers in Sto. Domingo, Bauan, and Tabangao, Batangas City. Slipmouth and anchovy showed low catch in 1993, as compared to 1992. This decline, however, could be attributed to seasonal variations. Longer time series analysis is required to establish whether the species are indeed declining. The municipal fishing's peak season is October to May, especially in the municipality of Mabini. The lean period is from June to September, coinciding with the southwest monsoon where incremental conditions at sea make fishing difficult.

Table 4.3. Quantity of commercial fish landed in Batangas City.

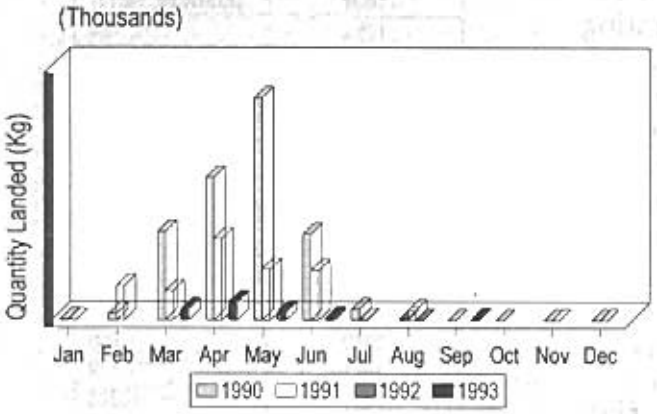
Year	Quantity (MT)
1993	184
1992	--
1991	625
1990	1,348
1989	--
1988	--
1987	1,112
1986	1,782
1985	1,687
1984	1,556
1983	1,565
1982	1,750
1981	7,589
1980	8,028
1979	8,231
1978	6,764
1977	7,270
1976	2,048

Sources: Fisheries Statistics of the Philippines, BFAR (1976-87) and Bureau of Agricultural Statistics, Batangas City (1990-93).

Commercial fish catch also showed some decline as shown in Table 4.3. Some species caught by this sector showed seasonal variability, such as frigate tuna *(See Figure 4.3)* and round scad *(See Figure 4.4)*. However, some of the fishes were caught not from the Batangas Bay, but off Mindoro and Lobo (Batangas) waters.

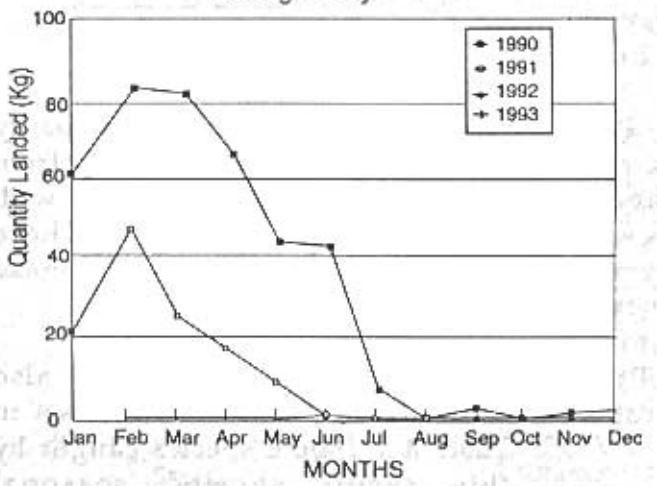
Overall, fish landings in the Batangas Bay area included catches from waters outside the bay by both sectors. Also, some municipal catches were landed in Calaca in Balayan Bay, usually by fishers from

Figure 4.3. Frigate tuna landed at Wawa, Batangas City.



Source: 1990-1993 BAS Data (Commercial Fisheries).

Figure 4.4. Round scad landed at Wawa, Batangas City.



Source: 1990-1993 BAS Data (Commercial Fisheries).

that area. Thus, it is difficult to determine the actual catch from the bay, given existing statistics. There is a need to undertake a comprehensive survey to assess this issue. Apart from those catches earmarked for the market, fishes caught for home consumption must be assessed in order to provide an overall picture of fish production from the bay region.

The pollution impact on the fisheries resources of Batangas Bay has not been assessed. Despite the presence of many large industries, growing urban centers and increasing shipping activities, the level of pollution in the bay appears to have little observable effects on the fisheries resources; but perhaps this is masked by the impact of resource use conflicts.

Fishing Communities and Fishing Pressure

The municipal fishery is an important economic sector in the region. About 70 percent of the municipal fisherfolks are working full-time. The remaining 30 percent have seasonal employment, such as carpentry and masonry. As of 1994, there were 8,965 fisherfolks in the bay region, distributed as follows:

Municipality	No. of Municipal Fisherfolk
Tingloy	1,708
Bauan	3,130
Mabini	875
Batangas City	3,252
Total	**8,965**

The lower number of Tingloy fisherfolks may be attributed to its small population and isolation. In the case of Mabini, the low figure may have been due to shift to overseas contract work.

Fishing boats and gears are usually owned by the fisherfolks themselves with capital generally coming from informal sources like relatives, as well as from their savings. For a drift gill net operation in Maricaban, having a crew of four, including the boat owner, will have an average income of ₱ 4,000/month for the owner and ₱ 1,333/month for each crew member over a period of six months. These estimates were based on an average catch of 10 kg per fishing trip and 20 fishing trips/month and catch sold at ₱ 40/kg. For *sakag/salap* operation of anchovy, a fisherfolk can earn about ₱ 6,000/month but only for four months within the year. Among the Calaca set gill net operators (usually two crews), each can earn about ₱ 22,500/month but for three months only within the year. Thus, the seasonality of fishing results in occupational pluralism among fisherfolks.

For the commercial fisheries, there are about 392 fisherfolks of which 19 are in Bauan, 85 in Tingloy, and the rest from Batangas City. An estimated 3 percent of the region's coastal population is dependent on commercial fishing for livelihood.

In the absence of stock assessment data, the number of fisherfolks or fishing boats relative to the fishing ground area may be used as an indicator of fishing pressure or intensity. Within the Batangas Bay, there were 41 fisherfolks and 12 fishing boats per 1 km^2 of fishing ground, respectively. Considering that the Batangas Bay and the adjacent waters within the bay region have a surface area of less than 230 km^2, such concentration of fisherfolks or boats is indicative of heavy fishing pressure. In contrast, in Lingayen Gulf which has an area of about 2,100 km^2, the proportions are 13 fisherfolks and 7 fishing boats per 1 km^2 of fishing ground, respectively. Lingayen Gulf is already overexploited. However, the comparison between the two areas does not necessarily imply that Batangas Bay has a higher exploitation rate. Assessment must be done through a proper survey.

Fry Gathering

Fry gathering is a small-scale component of the municipal fisheries and is seasonal in the Batangas Bay. The commonly caught fry of commercial value are those of milkfish (*Chanos chanos*) and tiger shrimp (*Penaeus monodon*) which are both abundant from March to August. Women and children are usually the ones gathering the fry, using skimming nets in the shallow portions of the coast (UPSRF, 1991). In recent years, the catch has been declining and, since 1994, the fry industry in the Batangas Bay has almost become nonexistent. Traders are now getting fry from other areas, like Lobo, which is outside the bay waters.

Illegal Fishing Activities

Illegal fishing activities, such as the use of explosives and cyanide, occur within the vicinity of the Batangas Bay, particularly around Maricaban Island and parts of Mabini, usually in the coralline areas. Cyanide is used in catching aquarium fishes in coralline areas while explosives are used for catching fishes for food. On the other hand, the use of fine-meshed nets are widespread around the bay. Fine-meshed gill nets and push nets are used for squid and *salap* for fry of anchovy (*dulong*). Set gill nets are used to catch sardines and frigate tuna. Efforts to curb illegal fishing, including the enactment of regulations to the effect, have reduced such an activity, but it is not entirely eliminated and this is being ascribed as the major cause of decline in

fish stocks. Information on illegal fishing activities is scant. Research is needed to assess the impact of illegal fishing on the fisheries of the bay and the coastal communities.

Fish Trading and Marketing

The marketing of fish landed in Batangas Bay is largely for local consumption (within Batangas Province). Those landed in Batangas City are usually sold in nearby areas, including Lipa City in the north. It is only when there is a supply glut that those landed in Batangas City are transported to Metro Manila. Fish caught are sold both to retailers and wholesalers. Usually, the shares of fishing crews are sold to retailers. On the whole, the trading of fish in Batangas City has involved a limited number of middlemen and, thus, fish sold is cheaper than in Metro Manila.

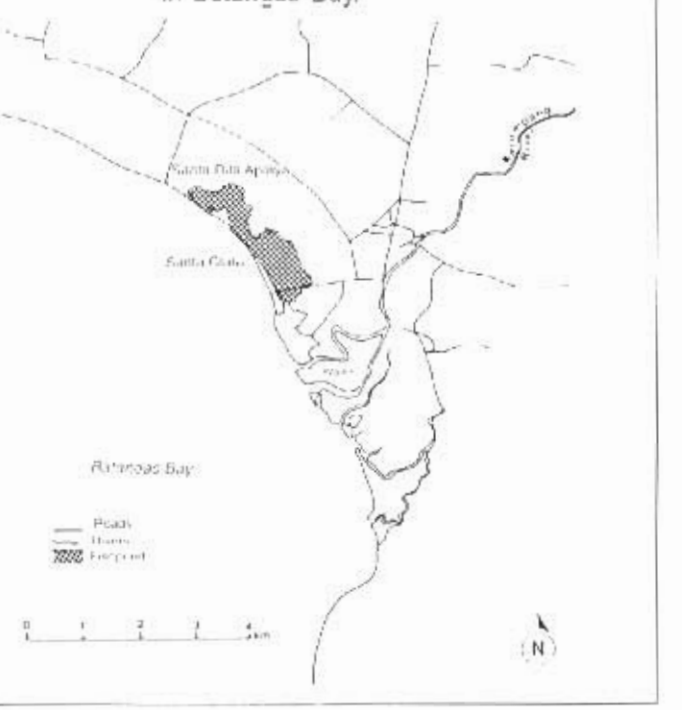
BRACKISHWATER AQUACULTURE

Brackishwater pond culture is the only form of aquaculture in the bay region. Brackishwater ponds are found in the former mangrove/nipa swamps in Batangas City (Barangays Sta. Clara and Sta. Rita Aplaya). Ponds in Malitam, Cuyo, and Batangas City were converted to industrial/commercial areas. Figure 4.5 shows the location of brackishwater ponds in Sta. Rita Aplaya and Sta. Clara, with a total area of about 80 ha. Species cultured are milkfish (*Chanos chanos*) and shrimps, especially *Penaeus monodon* and *P. indicus*.

Farming practices involve the use of fertilizers to grow natural food (e.g., *lab-lab* for milkfish). Stocking density is low at 2,000 fingerlings/ha. Harvest is poor, due to low survival of stocks. Sometimes, shrimps are cultured together with milkfish but at a low stocking density. Monoculture of shrimps is being practiced but only on a small-scale basis. Annual aquaculture production in the bay region is estimated as follows: milkfish monoculture (300-500 kg/ha); shrimp (*P. monodon*) monoculture (100-250 kg/ha); and milkfish/shrimp polyculture (300 kg/ha milkfish and 100 kg/ha shrimp).

Industrialization and urbanization appear to have significant adverse impacts on aquaculture. In addition to direct land conversion into industrial and commercial uses, water pollution associated with industrialization has affected aquaculture expansion and production in the region.

Figure 4.5. Location of brackishwater fishponds in Batangas Bay.



PROTECTED AREAS AND ARTIFICIAL SHELTERS IN BATANGAS BAY

Although there are coral reefs at the bay's fringes, there are no planned or legislated protected sites in the area. Mabini, however, has declared some marine areas as reserves in Balayan Bay where tourism is being encouraged.

Underwater structures associated with piers, jetties, and mooring devices located and/or placed within ports, such as those of the Caltex Refinery, Pilipinas Shell Refinery, Batangas City Port, and other private companies serve as habitats for marine organisms. These structures act as artificial shelters contributing to marine biodiversity and productivity quite similar to coral reefs. Among such structures, only the jetties of the Shell Refinery at Tabangao, Batangas, have been visually surveyed. Sponges, polychaetes, echinoderms, tunicates, and gorgonians were observed encrusting these jetties. Also, fishes were observed among these structures, such as snappers *(Lutjanidae)*, goatfish *(Mullidae)*, mullet *(Mugilidae)*, butterfly fish *(Chaetodontidae)* and turkey fish *(Pterois)*. However, no systematic study has been conducted on these structures.

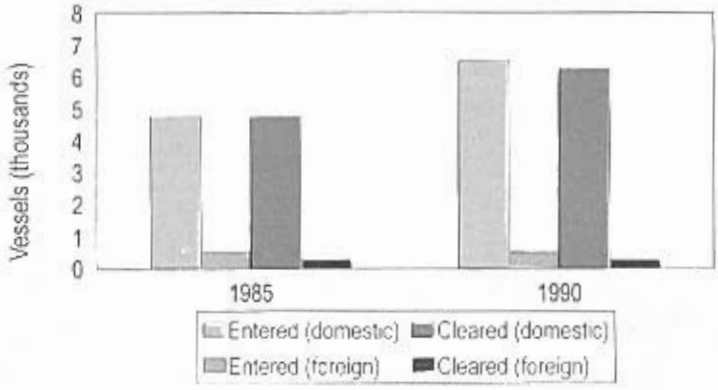
SHIPPING AND NAVIGATION

Batangas Bay is used widely by both domestic and foreign vessels, resulting in increased vessel traffic over the years. Between 1985 and 1990, the number of domestic and foreign vessels entering the bay rose from 5,052 ships to 6,776 (*See Figure 4.6*). The shipping lanes in and out of the bay are shown in Figure 4.1. Vessels can pass either through the Verde Island Passage or via Maricaban Strait.

Shipping statistics taken for the month of February 1995 showed that a total of 1,323 ships docked in Batangas Bay, of which 94 percent were domestic vessels. About 81 percent of the ships docked in the public ports of Batangas City and Bauan, while 19 percent docked in the private ports of industrial firms.

Batangas Bay is being developed into an international port, serving not only Batangas Province but also the nearby provinces of Cavite, Laguna, Rizal, and Quezon. The establishment of industrial complexes along the coasts of Batangas Bay has enhanced the strategic importance of the bay for international trade. It is expected that the volume of ships passing through the bay will significantly increase and potentially will cause both resource use conflicts and pollution.

Figure 4.6. Number of ships entered and cleared in the port of Batangas in 1985 and 1990.



Source: *Philippine Ports Authority.*

COASTAL TOURISM

Coastal tourism in the Batangas Bay is not yet well-developed, as compared to the adjacent Balayan Bay. There are only few beach resorts in the bay areas, largely located in Bauan (*See Figure 4.7*). Potential tourist areas are in the northern tip of Maricaban Island.

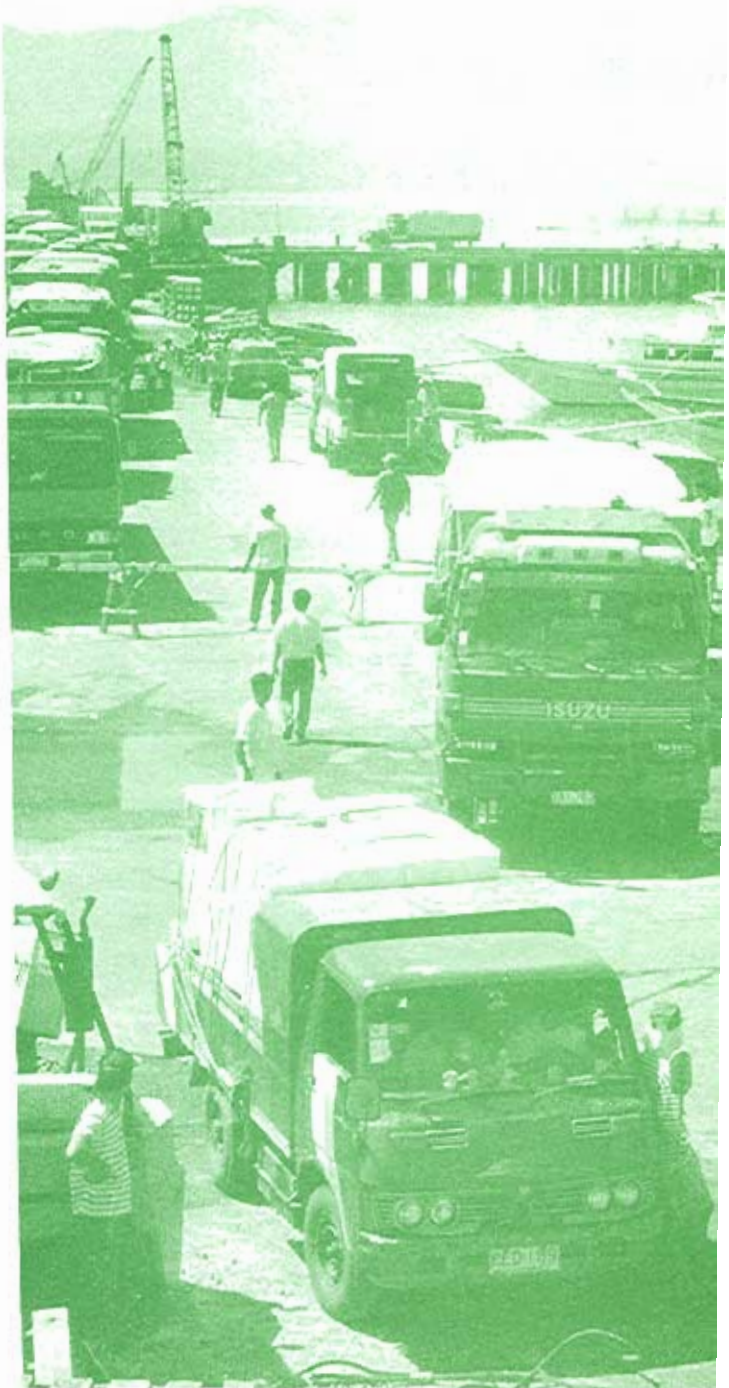
Figure 4.7. Location of beach resorts in the Batangas Bay Region, 1993.

***Source**: OPPDC, n.d.*

LEGEND with beach resorts with potential

Source. *OPPCDC Unpublished Data Files*

Land-based Economic Sectors



Chapter 5.
LAND-BASED ECONOMIC SECTORS

INTRODUCTION

The land-based economic sectors that affect the general environment of the Batangas Bay Region, including Batangas Bay, are discussed in this chapter. These sectors are agriculture, industry, and commerce. Only pertinent aspects will be covered with respect to their contribution to marine pollution.

Due mainly to data limitation on the region, this chapter utilizes only cross-section information. Whenever possible, data for the whole province are presented vis-a-vis those for the bay region so as to provide comparison.

AGRICULTURAL SECTOR

Batangas is largely an agricultural province, although this may change in the next 10 years or so as it moves towards industrialization. Currently, its agriculture is dominated by coconut and sugarcane, followed by rice, corn, coffee, and banana. There are other crops, like fruit trees and vegetables, but these are minor crops and seasonal in production.

Batangas Province has a complicated cropping system, such as multistorey cropping and intercropping (BSWM, 1985). As of 1994, a total of 187,790 ha of land in Batangas were utilized for agriculture: 13 percent in the coastal areas and 25 percent in interior municipalities of the BBR, respectively; while 62 percent were outside the region.

Coconut is widely cultivated in the province. Annual yield ranged from 150-4,403 kg/ha, depending on the management system employed, bearing tree age, and level of pest infestation (BSWM, 1985). A large part of the production was for copra. Production in 1994 was 220,401 MT, valued at 2.2 million pesos covering an area of 37,170 ha. Fertilizers are not usually applied in coconut plantations, except where there is intercropping of seasonal and annual crops, like vegetables and coffee. Also, very limited pest control is done due to lack of technical assistance from authorities. In 1985, BSWM reported an aggregate total area for coconut at 85,103 ha. This has considerably decreased in nine years, possibly due to direct conversion into industrial and residential land uses.

Sugarcane is also an important cash crop in Batangas Province, enhanced by the presence of two milling factories – the Batangas Central Azucarera and the Central Azucarera de Don Pedro. These milling factories are located outside the region – in Balayan and Nasugbu – producing semi- and nonrefined sugar, respectively. Sugarcane yield ranged from 2,670 kg/ha in District I to 62,705 kg/ha in District III. Such a low yield in the former was attributed to ratooned crop on its third harvest (BSWM, 1985). The 1994 sugarcane production was 3,675.090 MT, valued at ₱2.38 million. Fertilizers were applied in sugarcane farming to improve soil fertility; while the use of pesticides was nil, due to high cost and lack of technical assistance from authorities. Like coconut, sugar land has been drastically reduced from an aggregate total of 70,304 ha in 1985 by about 66

percent, possibly due to industrial and residential land uses.

Rice is the major grain crop produced in the province, followed by corn. Rice production comes from three farming systems as shown in Table 5.1.

Table 5.1. Rice farming system and distribution by land area extent.

Category	1985	1994
Irrigated rice	2,300 ha	5,761ha
Nonirrigated rice	17,093 ha	10,212 ha
Upland Rice	20,463 ha	23,233 ha
Total	**39,856 ha**	**39,206 ha**

The 1994 production area for rice was lower by 650 ha from the BSWM (1985) survey of 39,856 ha; while the irrigated ricelands have increased by 2.5-fold. Rice production is largely extensive, usually one cropping a year during the wet season. Inorganic fertilizers are used to improve soil fertility. Weeds are controlled through manual means usually in nonirrigated rice fields; while weedicides are used in irrigated rice lands. For controlling pests, like mole crickets, green leafhopper, and stemborer, several insecticides are used like **Thiodan, Folidol, Sevin, Brodan, Endrin, Furadan, Hytox, Gusathion, Malathion, Decis,** and **Parapest.** Some of these pesticides are banned.

The distribution of ricelands for the 1994 data showed that 44 percent were in interior areas and 8 percent in the coastal areas of the bay region, respectively. Among the municipalities in the region, Rosario had the largest nonirrigated riceland. In terms of rice production, about 130,107 MT of rice were produced by the province in 1994. About 40 percent (52,057 MT) came from irrigated rice culture; while the rest were either rainfed or upland type. Rice production was not sufficient to meet the province's increasing population.

LIVESTOCK AND POULTRY

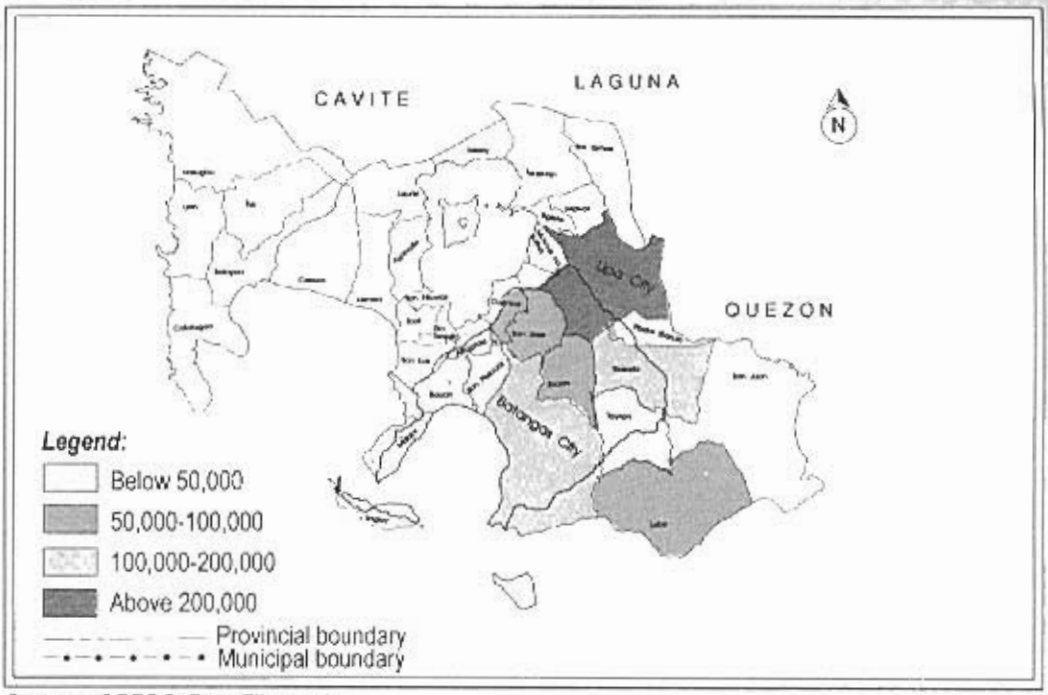
Livestock and poultry-raising serve as additional income sources for farmers, although commercial ventures, especially chicken, exist. Cattle, swine, and goats are also largely raised for domestic consumption although some are for breeding and fattening purposes. In addition, some cattle and goats serve as sources of milk, typically for home consumption. Carabaos and horses are raised as draft animals for domestic use and export elsewhere. Livestock production in the province is shown in Table 5.2.

Table 5.2. Livestock production in Batangas Province.

Livestock	1985	1994
Cattle	81,420	83,731
Swine	237,192	293,062
Goat	56,386	51,169
Carabao	26,768	27,911
Horse	6,943	9,303
Total	**408,712**	**465,176**

Within the bay region, Lipa City had the largest production of livestock, followed by Batangas City and Rosario *(See Figure 5.1)*. Seven municipalities had

Figure 5.1. Number of heads of total livestock in the Batangas Bay Region, 1993.



Source: OPPDC, Data Files, n.d.

production below 10,000 heads while four were between 10,000 to 25,000 heads.

Chickens are raised for commercial and home consumption. In 1993, about 14,648,230 heads of chicken were produced in the province, of which 58 percent were broilers and 42 percent layers. Most of this production came from the interior municipalities of the region (61%) and elsewhere (38%).

INDUSTRIAL SECTOR

The industrial sector in the bay region is categorized into three types, based on the scale of operation (output): large-, medium-, and small-scale. As of 1994, there were 75 establishments in the region -- 44 located in the coastal municipalities and 31 in the interior areas. About 57 percent of the firms were owned by Filipinos, 6 percent were foreigner-owned, while 32 percent were partially foreign-owned, and 5 percent of undefined ownership. By scale of operation, industrial firms in the region were distributed as follows: large-scale (45%); medium-scale (20%); and small-scale (35%).

Of the establishments in the coastal towns of Batangas Bay, 47 percent sold their products on the domestic market, 30 percent exported, while 23 percent of unknown markets. For the whole region, firms sold their products as follows: domestic market (45%); exported (28%); and unknown market (27%).

COMMERCIAL SECTOR

Commercial establishments in the region are relatively concentrated in urban and urbanizing areas, such as Batangas City, Lipa City, and Bauan. Such commercial establishments include those that generate solid and liquid wastes which can potentially enhance pollution in the river systems and the

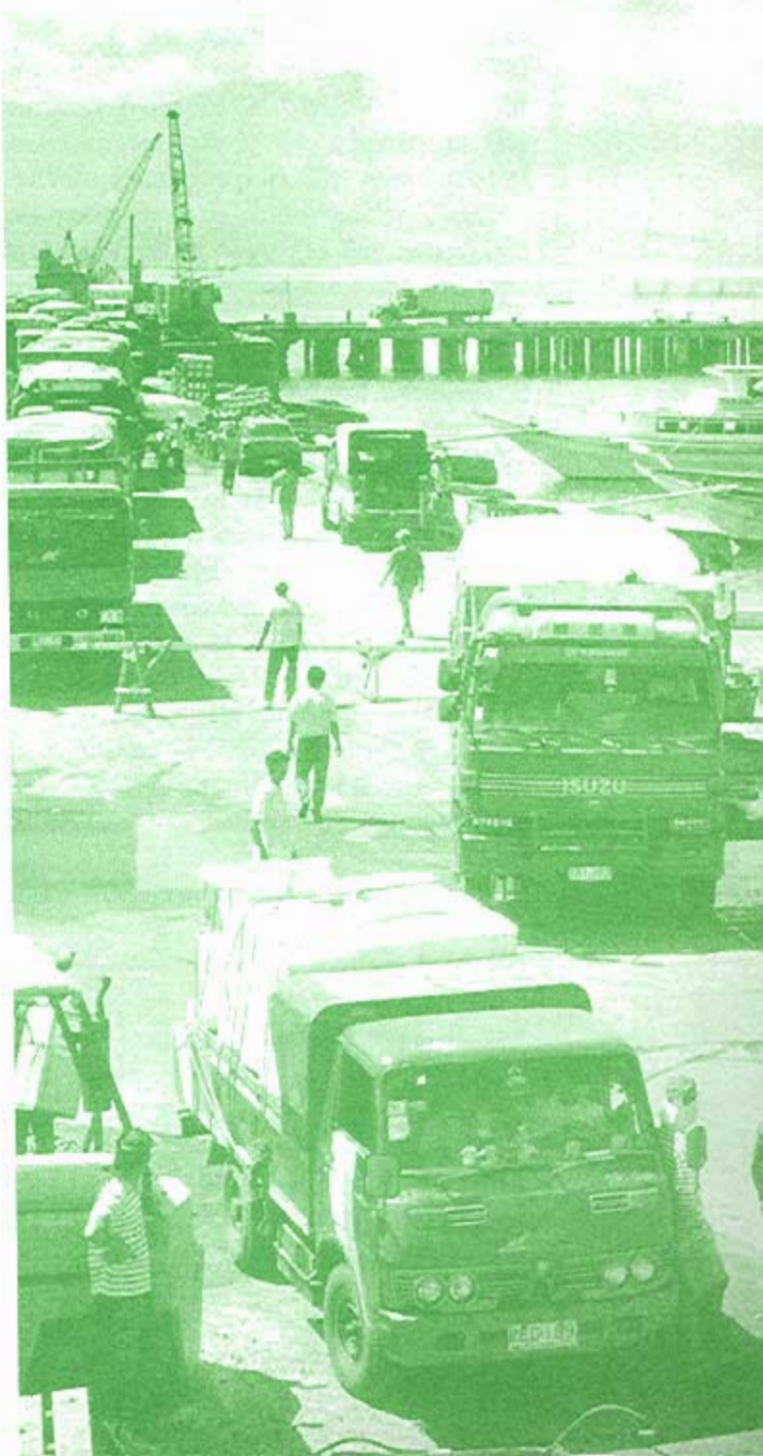
Batangas Bay. In addition to restaurants and eateries, numerous fish, meat, and vegetable stalls in public markets generate wastes that are typically disposed off in dumping sites and even rivers. Hospital wastes and petroleum products are generated by hospitals/clinics and gas stations, respectively. A listing of the commercial establishments in the three localities is shown in Table 5.3.

Table 5.3. Kind and number of waste-generating commercial establishments in Batangas City, Lipa City, and Bauan (1994).

Kind of Commercial Establishment	Number		
	Batangas City	Lipa City	Bauan
Fish Vendors	120	52	72
Meat Vendors	80	51	18
Fruit and Vegetable Vendors	140	86	214
Bakeries/Bakeshops/Bread Stores	42	44	14
Restaurants/Canteens/Carinderias/ Refreshment Parlors	173	121	48
Groceries/Sari-sari Stores	478	438	494
Hospitals/Medical Clinics/ Dental Clinics/Optical Clinics	55	70	21
Gasoline Stores	11	9	5

Sources: *Office of the City and Municipal Treasures of Batangas City, Lipa City, and Bauan. Data Files, n.d.*

State of Marine Pollution



Chapter 6.
STATE OF MARINE POLLUTION

SOURCES AND LEVELS OF MARINE POLLUTION

Domestic Sources

The bay region's coastal municipalities do not have sewage treatment facilities. Thus, a portion of their untreated domestic wastes eventually finds its way into Batangas Bay through various waterways. In 1994, in the coastal areas alone, based on the population of 360,529 and a per-capita biochemical oxygen demand (BOD) of 18 kg/year, the load was estimated at 6.5×10^6 kg. BOD is a water-quality parameter used to determine the relative oxygen requirements of wastewaters, effluents, and polluted waters. BOD from domestic wastes is estimated at 50 g/capita per day, while roll-on/roll-off (RO-RO) vessels is estimated at 100 kg/day. Table 6.1 gives the BOD loading estimates from domestic sources into various rivers in the region.

Preliminary measurements of BOD, near the Pilipinas Shell Refinery jetties and the Batangas Port, ranged from 7-22 mg/l. BOD measurements done in 1990 (Batangas Port Project) in the tributaries that led to Calumpang river yielded loads of 7-48 mg/l. Calumpang River was the major source of BOD in the bay and the load moved northward along the shoreline.

Total coliform counts obtained in a preliminary study conducted in 1990 ranged from 23-240 MPN/100 ml in marine stations in the vicinity of the existing Batangas port. The water quality criterion for total coliforms for Class SC waters, such as Batangas Bay, was 5,000 MPN/100 ml. While the total coliform levels obtained in marine waters were well below the criteria set forth by the Department of Environment and Natural Resources (DENR), the data were limited and would need further verification *(See Figures 6.1, 6.2, and 6.3)*. There appear to be no data on coliform counts in the major rivers and estuaries. For instance, coliform counts between 10^6 and 10^9 are expected per 100 ml of wastewater (Economopoulos, 1993). The wastewater-volume per capita can range between 50 to 300 liters per day, depending on the standard of living. Given the limited volumes of the river and bay waters surrounding the Batangas Bay, the increase in coliform loads is expected due to the growing population levels in the area.

From a World Bank (1994) study, solid wastes generated based on population projection

Table 6.1. Preliminary estimates of BOD loading from Batangas Bay Rivers (kg/day), given increments of growth of the population.

River	1990	1995	2000
Calumpang River	136,443	148,314	168,098
Majuia River	5,433	5906	6,693
Cuta River	1,042	1,133	1,284
Pataran River	463	503	570
Potol River	369	401	455
Growth(multiply)	*1.000*	*1.087*	*1.232*

Source: *Batangas Port Project Report*

Figure 6.1. Estimated liquid waste inventories, using Batangas Bay population estimates, 1995.

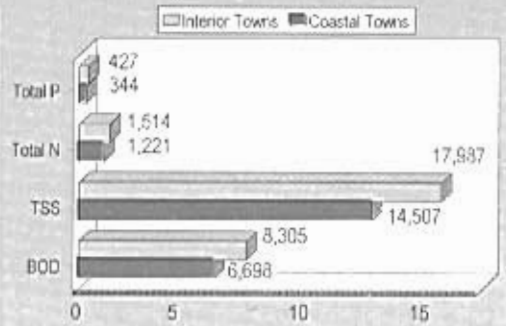


Figure 6.2. Estimated liquid waste inventories, using Batangas coastal population estimates, 1995 and 2000.

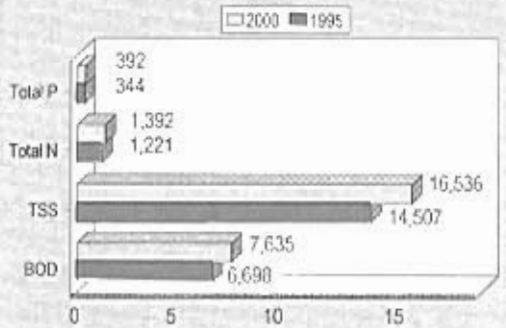
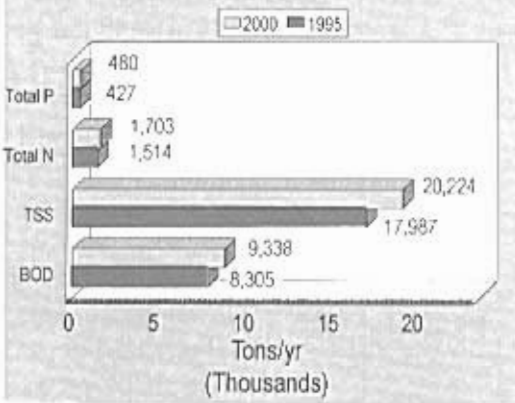
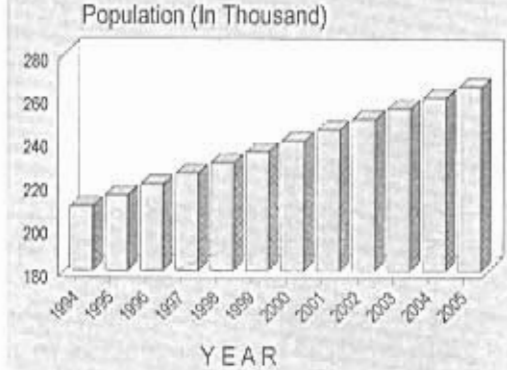


Figure 6.3. Estimated liquid waste inventories,using Batangas Bay interior area population, 1995 and 2000.



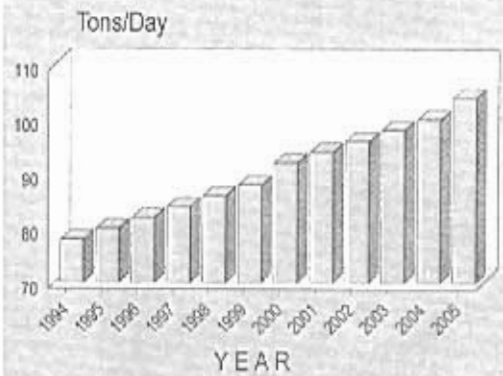
in Batangas City from 1994 to 2005 *(See Figure 6.4)* would be in the order of 80 to 100 tons/day *(See Figure 6.5)*. The wastes contributed by each sector (i.e., residential/commercial; high income, residential; middle income; and low income) are shown in Figure 6.6. About 40 percent of the wastes are generated by the residential/commercial sector. The household and commercial waste characteristics in Batangas City are shown in Figure 6.7. Most of the wastes are biodegradable, consisting of vegetable/putrescible, yard, and paper wastes.

Figure 6.4. Population projection, Batangas City, 1994-2000.



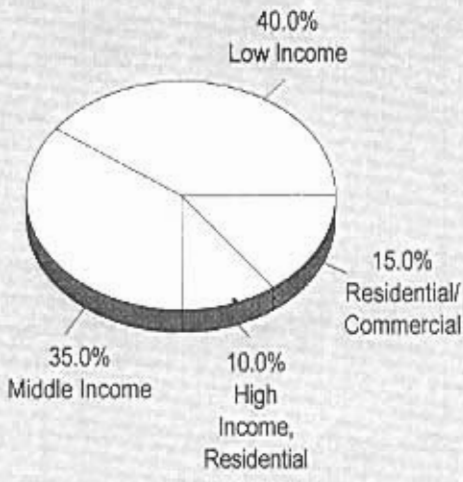
***Source**: Urban Development and Solid Waste Management Study, 1995.*

Figure 6.5. Projected waste generation rate, Batangas City, 1994-2000.



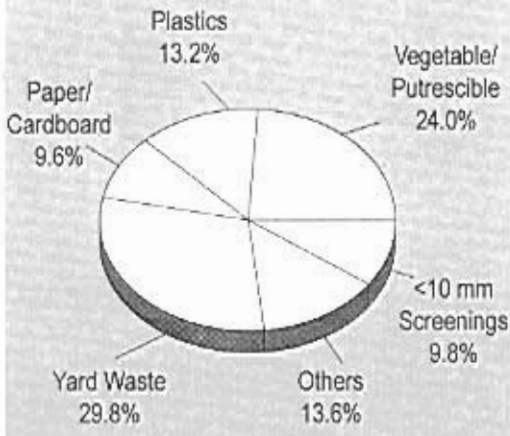
***Source**: Urban Development and Solid Waste Management Study, 1995.*

Figure 6.6. Waste contribution, by sector in Batangas City.



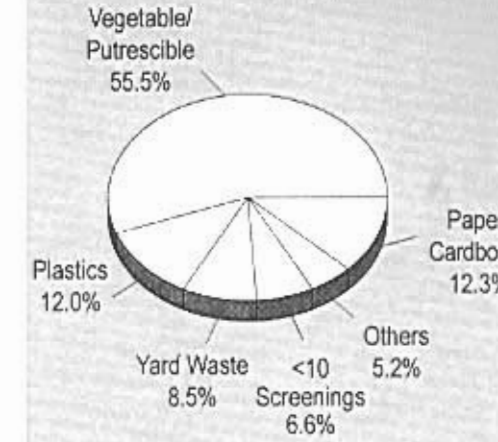
Source: *Urban Development and Solid Waste Management Study, 1995.*

Figure 6.7. Household and commercial waste characteristics in Batangas City.



Source: *Urban Development and Solid Waste Management Study, 1995.*

Figure 6.8. Market waste characteristics in Batangas City.



Source: *Urban Development and Solid Waste Management Study, 1995.*

Putrescible wastes produced by the coastal municipalities of the bay region would be in the order of 54,000 tons/yr, based on a factor of 150 kg/person/yr as estimated from Economopoulos (1993).

Market waste in Batangas City as shown in Figure 6.8 indicates that 55.5 percent are vegetables/putrescible and are biodegradable. If paper and yard wastes will be included, 75 percent of market wastes are biodegradable. As such, this has implications on waste management strategies for market wastes in Batangas City and in other municipalities.

Open dump sites exist in Batangas City and in the towns of Mabini and Bauan *(See Table 6.2)*. Among the coastal municipalities, Batangas City has the largest dump site, located at Tingga Labac with an area of 2 ha. Bauan's dump site is in Barangay Sinala with an area of 1 ha. Mabini has its dumpsite near the poblacion, adjacent to Barrio Bulacan, with an area of about 25 m^2 and 6 m deep.

There are 25 hospitals and clinics in the coastal municipalities along Batangas Bay. None of these establishments are known to have incinerators. Thus, hazardous hospital wastes are burned in the open, dumped inside or outside the hospital compound, or buried. Some of these wastes probably

Table 6.2. Dump sites in Batangas Bay Region, 1995.

Municipality	Location (Barangay)	Area (sq.m.)	Distance to Town Proper (km)	Water Body Present	Owner	Type
Coastal Municipalities						
Batangas City	Tingga Labac	20,000	2	stream	private	open
San Pascual	Balimbing	3,000	1	creek	public	open
Bauan	Sinala	9,153	3	creek	public	open
Mabini	Poblacion	25	0	none	public	compost pit
Interior Municipalities						
Lipa City	Sitio Cumba, Sapac	20,000	6	none	public	open (ravine)
Ibaan	Balanga	10,000	3	none	private	open
Rosario	Maalas-as	35,690	7	stream	public	open
Padre Garcia	near a livestock market	10,000	1	none	public	open

Source: Concerned Municipalities

enter tributaries and eventually reach the bay.

Agricultural Sources

Wastes associated with the agricultural sector come mainly from runoff and leaching of fertilizers and pesticides/herbicides used. Livestock raising (e.g., cattle, poultry, and swine) also contributes substantial loading of predominantly organic wastes into rivers and tributaries that eventually enter the bay.

The annual livestock production in the coastal areas of Batangas Bay was estimated at 66,600 heads of cattle, 242,000 heads of swine, and 4,800,000 chicken heads. Based on these numbers, the estimated total nitrogen and BOD contributions of liquid wastes from livestock and chicken for 1993 were computed and are shown in Figures 6.9 and 6.10, respectively.

The common pesticides/herbicides used by farmers in Batangas Bay are shown in Table 6.3. Despite the ban on methyl parathion (e.g., **Folidol, Meptox, Methyl Fosferno, Parapest**),

Figure 6.9. Estimated total N contribution of liquid wastes from livestock and chicken, Batangas Bay, 1993.

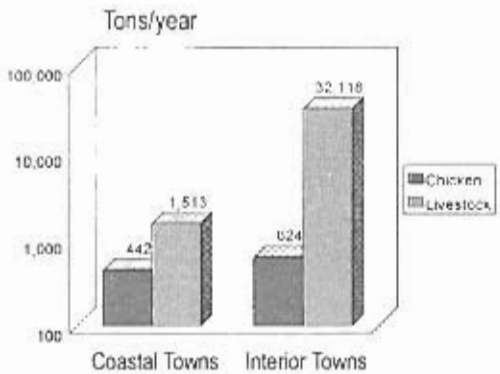


Figure 6.10. Estimated BOD contribution of liquid wastes from livestock and chicken, Batangas Bay, 1993.

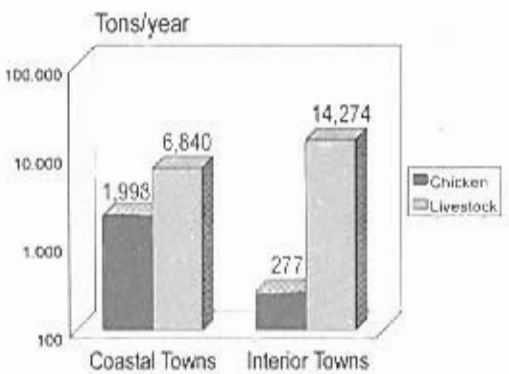


Table 6.3. Commonly-used pesticides in the Batangas Bay Region.

Common Name	Brand Name	Registrant Name	Common Name	Alternative Pesticide Brand Name	Registrant Name
Methyl Parathion (Banned)	Folidol M 50 EC Meptox 50 EC Methion 50 EC Methyl Fosierno Parapest M 50 EC	Bayer Philippines Shell Chemicals Marsman Jardine Davies Planters Products	PPMC CARBOFURAN CYPERMETHRIN CYFLUTHRIN DELTAMETHRIN DIAZINON FENVALERATE IMIDACLOPRID LAMBDACYHALOTHRIN MALATHION TRIAZOPHOS	Hopcin 50 EC Furadan 3 G Ripcord 2.5 EC Baythroid 050 EC Decis R Basudin 5 G Diazinon 60 EC Sumicidin 3 EC Confidor 100 SL Karate 2.5 EC Shell Malathion 57 EC Hostathion 40 EC	Hoechst Bayer Phils Shell Chemicals Bayer Phils Hoechst Shell Chemicals Shell Chemicals Shell Chemicals Bayer Jardine Davies Shell Chemicals Hoechst
Azinphos Ethyl (Banned)	Blonox 40 EC Telothion 40 EC Marsathion 40 EC Gumathion 40 EC	Planters Products Shell Chemicals Marsman Bayer	CARBARYL CARBOFURAN DELTAMETHRIN DIAZINON LAMBDACYHULATHRIN METHOMYL TRIAZOPHOS	Sevin 50 WP Furadan 3 G Furadan 5 G Decis 2.5 EC Diazinon 60 EC Karate 2.5 EC Lannate L Hostathion 40 EC	Rhone-Poulenc Bayer Bayer Hoechst Shell Chemicals Jardine Davies Du Pont Hoechst

azinphos ethyl (e.g., **Telothion, Marsathion, Gusathion**), and organotin compounds (e.g., **Brestan, Aquatin**), a fair amount is apparently still being used in the area. Inevitably, some of these pesticides end up in Batangas Bay. However, no data exist on the levels in Batangas Bay waters or sediments. A study called Pesticide Watch was conducted by the EMB-Research Division on fish samples in the bay and preliminary results showed negligible concentration of pesticide.

Table 6.4. List of industries and establishments within the Batangas Bay areas.

Firms	Contaminations
Pilipinas Shell Petroleum Corp Tabangao, Batangas	Oil spillages, phenolic substances Cooling water from heat exchager
Chemphil-LMG Chemical Pinamucan, Batangas	Loading/unloading of chemicals Oily wastewater from washing
Caltex-Philippines Inc San Pascual, Batangas	Oil/grease spillages, phenolic substances cooling water from heat exchager
United Coconut Chemicals,Inc Bauan, Batangas	Splitting process, fatty acid, glycerine, alcohol production
Union Carbide (Far East)Inc San Miguel, Bauan, Batangas	Spillages of organic chemicals during blending operation
Petron Corporation Mabini, Batangas	Oily wastewater from accidental spills from plant washing
Sakamoto Corporation Danglayan, Batangas	Oily wastewater during storing, receiving, distribution of chemicals
Himmel Industries Pinamucan, Batangas	Oily wastewater during spillages from distribution of chemicals
Keppel Shipyard Bauan, Batangas	Oily wastewater from spray painting operation
A G & P Fabrication Plant San Pascual, Batangas	Oily wastewater from steel, spray painting booth
PNOC Coal Stockyard Bauan, Batangas	Surface runoff, wastewater from coal stockyard premises
Purefoods Flour Mill Mabini, Batangas	Surface runoff, domestic wastewater, machinery washing containing oily wastewater

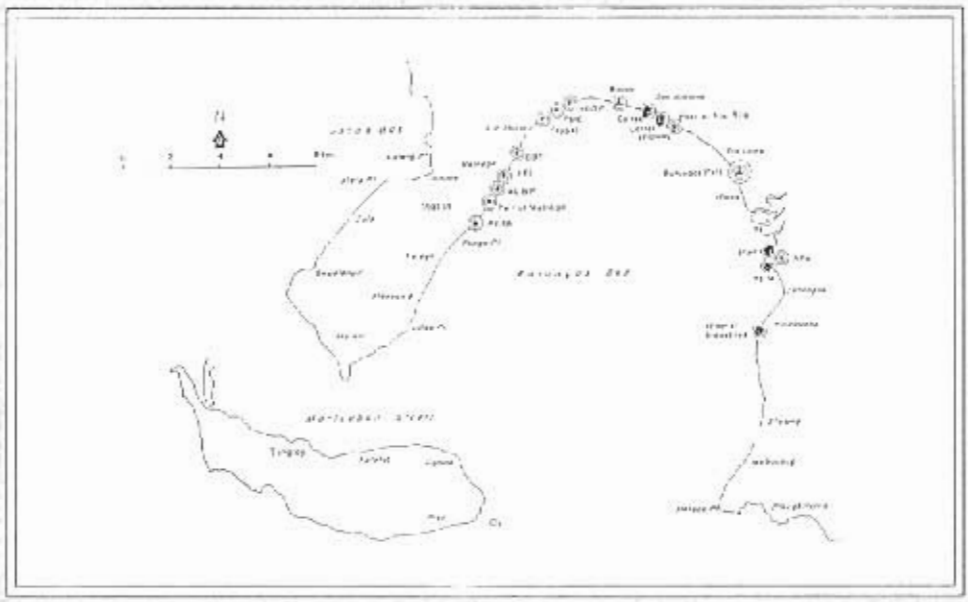
Industrial Sources

Industrial waste loading into the Batangas Bay comes from oil refineries, a power-generating plant, shipyards, chemical manufacturing plants, and alcohol distilleries, among others. Table 6.4 lists a number of major industries around the bay and the contaminants associated with them. Figure 6.11 shows the location of the major industries around Batangas Bay.

A brief description of the activities of some of these firms, as well as wastes associated with their operations, obtained mainly from DENR (1992), is presented below.

Pilipinas Shell Petroleum Corporation (PSPC). PSPC is located in Tabangao, Batangas City. Its petroleum

Figure 6.11. Location of industrial establishments along Batangas Bay, 1994.



refinery was built in 1962 and has a rated capacity of 68,000 barrels per day. Oil, grease, and phenolic substances are the major contaminants coming from the refinery's spillages. The oily wastewater is treated at the refinery's three oil/water separator units and ends up in a holding basin.

Other wastes generated at the refinery consist of tank sludge (1,000 tons/yr), comprising mainly of soil and hydrocarbons; spent lime (110 tons/yr), comprising of copper oxide (CuO) and magnesium (MgO); and metal wastes (50 tons/yr), comprising mainly of scrap metals. These wastes are generally not disposed of in the bay. Cooling seawater that goes through various heat exchangers averages at 15,000-22,500 m^3/day and is discharged into the bay.

Caltex-Philippines, Inc. Caltex-Philippines started its operations in 1954 and has a rated capacity of 70,500 barrels per stream day. The refinery is located in San Pascual, Batangas. Like PSPC, oil, grease, and phenolic substances are the major contaminants from this plant.

The oily wastewater from the process units passes through a series of oil/water separators where oil is recovered and pumped back into the storage tanks. The unrecovered oily water then goes to an induced air flotation system and injected with a demulsifying agent where the remaining oil in the wastewater is finally separated and recovered. The treated effluent then goes to a stabilization pond before being discharged into the Lagnas River. The refinery's volume of discharge is 1,700 m^3/day which includes cooling water.

Other sources of wastes include lead sludge (850 barrels/yr), composed mainly of lead and gasoline residues; crude sludge (7,000 barrels/yr), composed mainly of crude oil residues; spent lime (330 m^3/yr), composed mainly of CaO, MgO, and $Ca/MgCO_3$; spent caustic (3,000 barrels/yr), consisting of caustic soda, napthenic

acids, mercaptans and phenols; and boiler ash (2,500 kg/yr) comprising of carbon soot, fuel ash, metallic oxides, and sand. The disposal of solid wastes covers sludge farming/weathering, incineration, and recycling/reuse by third parties.

Chemphil-LMG (Pinamucan Bulk Chemical Plant). This plant, an organic chemical tank farm that started operations in January 1991, is located in Pinamucan, Batangas City. The facility is engaged in receiving, storing, and unloading organic chemicals. The major source of wastewater comes from accidental spillages during loading and unloading of chemicals and oily wastewater from cleaning and plant washings.

Chemphil-LMG Chemicals, Inc. This company is engaged in the production of hard alkylbenzene. Its main raw materials are benzene, detergent polymer, and hydrochloric acid. Oily wastewater (35-40 m^3/day) is treated in the firm's wastewater treatment facility (WTF), consisting of a neutralization pit, an impounding basin, and an API oil/water separator with three skimmers. Recovered oil is recycled and blended with industrial fuel oil used in hot oil firming. The effluents from the company are also discharged into the Batangas Bay via Hagonoy Creek.

United Coconut Chemicals, Inc. (UNICHEM). UNICHEM is located in Danglayan, Bauan, Batangas, and is engaged in the conversion of crude coconut oil into higher chemicals, such as fatty acids, fatty alcohol, and glycerine. The firm has a WTF designed for 500 m^3/day. The treatment process uses the activated sludge system. Wastewater comes from the splitting process, fatty acid processing, glycerine production, and fatty alcohol production. The effluents are discharged into the Hagonoy Creek.

Union Carbide (Far East), Inc. Union Carbide is engaged in receiving, storing, and blending organic chemicals and is located in San Miguel, Bauan, Batangas. Wastewater is derived from accidental spillages of organic chemicals during blending and unloading operations and oil from plant washings. The tank farm is served by an oil/water separator with treated effluents discharged into the Batangas Bay.

Petron Corporation (Mabini Bulk Depot). The bulk terminal, located in Mabini, Batangas, receives, stores, and distributes petroleum products, such as diesel oil, regular and premium gasoline, and industrial fuel oil which comes from the Bataan Refinery. Wastewater comes from plant washings and accidental spillages during storing, receiving, and unloading operations. Oily wastewater is treated with an oil/water separator and the treated effluent is finally discharged into the Batangas Bay.

Other Industries. Other major sources of contaminants in the bay are: a) *Sakamoto Corporation* (Danglayan, Bauan, Batangas) – glycerine-producing plant; b) *Himmel Industries* (Pinamucan, Batangas City) – receiving, storing, and distributing chemicals; and c) *General Milling Corporation.*

ASSESSMENT OF THE BATANGAS BAY

The Batangas Bay has been classified by the DENR as Class SC waters which are suitable for recreational and fishing activities (DENR, 1992). However, the bay is not being utilized for recreational purposes and does not have designated coral reef parks and

reserves. Neither is it a major tourist zone, although a popular scuba-diving area is located on the west side of the bay toward Balayan Bay. Instead, the bay waters are being used for domestic and industrial purposes and receive untreated, partially-treated, and fully-treated wastes. Table 6.5 shows the major pollutants in Batangas Bay and their likely sources. One of the industrial uses of the bay waters is for cooling. For instance, two major industries utilize an average of 15,000 to 22,500 m^3 of seawater per day. This water is pumped through a series of pipelines and passed through various heat exchangers before finally being discharged into the bay.

Table 6.6 shows the water quality criteria for Philippine coastal waters appropriate to their designated beneficial use. The criteria are based on a classification system for surface freshwater and seawater (Tables 6.7 and 6.8). Limited measurements of a number of parameters, such as pH and oxygen obtained by the DENR, were well within the range for Class SC waters.

Microbial pollution is a critical parameter and coliforms are widely used as indicators of the possible presence of enteric pathogens. The water quality criteria for total coliforms in Class SC waters, such as Batangas Bay (used for boating, commercial and sustenance fishing, etc.), is 5,000 MPN/100 ml. Coliform counts obtained in earlier studies yielded values significantly lower than this except for a study done in the Tabangao area in 1983 (UPSRF, 1991).

Bacterial counts in water samples obtained in the 1983 study from rivers and other tributaries yielded counts ranging from 16,000-900,000 MPN/100 ml. This is a parameter that would, therefore, be important to monitor,

Table 6.5. Pollutants and their sources in Batangas Bay.

Pollutants	Sources
Pathogens	Livestock
	Agriculture
	Domestic wastes
Nutrients	Livestock
	Agriculture
	Fertilizers
	Domestic and Industrial
Wastes	Ship wastes and runoff
	Dredging
Toxic and hazardous wastes	Heavy industries
	Mining
	Agriculture
	Hospital wastes
	Ship discharges
Suspended solids	Siltation
	Mining and earth removal
	Domestic and Industrial

especially with the expected increase in population levels around the bay and the health risks associated with increased coliform counts.

Suspended solids exert harmful effects on the marine environment as these reduce sunlight penetration. These suspended particles also become carriers of toxic substances and pathogenic microorganisms over great distances and affect fish and filtering species sensitive to the blocking of branchiae. When these suspended solids settle, they can clog spawning grounds inhibiting the reproduction of fish and can also form sludge blankets causing asphyxiation to the benthic environment. Since major coastal and inshore activities are expected to increase suspended sediment load in the bay, primary data on suspended solids and the continued monitoring of this parameter would be important.

Table 6.6. Water quality criteria for conventional and other pollutants affecting aesthetics and exerting oxygen demand for seawater.

Parameter	Unit	Class SA	Class SB	Class SC	Class SD
Color	PCU	[1]	[1]	[1]	[1]
Temperature[2] (max. rise in degree Celsius)	°C rise	3	3	3	3
pH (range)		6.5-8.5	6.0-8.5	6.0-8.5	6.0-9.0
Dissolved Oxygen[3] (Minimum)	% sat'n (mg/L)	70	70	70	50
5-day 20°C BOD	mg/L	3	5	7(10)	--
Total Suspended Solids	mg/L	[4]	[5]	[6]	[6]
Surfactants (MBAS)	mg/L	0.2	0.3	0.5	--
Oil/Grease (Petroleum) Ether Extraction	mg/L	1	2	3	5
Phenolic Substances as Phenols	mg/L	nil	0.01	[7]	--
Total Coliforms[8]	MPN/100 ml	70[8]	1,000[8]	5,000[8]	
Fecal Coliforms[8]	MPN/100 ml	nil	200[8]	--	--
Copper	mg/L	--	0.02[9, 10]	0.05[10]	--

Legend:

[1] -- No abnormal discoloration from unnatural causes

[2] -- the allowable temperature increase over the average ambient .

[3] -- Sampling taken between 9:00 AM and 4:00 PM.

[4] -- Not more than 30% increase.

[5] -- Not more than 30 mg/L increase.

[6] -- Not more than 60 mg/L increase.

[7] -- Not present in concentrations to affect fish flavor/taste.

[8] -- These values refer to the geometric mean of the most probable number of coliform organism during a 3-month period and that the limit indicated shall not exceed 20% of the samples taken during the same period.

[9] -- For spawning areas for *Chanos* and of other similar species.

[10] -- Limit in terms of dissolved copper.

Table 6.7. Water usage and classification -- surface freshwater.

Classification	Beneficial Use
AA	**Public Water Supply Class I.** This class is intended primarily for waters having watersheds which are uninhabited and otherwise protected and which require only approved disinfection in order to meet the National Standards for Drinking Water (NSDW) of the Philippines.
A	**Public Water Supply Class II.** For sources of water supply that will require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the NSDW.
B	**Recreational Water Class I.** For primary contact recreation such as bathing, swimming, skin diving, etc., particularly those designated for tourism purposes.
C	**Fishery Water** for the propagation and growth of fish and other aquatic resources. **Recreation Water Class II.** Boating, etc. **Industrial Water Supply Class I.** For manufacturing processes after treatment.
D	For agriculture, irrigation, livestock watering, etc. Industrial Water Supply Class II (e.g., cooling, etc.) Other inland waters, by their quality, belong to this classification.

Table 6.6. Water usage and classification – coastal and marine waters.	
Classification	**Beneficial Use**
SA	Waters suitable for the propagation survival, and harvesting of shellfish for commercial purposes Tourist zones and national marine parks and reserves established under Presidential Proclamation No. 1801; existing laws and/or declared as such by appropriate government agency. Coral reef parks and reserves designated by law and concerned authorities.
SB	**Recreational Water Class I.** Areas regularly used by the public for bathing, swimming, skin diving, etc. Fishery Water Class I. Spawning areas for *Chanos chanos* or "bangus" and similar species.
SC	**Recreational Water Class II.** (e.g., boating, etc.) **Fishery Water Class II,** commercial and sustenance fishing. Marshy and/or mangrove areas declared as fish and wildlife sanctuaries.
SD	**Industrial Water Supply Class II,** e.g., cooling, etc Other coastal and marine waters, by their quality, belong to this classification

Wastes high in nutrients and organics discharged in enclosed bays and harbors with fairly confined waters may cause serious eutrophication problems. This problem can become quite acute in water bodies where recirculation and flushing rates are not favorable. While nutrient data for Batangas Bay waters are limited, values obtained have generally been comparable to other less contaminated bodies of water in the country.

It is generally established that the primary productivity in most coastal shelf waters averages 25-150 g net C/m^2/yr, if the Total Organic Carbon (TOC) from the wastewater discharged into the bay is only a fraction of the above value. Assuming that 10 percent of the carbon production is acceptable, an estimate can be made of the contribution from people living around Batangas Bay. Thus, if the population is about 325,000, the TOC load in untreated wastewater is assumed to be 45 kg/person/yr and all of this ends up in the bay which has an estimated area of 220 m^2, the bay would receive about 66.5 g/TOC/m^2/yr. This carbon contribution appears to be higher than the assumed 10 percent of the primary production average value of coastal shelf waters.

In temperate areas, the chemical oxygen demand (COD) load, a measure of the oxygen equivalent of the organic matter that is susceptible to oxidation by a strong chemical oxidant, which can be discharged from standard urban sewage into semienclosed sea bodies without any real harm to the environment, is 1 g/day/m^3 (UNEP/WHO, 1985). As the COD load per person is about 100 g/day, the required sea volume would be of the order of 100 m^3 per person. Using this value as a first order estimate of the contamination levels in Batangas Bay, the population (325,000) of the coastal areas around the bay would require a seawater volume of 3×10^7 m^3. The estimated volume of Batangas Bay waters is 8×10^{10} m^3. Thus, it appears that the COD levels derived from the inputs of untreated

organic loads from the population may not yet be at a critical level.

Heavy industries also contribute to the BOD loadings in the area. Nonetheless, the contributions from the industry sector may be small compared to untreated sewage from the population and livestock rearing operations. Data obtained by the DENR in earlier studies indicate that the BOD levels are generally on the high side, especially in the tributaries and mouths of rivers draining into the bay.

Oil and grease values in seawater determined near one of the refineries and around the Batangas port ranged from <0.04 ppm to 0.5 ppm. However, much higher values (0.26 ppm to 70 ppm) with a mean of 16 ppm were obtained in 1983 in the vicinity of Tabangao and Libjo. The criterion for oil and grease in Class SC waters is 3 mg/l (ppm). There appear to be very limited data on oil and grease for other areas in the bay. The presence of refineries and heavy shipping traffic in the bay would warrant the monitoring of this parameter. The risks associated with oil contamination shown in Table 6.9, which presents oil spill incidents in Batangas Bay since 1983. About 10 oil spills of varying scales were reported from 1991 to 1993.

OIL SPILL CONTINGENCY PLAN

A Batangas Bay Marine Pollution Control Contingency Plan has been developed by the 5th Coast Guard District. This plan, the latest version written in 1990 and incorporated in the most recent version of the National Oil Spill Contingency Plan (1994), aims "to protect Batangas Bay and its rivers and tributaries from the damaging effects of oil spills and the spread of noxious substances by providing a coordinated response mechanism for combatting oil spills using the combined resources of the private sector and the government".

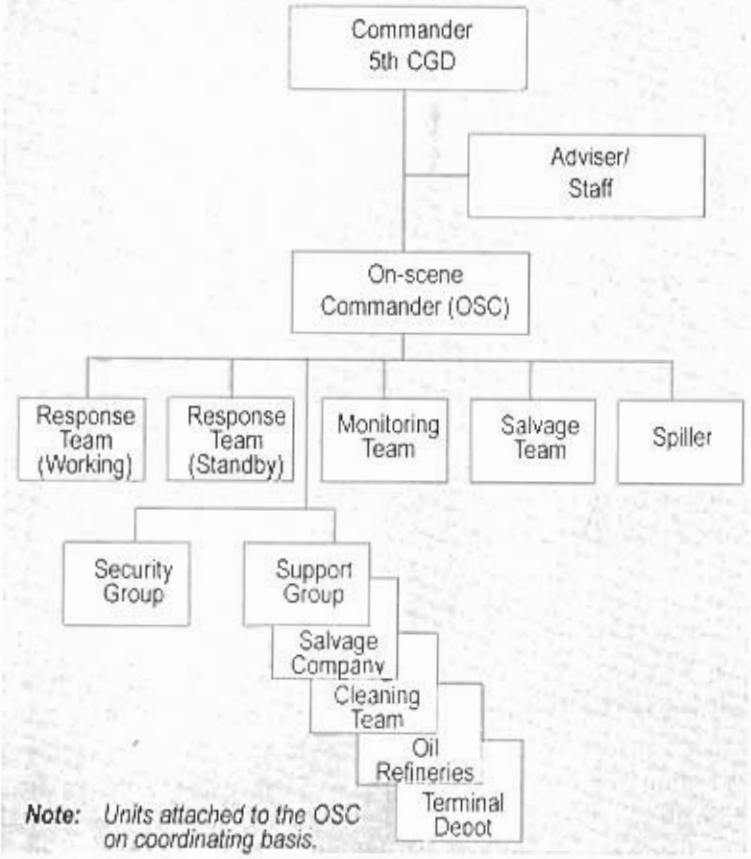
The contingency plan serves to unify the various local spill response mechanisms in Batangas Bay, including inland waters and their tributaries. Figure 6.12 shows the oil spill response control organization; while Figure 6.13 shows the flow of communications in the event of an oil spill.

Table 6.9. Oil spill incidents in the Batangas Bay Region, 1983-1994.

Date	Spiller/Source	Place	Approximate Quantity	Pol/Chem. Products
30 May 1986	PILIPINAS SHELL	Batangas	6,000 bbls.	Bunker Oil
19 August 1989	NPC TANK #2	San Pascual, Batangas	15,000 ltrs.	Bunker Oil
16 July 1990	PILIPINAS SHELL	Tabangao, Batangas	150 ltrs.	Fuel Oil
10 March 1991	PILIPINAS SHELL	Batangas	2,100 ltrs.	Bunker Oil
20 March 1991	CALTEX REFINERY	Batangas	200 bbls.	Crude Oil
10 Sep. 1992	M/T Andhika Ariadne	Batangas	30 bbls.	Diesel Oil
17 Dec. 1992	PILIPINAS SHELL	Batangas	30 bbls.	Diesel Oil
24 April 1993	Batangas Power Plant	Pinamucan, Batangas City	25 ltrs.	Used Oil
01 May 1993	PILIPINAS SHELL	Mapul, Taysan, Batangas City (Bunga River)	20,000 ltrs.	Bunker Oil
09 July 1993	Batangas Power Plant	Pinamucan, Batangas City	25 ltrs.	Used Oil
29 Sept. 1993	Caltex Refinery	San Pascual, Batangas	420 ltrs.	Bunker Oil

Source: Philippine Coast Guard

Figure 6.12. Oil spill response control organization, Batangas Bay.



those in Balayan Bay), and could be interfering with the benthic biological processes. It may be useful to assess the contamination by plastics of the bay and put forward mechanisms to reduce their introduction into the marine environment.

Other Issues

The potential risks posed by industrial facilities on the environment and human health have been assessed in a recent nationwide survey (IEMP, 1993). A listing of firms in Batangas province, classified according to industry type, is in Table 6.10. The pollutive/hazardous types of facilities are mostly small- to medium-scale enterprises involved in food processing, beverage manufacturing, and wood product and by-product manufacturing. The extremely pollutive/hazardous types are heavy or large industries involved in petroleum refining, electricity generation, industrial machineries, and equipment manufacturing, among others.

The waste management practices and capabilities of the various sectors using Batangas Bay vary significantly. One of the issues relates to the ability of the companies to comply with the recently revised effluent standards of the DENR (Department Administrative Order No. 35) given existing technology and resources.

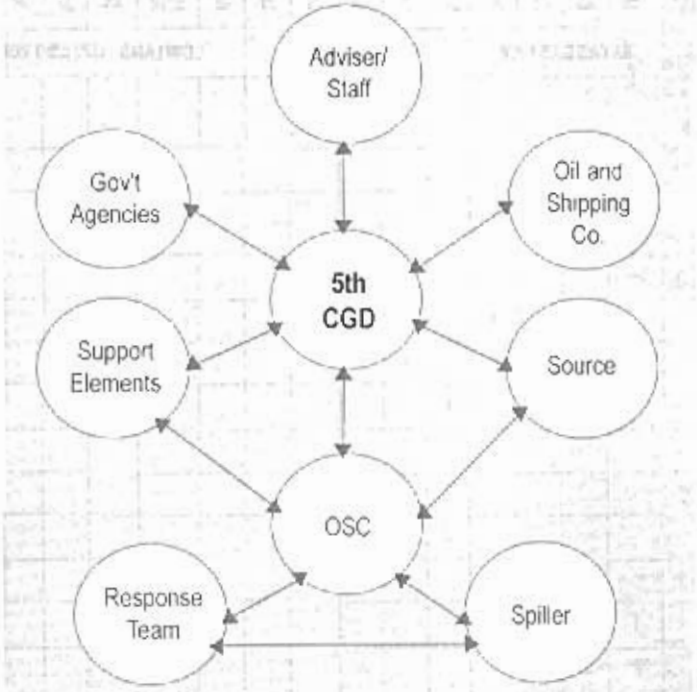
Another issue is the government's apparent limitation to monitor

OTHER MARINE POLLUTION ISSUES

Plastics

There is a growing concern that the impact of plastics on the marine environment is much more significant than previously perceived (E.D. Goldberg, pers. comm.). Plastics interfere with fishing activities, prevent primary production of benthic communities once deposited in sediments, and enhance the development of anoxic conditions in sediments. In Batangas Bay, plastics coming from land and those dumped from ships have interfered with fishing activities by clogging fishing nets, reduced the aesthetic value of beaches and coastal areas (including

Figure 6.13. Oil spill communications flow diagram, Batangas Bay.



the compliance by companies on a regular basis. The responsibility of monitoring the industrial sector is borne principally by the DENR Region IV. However, due to the limitations of manpower and resources, as well as the large area of responsibility of Region IV (the whole of the CALABARZON), monitoring cannot be effectively and regularly undertaken.

Still another issue relates to the problem of wastes generated by small enterprises. This includes the backyard raising of livestock. Such undertakings discharge wastes into rivers and tributaries that empty into Batangas Bay which are difficult to monitor for compliance.

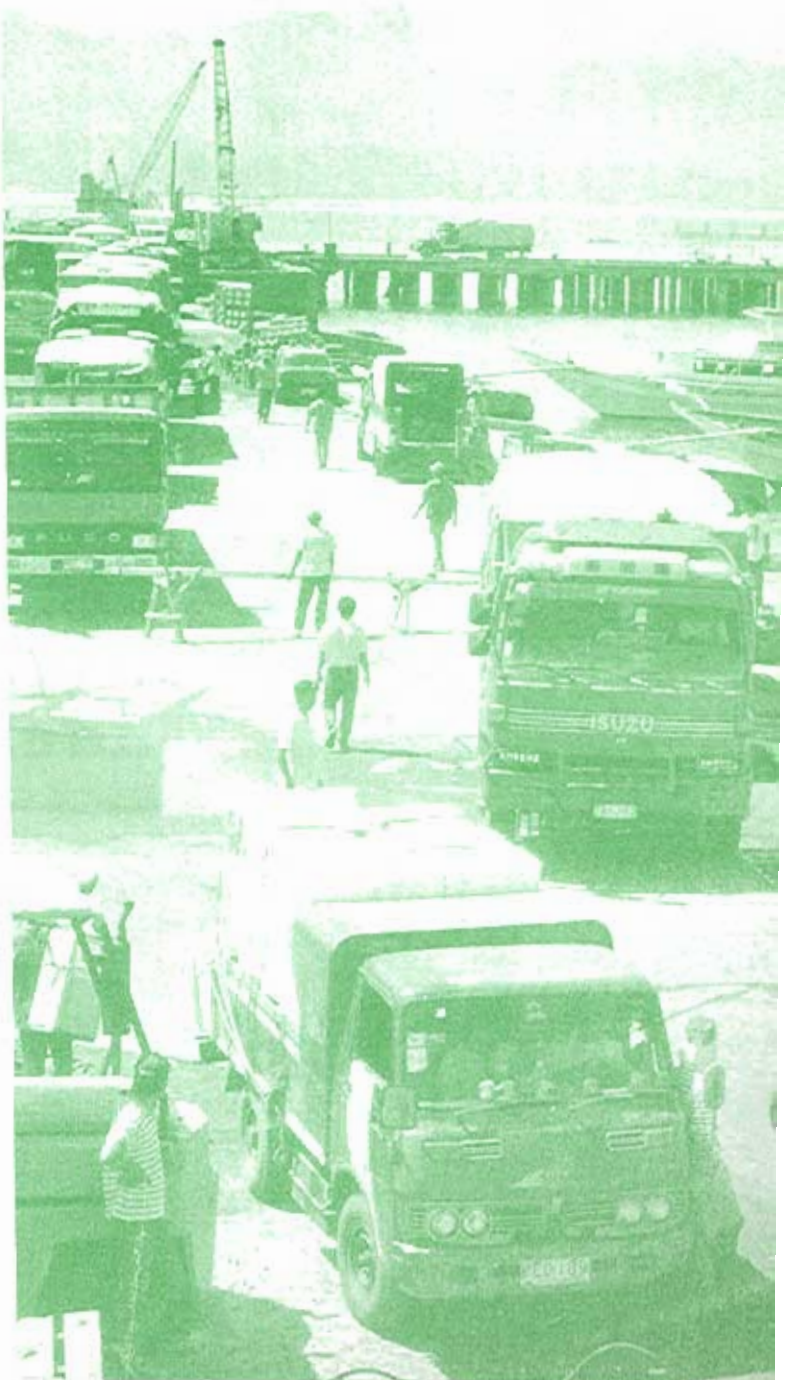
While the preceding issues relate primarily to Batangas Bay, the influence of pollutants generated or originating from Batangas Bay to the adjacent bodies of water (e.g., Balayan Bay) should not be overlooked. Transport of wastes and pollutants from one bay to another is brought about principally by currents. The types of pollutants that have the greatest likelihood of affecting Balayan Bay would be the buoyant solid wastes (e.g., plastics) and oil. There are already complaints aired by resort owners in Balayan Bay about wastes that end up in their beaches which are suspected to come from Batangas Bay.

Table 6.10. Pollutive firms in Batangas Province, by industry type and location.

	Industry Code Number	Frequency		Mabini	Bauan	San Pascual	Batangas	Nasugbu	Lian	Balayan	Calaca	Lemery	Agoncillo	Mataas na Kahoy	San Jose	Ibaan	Rosario	Lipa
		No.	%	BATANGAS BAY				BALAYAN BAY					LOWLAND - UPLAND ZONE					
EXTREMELY HAZARDOUS/ HIGHLY POLLUTIVE		(3)	5.9															
1. Petroleum refineries	3530	2				1	1											
2. Manufacture of miscellaneous products of petroleum and coal	3540	1					1											
HIGHLY POLLUTIVE/HAZARDOUS		(6)	11.8															
3. Generating and distributing electricity	4110	1					1											
4. Distilling, rectifying and blending	3131	3							2		1							
5. Manufacture of cement	3630	1						1										
6. Ship building and repairing	3841	1			1													
HIGHLY POLLUTIVE/NON-HAZARDOUS		(2)	3.9															
7. Sugar milling and refining	3123	2						1		1								
POLLUTIVE/EXTREMELY HAZARDOUS		(6)	11.8															
8. Wood drying and preserving plant	3314	1		1														
9. Manufacture of basic industrial chemicals	3511	4		2	2													
10. Manufacture of animal feeds	3512	1			1													
POLLUTIVE/NON-HAZARDOUS		(14)	27.4															
11. Hog raising	1213	13						1		1					1	1	2	7
12. Production of crude coconut oil	3116	1			1													
POLLUTIVE/NON-HAZARDOUS		(11)	21.6															
13. Other stone quarrying	2239	1					1											
14. Coffee roasting and processing	3127	1																1
15. Manufacture of animal feeds	3128	9				1	1						1	2	1			3
LOW POLLUTIVE/HAZARDOUS		(4)	7.8															
16. Minerals, metals and industrial chemicals	6170	1			1													
17. Petroleum and petroleum products	6180	3		1	1		1											
LOW POLLUTIVE/NON-HAZARDOUS		(5)	9.8															
18. Flour milling	3119	1		1														
19. Manufacture of other grain and mill products	3121	1					1											
20. Rice and corn milling	3118	1										1						
21. Sawmills, planning, and other wood mills	3311	2																
TOTALS		(51)		5	7	2	7	3	2	2	1	1	1	2	2	1	2	11

Source: IEMP (1993)

Population and Demographic Characteristics



Chapter 7.
POPULATION AND DEMOGRAPHIC CHARACTERISTICS

INTRODUCTION

This chapter discusses the socioeconomic and demographic characteristics which have important implications on the development of the region, including environmental management. Batangas Province's population reached 1,476,783 in May 1990, with an average annual growth rate of 2.58 percent. This represented an increase of 302,582 since the last censal year. The current population level of Batangas places it as the biggest in Region IV or about 18.88 percent of the total regional population.

POPULATION

Total Population and Distribution

The 1990 National Census showed that the population of Batangas was 1,476,783 and is expected to rise to 2,946,937 in 2020 (*See Table 7.1*). Similarly, the population of the Batangas Bay region is expected to increase from 733,240 (50% of total population) to 1,546,235 (52%), within the same timeframe.

Population in the coastal municipalities of the Batangas Bay was reported at 324,761 (22%) in 1990 and is expected to increase to 714,022 (24%) in 2020 (*See Table 7.2*). Some 89,483 people were from the coastal barangays in 1990 and projected to increase by two folds in 2020. Likewise, the population in the interior communities of the region was 408,479 in 1990 and is expected to rise to 832,212 in 20 years. While there will be projected increase in population for the interior municipalities of the region, the growth will remain relatively stable. In the coastal municipalities, however, there will be an influx of migration perhaps due to urbanization and industrialization in these areas within the 20-year period.

Population Density

The population of Batangas Province is projected to double from 1990 to 2020. This increase is reflected in the current population density of 46.63 persons per km^2 to 93.06 persons per km^2 over that span of time. In 1990, the bay region showed higher population density at 49.96, with the coastal municipalities having density at 70.62. This latter will increase to 155.26 persons per km^2 by 2020, possibly due to urbanization and industrial development. In particular, the population density of the coastal barangays along Batangas Bay with total land area of 8,072.20 ha, is projected at 1.1 to 23.48 persons per hectare from 1990 to 2020. Table 7.3 shows the population density of the province and the bay region. Projected density increase for the bay region is higher (105.36) than the provincial projection of 93.06 by the year 2020.

Among the coastal barangays along Batangas Bay, Bauan showed the highest average population density at 65.98 persons/ha, while the lowest was Tingloy at 0.607 person/ha. Although

Table 7.1a. Projected population, by municipality, Batangas Bay Region, 1991-2000.

Municipality	Growth Rate (%)	NSO Count	PROJECTED POPULATION (PERSONS)									
		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
PROVINCE	2.32	1,476,783	1,511,287	1,546,645	1,582,866	1,619,983	1,658,019	1,696,995	1,736,929	1,777,860	1,819,793	1,862,774
BATANGAS BAY REGION												
1. Coastal Areas												
Batangas City	2.57	184,970	189,724	194,600	199,601	204,730	209,992	215,389	220,924	226,602	232,426	238,399
Bauan	3.13	59,258	61,113	63,026	64,998	67,033	69,131	71,295	73,526	75,828	78,201	80,649
Mabini	2.57	30,474	31,257	32,060	32,884	33,730	34,596	35,486	36,398	37,333	38,292	39,276
San Pascual	2.82	34,606	35,606	36,610	37,642	38,704	39,795	40,917	42,071	43,257	44,477	45,732
Tingloy	1.43	15,430	15,651	15,874	16,101	16,332	16,565	16,802	17,042	17,286	17,533	17,784
Subtotal (Coastal)	**2.50**	**324,761**	**333,351**	**342,170**	**351,226**	**360,529**	**370,079**	**379,889**	**389,961**	**400,306**	**410,929**	**421,840**
2. Interior Areas												
Alitagtag	1.00	16,016	16,176	16,338	16,501	16,666	16,833	17,001	17,171	17,343	17,516	17,692
Cuenca	1.66	20,176	20,511	20,851	21,198	21,549	21,907	22,271	22,640	23,016	23,398	23,787
Ibaan	1.90	31,220	31,813	32,418	33,034	33,661	34,301	34,952	35,617	36,293	36,983	37,686
Lipa City	2.83	160,117	164,648	169,308	174,099	179,026	184,093	189,302	194,660	200,169	205,833	211,658
Lobo	1.10	26,881	27,177	27,476	27,778	28,083	28,392	28,705	29,020	29,340	29,662	29,989
Padre Garcia	2.85	25,958	26,698	27,459	28,241	29,046	29,874	30,725	31,601	32,502	33,428	34,381
Rosario	2.12	66,923	68,342	69,791	71,270	72,781	74,324	75,900	77,509	79,152	80,830	82,544
San Jose	3.01	38,680	39,844	41,044	42,279	43,552	44,862	46,213	47,604	49,037	50,513	52,033
Taysan	1.51	22,508	22,848	23,193	23,543	23,898	24,259	24,626	24,998	25,375	25,758	26,147
Subtotal (Interior)	**2.00**	**408,479**	**418,057**	**427,878**	**437,943**	**448,262**	**458,845**	**469,695**	**480,820**	**492,227**	**503,921**	**515,917**
TOTAL *(Coastal + Interior)*	**2.25**	**733,240**	**751,408**	**770,048**	**789,169**	**808,791**	**828,924**	**849,584**	**870,781**	**892,533**	**914,850**	**937,757**

Source: *OPPDC. Unpublished Data Files.*

Table 7.1b. Projected population by municipality, Batangas Bay Region, 2000-2020.						
Municipality	Growth Rate	PROJECTED POPULATION (PERSONS)				
	(%)	2000	2005	2010	2015	2020
PROVINCE	2.32	1,862,774	2,089,117	2,342,963	2,627,654	2,946,937
BATANGAS BAY REGION						
1. **Coastal Areas**						
Batangas City	2.57	238,399	270,649	307,261	348,827	396,015
Bauan	3.13	80,649	94,086	109,761	128,048	149,382
Mabini	2.57	39,276	44,589	50,621	57,469	65,243
San Pascual	2.82	45,732	52,554	60,394	69,404	79,758
Tingloy	1.43	17,784	19,092	20,497	22,005	23,624
Subtotal (Coastal)	**2.50**	**421,840**	**480,971**	**548,535**	**625,753**	**714,022**
2. **Interior Areas**						
Alitagtag	1.00	17,692	18,594	18,543	20,540	21,588
Cuenca	1.66	23,787	25,828	28,044	30,450	33,063
Ibaan	1.90	37,686	41,405	45,491	49,980	54,912
Lipa City	2.83	211,658	243,351	279,791	321,686	369,855
Lobo	1.10	29,989	31,675	33,456	35,337	37,324
Padre Garcia	2.85	34,381	39,568	45,537	52,406	60,312
Rosario	2.12	82,544	91,673	101,811	113,070	125,575
San Jose	3.01	52,033	60,350	69,996	81,184	94,160
Taysan	1.51	26,147	28,209	30,434	32,835	35,425
Subtotal (Interior)	**2.00**	**515,917**	**580,653**	**654,102**	**737,488**	**832,212**
TOTAL *(Coastal + Interior)*	**2.25**	**937,757**	**1,061,624**	**1,202,637**	**1,363,241**	**1,546,235**

Source: *Table 5.1.*

Table 7.2a. Projected population, coastal barangays in Batangas Bay, 1991-2000.											
Municipality	NSO Count	PROJECTED POPULATION (PERSONS)									
	(1990)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Batangas City	40,708	41,757	42,797	43,862	45,076	47,230	47,413	48,626	49,870	51,146	52,455
Bauan	18,336	18,939	19,528	20,131	18,273	18,846	19,435	20,043	20,671	21,317	21,984
Mabini	11,322	11,618	11,919	12,230	12,533	12,856	13,186	13,524	13,873	14,229	14,596
San Pascual	10,933	11,235	11,550	11,873	12,215	12,559	12,914	13,278	13,652	14,036	14,434
Tingloy	8,184	8,598	8,415	8,533	8,560	8,656	8,755	8,854	8,954	9,055	9,257
TOTAL	89,483	92,147	94,209	96,629	96,657	100,147	101,703	104,325	107,020	109,783	112,726
Source: *OPPDC.*											

Table 7.2b. Projected population, coastal barangays in Batangas Bay, 2000-2005-21010-2020.						
Municipality	Growth Rate	PROJECTED POPULATION (PERSONS)				
	(%)	2000	2005	2010	2015	2020
Batangas City	2.57	52,455	59,551	67,606	76,752	87,135
Bauan	3.13	21,984	25,647	29,920	34,905	40,720
Mabini	2.57	14,596	16,571	18,812	21,357	24,246
Pascual	2.82	14,434	16,587	19,062	21,905	25,173
Tingloy	1.43	9,257	9,938	10,669	11,454	12,297
TOTAL	2.50	112,726	128,293	146,069	166,373	189,571
Source: *Table 5.2*						
Note: *Municipality growth rates substituted for barangay growth rates*						

Table 7.3. Population density of Batangas Bay Region, 1990-2020.

Table 7.3. Population Density of Batangas Bay Region, 1990-2020.						
Municipality	Land Area	Projected Population Density				
	(Sq. Km)	1990	1992	1994	2000	2020
PROVINCE	31,667.10	46.63	48.84	51.16	58.82	93.06
BATANGAS BAY REGION						
1. Coastal Areas						
Batangas City	2,829.60	65.37	68.77	72.69	84.25	139.95
Bauan	666.00	88.98	94.63	58.94	121.09	224.30
Mabini	429.60	70.94	74.63	38.09	91.42	153.27
San Pascual	349.50	99.08	104.75	101.08	130.85	228.21
Tingloy	324.30	47.58	48.95	50.36	54.84	72.85
Subtotal (Coastal)	**4,599.00**	**70.62**	**74.40**	**78.39**	**91.72**	**155.26**
2. Interior Areas						
Alitagtag	243.40	65.80	67.12	68.47	72.69	88.69
Cuenca	403.60	49.99	51.66	53.39	58.94	81.92
Ibaan	989.50	31.55	32.76	34.02	38.09	55.49
Lipa City	2,094.00	76.46	80.85	85.49	101.08	176.63
Lobo	1,926.80	13.95	14.26	14.57	15.56	19.37
Padre Garcia	937.40	27.69	29.29	30.99	36.66	64.34
Rosario	1,694.30	35.33	36.84	38.42	43.57	66.29
San Jose	494.70	78.19	82.97	88.04	105.18	190.34
Taysan	1,093.60	20.58	21.21	21.85	23.91	32.39
Subtotal (Interior)	**10,077.30**	**40.53**	**42.46**	**44.48**	**51.20**	**82.58**
TOTAL	**14,676.30**	**49.96**	**52.47**	**55.11**	**63.90**	**105.36**

Mabini showed a low population density for its coastal barangay, this figure reflects the bay side only and not the entire municipality.

Municipal Populations

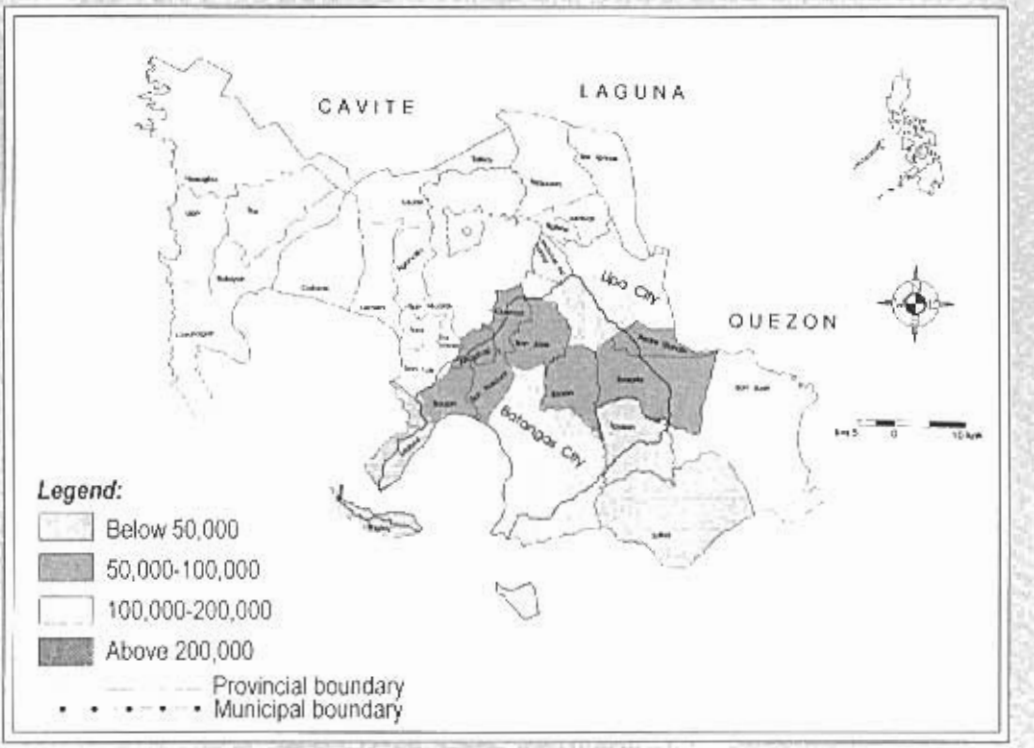
In the bay region, the 1990 census showed that 10 municipalities had populations below 50,000 (*See Figure 7.1*). These were Alitagtag, Cuenca, Ibaan, Lobo, Mabini, Padre Garcia, San Jose, San Pascual, Taysan, and Tingloy. Two municipalities – Bauan and Rosario – had populations in the 50,000 to 100,000 range; while Batangas City and Lipa City had populations in the 100,000 to 200,000 range.

In terms of gender types, the population in communities within the region was evenly distributed among the gender types, based on the 1990 census (*See Figure 7.2*). In some places, the males exceeded females by a few percent but the difference appears insignificant. By 2020, the populations of five municipalities in the bay region – Alitagtag, Cuenca, Lobo, Taysan, and Tingloy – are expected to remain below 50,000 (*See Figure 7.3*). Batangas City and Lipa City are projected to have populations exceeding 200,000.

Urban-rural Populations

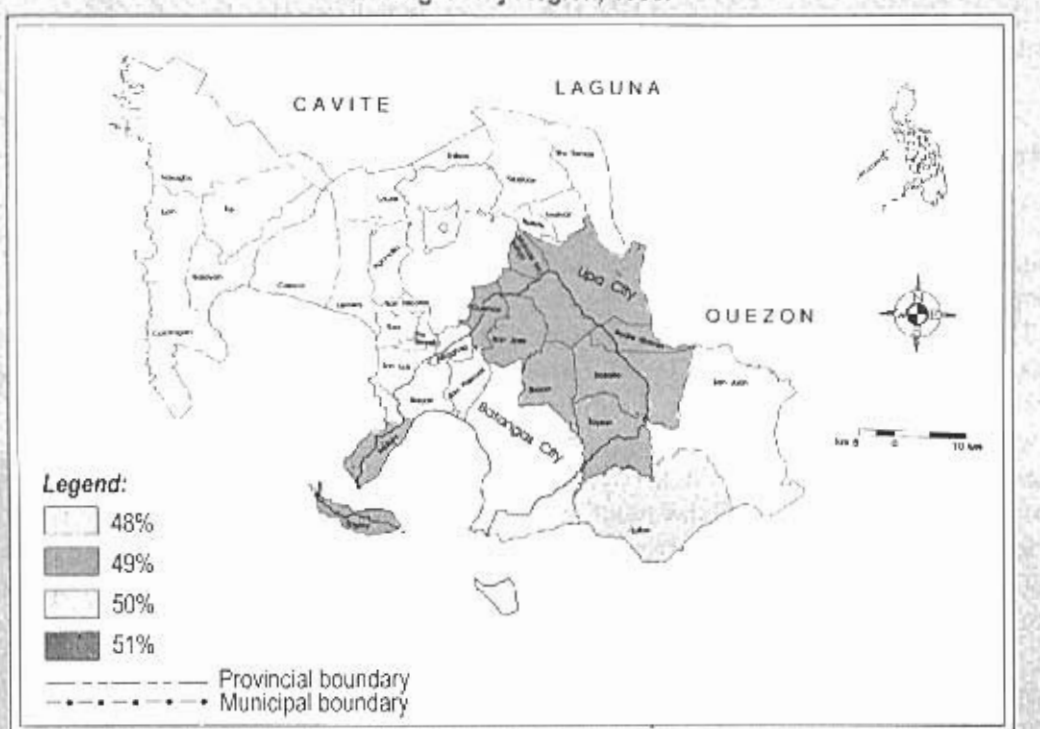
In 1990, the region's rural population was 68.94 percent of its total population. Significant rural populations were in the interior municipalities. Rural and urban populations were about equally distributed in the urbanizing municipalities like Batangas City, Lipa City, San Pascual, Cuenca, and

Figure 7.1. Population of municipalities in the Batangas Bay Region, 1990.



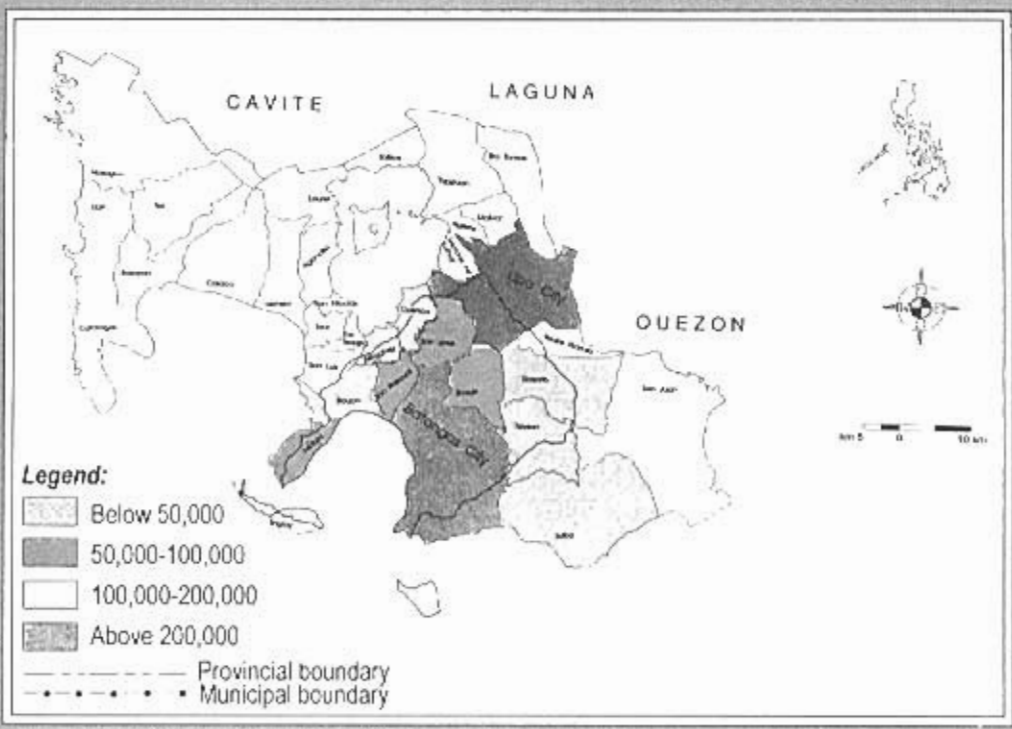
Source: *OPPDC, Unpublished Data Files.*

Figure 7.2. Percentage of the female population in the municipalities of the Batangas Bay Region, 1990.



Source: *NSO, 1990 Census on Population and Housing.*

Figure 7.3. Population of municipalities in the Batangas Bay Region, 2020.



Source: OPPDC, Unpublished Data Files.

Bauan. The general projection trend (1990-2002) is that urban population in these municipalities, except Bauan, will continue to increase, particularly for Batangas City (62.48%), Lipa City (59.10%), and San Pascual (64.75%). In this context, rural population refers to the population located outside of the *poblacion* and its suburbs. Bauan, which is within the region's industrial zone and contiguous with San Pascual, will most likely increase in urban population as a result of industrialization. The decrease in its urban population from 23.77 percent (1990) to 19.84 percent (2002) is attributed to a scenario in which Bauan will become a medium instead of a large town. This scenario restricts Bauan's industrialization. The most likely trend, however, is that Bauan will become urbanized as a result of industrialization and because it

Table 7.4. Projected population density, coastal barangays in Batangas Bay.

Municipality	Land Area (ha)	2000	2005	2010	2015	2020
Batangas City	2,074.76	25.28	28.70	32.59	36.99	42.00
Bauan	476.54	46.13	53.82	62.79	73.25	85.45
Mabini	1,139.27	12.81	14.54	16.51	18.75	21.28
San pascual	571.74	25.25	29.01	33.34	38.31	44.03
Tingloy	3,809.88	2.43	2.61	2.80	3.01	3.23
TOTAL	**8,072.20**	**13.96**	**15.89**	**18.10**	**20.61**	**23.48**

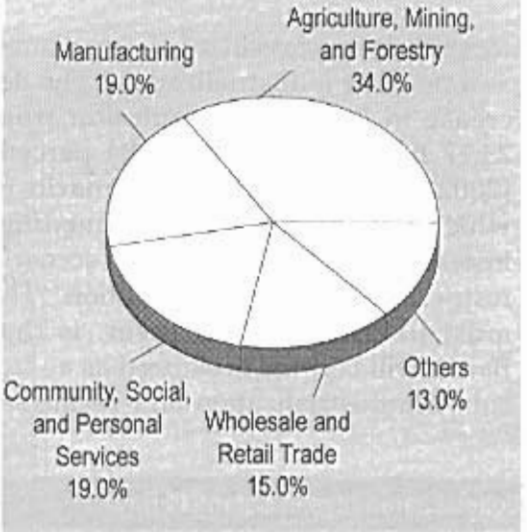
has a longer coastline than San Pascual which is ideal for the transhipment of raw and export materials. Of the 75 industrial establishments in the bay region in 1994, about 22 are located in Bauan.

EMPLOYMENT

Sectoral Employment

For Batangas, the agriculture and forestry sector had the largest employment in 1990, contributing 33 percent of the total provincial workforce. This trend is expected to go up by 2002, although growth will not be substantial compared to other sectors like trade, finance, real estate, and construction. These latter sectors had posted over 80

Figure 7.4. Employment by sector in Batangas Province.

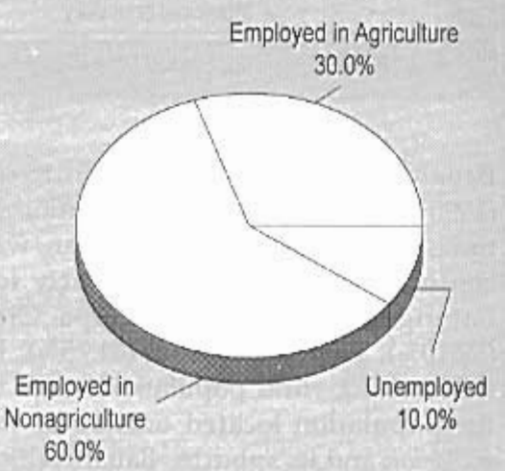


Source: *Socioeconomic Profile of Batangas Province, 1990.*

percent growth from 1980 to 1990 and expected to increase over 160 percent between 1990 to 2002. In 1990, the other sectors with the biggest employment were trade (79,089), manufacturing (88,099), private service (61,102), and construction (43,581). Figure 7.4 shows the employment profile by sector for the Batangas province.

The working age population (15 years old and above) of Batangas in 1993 was about 62.57 percent of its total population of which 58.60 percent were in the labor force (also known as labor-force participation rate, or LFPR). The working population is expected to increase by 29 percent by the year 2002; but the LFPR will remain steady. In terms of employment rate, however, about 10 percent was estimated to be unemployed. This trend is projected to remain the same for the year 2002.

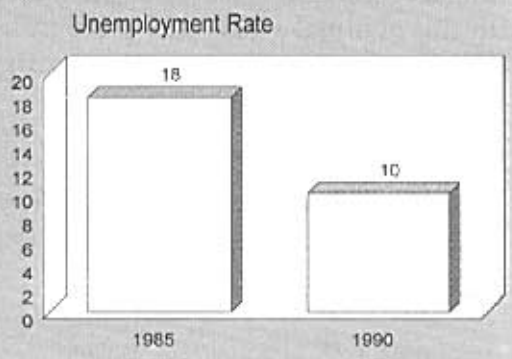
Figure 7.5. Household population in labor Force, 1990, in Batangas Province.



Source: *Socioeconomic Profile of Batangas Province.*

Available employment information for 1990 showed that the provincial labor force totaled 555,000, which was about 63 percent of the provincial working age population. Of those in the labor force, 10 percent were unemployed, 30 percent were employed in agriculture activities, and 60 percent were employed in nonagriculture activities (*See Figure 7.5*).

Figure 7.6. Unemployment rate in Batangas Province, 1985 and 1990.



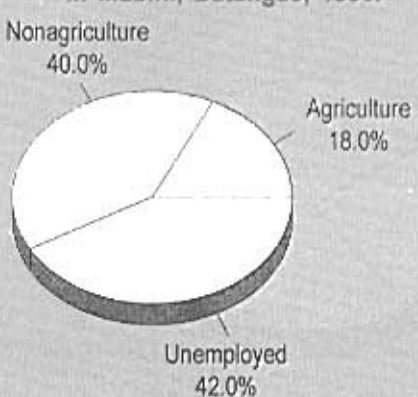
Source: *Socioeconomic Profile of Batangas Province, 1985 and 1990.*

The percentage of unemployed people in Batangas, belonging to the labor force, fell from 18 percent in 1985 to 10 percent in 1990 *(See Figure 7.6)*. This indicated that the employment situation in the province had improved in recent years.

Labor Force and Employment in the Coastal Communities of the Batangas Bay Region

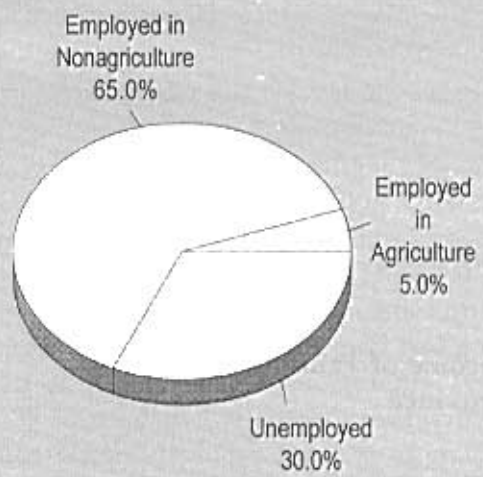
Data on the labor force and employment situation for many of the region's municipalities were not available. Only rough data for the coastal towns of Mabini (for 1993) and San Pascual (for 1989) were available. Based on such data, about 13,130 persons were in the labor force for Mabini in 1993. Of these, 42 percent were unemployed, 18 percent were employed in agriculture, while 40 percent were employed in other sectors *(See Figure 7.7)*.

Figure 7.7. Labor force and employmer in Mabini, Batangas, 1993.



Source: *Socioeconomic Profile of Mabini, Batangas.*

Figure 7.8 Labor force and employment in San Pascual, Batangas,1993

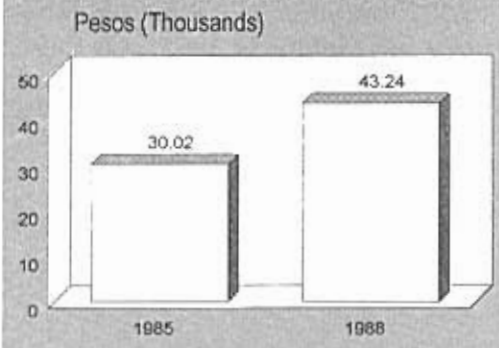


Source: *Socioeconomic Profile of San Pascual, Batangas.*

In San Pascual, the labor force totaled 22,196 persons in 1989. Of this number, 30 percent were unemployed, 5 percent worked in agriculture, and 65 percent were employed in nonagriculture sectors *(See Figure 7.8)*.

In retrospect, the unemployment rates appeared to be relatively higher in Mabini and San Pascual as compared to the whole province. Moreover, the agricultural sector was relatively less important in the two municipalities but not at the provincial level.

Figure 7.9. Average annual income of families in Batangas Province in 1985 and 1988.



Source: NSO 1985 and 1988 Family Income and Expenditure Surveys.

INCOME

Income of Families in Batangas Province

The average annual income of families in Batangas rose from ₱30,020 in 1985 to ₱43,240 in 1988 *(See Figure 7.9)*, showing an average growth rate of about 15 percent yearly. However, much of the increase may be attributed to the nominal wage and price inflation occurring all over the country through the years.

Between 1985 and 1988, the number of families in Batangas Province under the low-income groups (below ₱20,000 per year) had fallen; while those under the high-income groups (above ₱40,000 per year) increased *(See*

Figure 7.11. Literacy rate, Batangas Province, 1990.

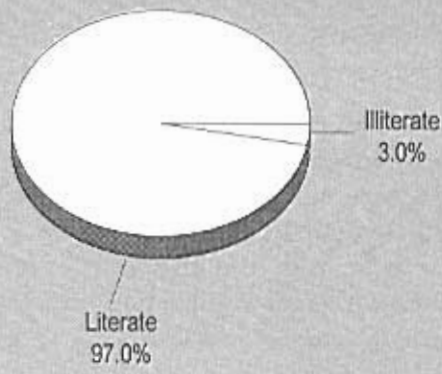
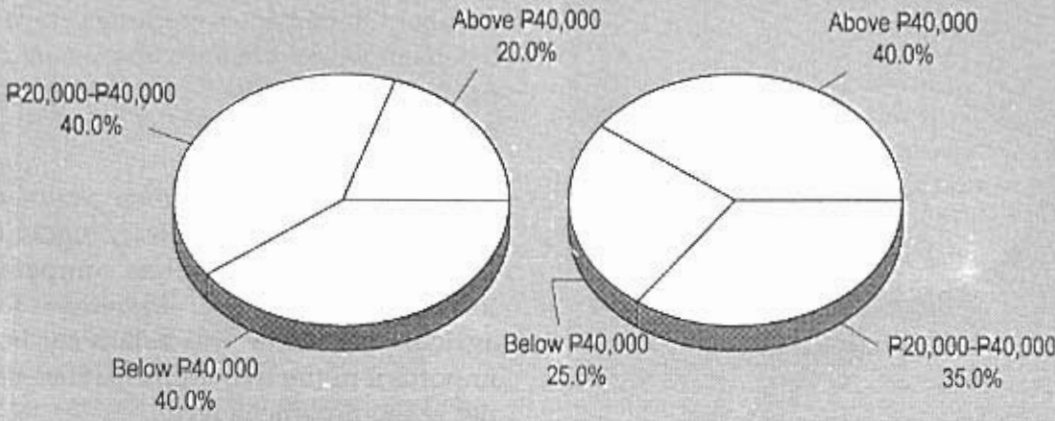
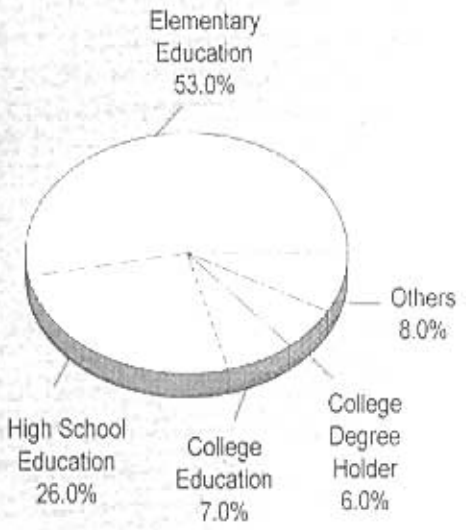


Figure 7.10. Families by income class per year, Batangas Province, 1985 and 1988.



Source: NSO 1985 and 1988 Family Income and Expenditure Survey.

Figure 7.12. Household population by highest educational attainment, Batangas Province, 1990.



Source: NSO 1990 Census of Population.

Figure 7.10). This would imply an improvement in income distribution in the province but it may also be interpreted as a result of the inflationary trend in wages and prices in recent years.

EDUCATION

Literacy Rate

The Batangas Province reports a very high literacy rate. In 1990, the whole province, including the bay region, showed a 97-percent literacy rate *(See Figure 7.11).*

Educational Attainment

Although the literacy rate of the population appeared high, only a small percentage acquired high-level education. In 1990, only 6 percent of the household population was college-degree holders and 7 percent had been to college *(See Figure 7.12).* Majority of the population reached only the high school (26%) and elementary (53%) levels.

HEALTH

Health Establishments in Batangas Province

There are 60 hospitals in the province; 45 are privately owned. The largest hospital is the Batangas Regional Hospital located in Batangas City. A more modern one is found in Lipa City – Mary Mediatrix Medical Hospital. It is equipped with new diagnostic equipment. In 1990, the bay region had a total of 322 health establishments, with 137 located in the coastal municipalities. These hospitals need to be upgraded in terms of facilities (equipment, operating rooms, patient, and outpatient rooms) and capacity (medical manpower), as the current level is not enough to cater to the health needs of the remote areas.

Nutrition

From a survey conducted in 1990, the communities in the bay region had a high malnutrition rate, based on the percentage of underweight children over the total number of children. This indicated that, in all the communities in the bay region, at least half of the total child population were underweight. One town reported an alarming underweight child population between 70 to 80 percent.

Sources of Drinking Water

At least 50 percent of the population in seven communities of the bay region obtained their drinking water from non-community water systems, such as wells and open-water bodies, which are usually untreated. Sourcing potable water from non-community systems seems to be more prevalent in the interior areas than in the coastal areas, except in Tingloy.

Sources of Cooking Fuel

The use of wood as cooking fuel is more prevalent in the interior areas of the region than in the coastal areas. In 1990, at least 25 percent of the populations in the towns and cities of the bay region used wood as cooking fuel. Three communities, including Lipa City, reported that at least 1/2 of the population used wood for cooking; while in 9 communities, it was 2/3.

Toilet Facilities and Garbage Disposal by Households

In 1990, the use of nonwater-sealed toilet facility was practiced by at least 25 percent of the population of the bay region, except in Bauan and San Pascual. In general, nonwater-sealed toilet facility was used more in interior municipalities, except in Tingloy, than in coastal communities.

Due to the inadequate and inefficient garbage collection system — of which about 60 percent are collected at any one time — uncollected solid wastes are disposed in various ways. The most common practice among households in the bay region is by burning. At least 50 percent of the populations of the towns use it, although burning is more prevalent in the interior than in the coastal areas. The rest are either buried or thrown indiscriminately anywhere.

Institutional and Legal Frameworks

Chapter 8.
INSTITUTIONAL AND LEGAL FRAMEWORK

OVERALL INSTITUTIONAL FRAMEWORK

The Batangas Bay area is administered jointly by the government and nongovernment institutions. The government institutions involved in the management of the bay include the Department of Environment and Natural Resources (DENR), the Philippine Coast Guard (PCG), the Philippine Ports Authority (PPA), Department of Agriculture (DA), Department of Education, Culture, and Sports (DECS), and the local government units composed of the provincial and municipal governments. On the other hand, the private sector includes the firms and corporations located in the bay region, the Batangas Coastal Resources Management Foundation, Inc., other NGOs, and local communities.

As shown in Table 8.1, all functions related to the management of the Batangas Bay Region are covered by various institutions, displaying some overlaps.

A brief profile of the government and nongovernment institutions tasked with various responsibilities related to managing the bay region is presented below.

Government Agencies

National Government

(a) Department of Environment and Natural Resources (DENR)

The DENR takes charge of the conservation, management, development, and proper use of the country's environment and natural resources. It is tasked with the formulation of rules and regulations for the control of water, air, and land pollution, and the promulgation of ambient and effluent standards for water and air quality, including the allowable levels of pollutants and radiation.

It has a specialized agency – the Environmental Management Bureau (EMB) – whose main responsibility is to execute its mandate for environmental protection. Aside from the EMB, the DENR has regional, provincial, and local offices that handle environmental matters at different administrative levels. These are the Regional Environment and Natural Resources Office (RENRO) and its field offices, namely: the Provincial Environment and Natural Resources Office (PENRO) and the Community Environment and Natural Resources Office (CENRO).

Environmental Management Bureau (EMB). The main functions of the EMB include the following:

- provide technical advise and guidance to regional offices in matters relating to environmental management and pollution control;
- recommend legislative policies and programs for environmental management and pollution control;
- formulate environmental quality standards for water, air, land, noise, and radiation;

Table 8.1. Jurisdiction of agencies over the management of Batangas Bay Region.

FUNCTION	DENR				PCG		PPA	DA	DECS	PROVINCIAL GOVERNMENT				MUN/ CITY	NGO		PRIV SEC
	EMB	RENRO	PENRO	CENRO	NOCOP	EMPO				PAO	ENRO	PPDO	TO		BCRMF	COMDA	
1. Resource Management																	
Fisheries																	
Aquaculture																	
Coral Reef																	
Agriculture																	
Land																	
Mineral																	
Forest																	
2. Environmental Management																	
Pollution control																	
a. land-based																	
b. sea-based																	
Waste Management																	
3. Shipping Port Management																	
4. Tourism																	
5. Human Settlement																	
6. Land Use/Zoning																	
7. Resource Planning																	
8. Policy Formulation																	
9. Environmental Education																	
10. Industrial Management																	
11. Law Enforcement Mgt																	
12. Community Organizing																	

- recommend regulations for environmental impact assessments and provide technical assistance for their implementation and monitoring;

- formulate rules and regulations for the proper disposition of solid wastes, toxic, and hazardous substances; and

- provide technical assistance to the Pollution Adjudication Board.

The EMB laboratory is the only one that meets international specifications. This laboratory extends its support to the regional and field offices, in terms of conducting the laboratory analysis of samples collected in the field. However, since the EMB provides services to all regions, it is unable to regularly accommodate requests for water quality examination of the Batangas Bay. Therefore, the latter task is transferred to the DENR Region IV.

Field Offices of DENR. The DENR has regional, provincial, and community offices mandated to implement its plans and programs at the field level. With respect to the management of Batangas Bay, the Environmental Management and Protected Areas Service (EMPAS) of Region IV is given the responsibility for implementing the laws, policies, rules, and regulations on environmental protection, including monitoring water quality and the compliance of the industries near the bay.

The PENRO and the CENRO of Batangas City provide support to EMPAS in the collection of information required by the regional office. Their roles in environmental monitoring have been limited and constrained by the lack of personnel with expertise in monitoring and by the absence of necessary facilities and equipment. In fact, the regional office has only two staff assigned to monitor all the industries in the CALABARZON area. Thus, the regular monitoring of environmental quality in Batangas Bay becomes difficult to achieve.

(b) Philippine Coast Guard (PCG)

The PCG is mandated to prevent, control, and mitigate marine pollution in coordination with DENR. In Batangas, the Marine Environment Protection Office (MEPO) of the Fifth Coast Guard District is tasked with the prevention, containment, and control of pollution in Batangas Bay. It also assists other agencies, such as the Bureau of Fisheries and Aquatic Resources (BFAR), in the enforcement of laws, rules, and regulations concerning illegal fishing and the DENR in the enforcement of laws related to the shipment of illegally cut logs. Likewise, it provides surveillance services within its area of jurisdiction, as well as to other agencies needing its services.

The MEPO is staffed by one officer and six enlisted men who are familiar with the rules and regulations on marine pollution and trained in the use of equipment for oil and chemical spill containment.

Under the PCG is the National Operations Center for Oil Pollution (NOCOP), which is responsible for marine protection of the whole country, including the inception of a national oil spill contingency plan. It is also responsible for providing the necessary training to PCG and MEPO personnel in the prevention and control of oil spills.

The PCG's NOCOP coordinates with industries, like Shell and Caltex refineries, in the event of an oil spill. These two companies possess the capability, equipment, and technical personnel to combat oil spills in Batangas Bay and in other parts of the country.

(c) Philippine Ports Authority (PPA)

The PPA, through its Port Management Unit (PMU) in Batangas City, controls the ports located in the provinces of Quezon, Aurora, Oriental and Occidental Mindoro, Marinduque, and Batangas. One of the functions of the PMU is to control marine pollution in coordination with DENR, PCG, and the local governments. The PPA and the DENR, PCG, and other national agencies are currently discussing the possibility of drawing up a memorandum of agreement to address the issues on waste disposal and management, particularly with regard to the provision of reception facilities to contain wastes at the port and from seafaring vessels.

(d) Maritime Industry Authority (MARINA)

The MARINA is mandated to develop and formulate plans, programs, projects, standards, specifications, and guidelines geared towards the promotion and development of the maritime industry. It is also tasked to ensure the growth and effective regulation of shipping enterprises and for the national security objectives of the country. The issuance of the certificate of competency to seamen which used to be the function of the Maritime Training Council has been transferred to the MARINA. The MARINA also undertakes the safety regulatory functions pertaining to vessel construction and operation, including the determination of manning levels. In addition, it enforces laws, prescribe and enforce rules and regulations, including penalties for violation governing water transportation and the Philippine Merchant Marine, and deputize the Philippine Coast Guard and other law enforcement agencies to effectively discharge these functions.

Other functions of the MARINA include the following:

- establish, prescribe, and regulate routes, zones, and areas of operation of particular operators of public water services;
- issue Certificates of Public Convenience for the operation of domestic and overseas water carriers;
- register vessels and issue certificates, licenses, or documents necessary or incident thereto;
- undertake the issuance of licenses to qualified seamen and harbor, bay, and river pilots;
- determine, fix, and prescribe charges pertinent to the operation of public water transport utilities, facilities, and services except in cases where charges or rates are established by international bodies or associations of which the Philippines is a participating member; and
- accredit marine surveyors and maritime enterprises engaged in shipbuilding, ship repair, ship breaking, domestic and overseas shipping.

(e) Department of Agriculture (DA)

The DA, through its various agencies, such as the Bureau of Soils and Water Management (BSWM), BFAR, and Fertilizer and Pesticide Authority (FPA), has adopted the policy of sustainable development by integrating measures to conserve soils and fishery resources and to protect water quality in its development programs and projects at the national and regional levels.

The BSWM is responsible for soil and water conservation in agricultural areas. Its soil erosion control program aims to minimize loss of top soil and reduce sediment pollution of streams, rivers, and coastal waters. At present, it has no soil conservation project for the bay region.

The BFAR collaborates with the DENR in the rehabilitation of coral reefs and in the protection of fishery resources. It also works closely with the PCG in the prevention of marine pollution and in the implementation of fishery laws. Being a staff bureau, its operations in the field, including the region, are very much confined and limited.

The FPA's main concern is the regulation of agricultural chemicals – manufacturing and marketing – to protect the public and the environment from the risks inherent in chemicals. It is also tasked with educating the agricultural sector on the hazards and proper use of fertilizers and pesticides.

(f) Department of Education, Culture and Sports (DECS)

The DECS is one of the agencies providing environmental education to the public with the youth sector as the major client. It has incorporated the concepts and practices of environmental protection and natural resources conservation into the curricula of the elementary and high schools. In 1980, the DENR – with DECS support – selected Batangas Province as a pilot area for launching its Soil Erosion Control Education Program, which integrated soil conservation concepts in the curriculum of selected elementary and high school institutions in the province.

The Local Government Units (LGUs)

The local government units (LGUs), by virtue of the Local Government Code (LGC), are mandated to participate in the management and protection of the environment and natural resources in their localities. They are tasked to implement functions related to environmental management which were conferred to them by the DENR, DA, and other agencies. Hence, they play an important role in the administration of the bay region.

(a) Provincial Government

Four offices under the provincial government are directly involved in the planning and management of the environment. These are the Office of the Provincial Planning and Development Coordinator (OPPDC), Environment and Natural Resources Office (ENRO), Provincial Tourism Office (PTO), and Provincial Agriculture Office (PAO). Figure 8.1 presents the organizational chart of the provincial government of Batangas.

By virtue of the authority vested by the LGC, the provincial government of Batangas exercised DENR functions by creating the Environment and Natural Resources Office (ENRO) in January 1996.

Details of the functions of the OPPDC, ENRO, PTO, and PAO are provided as follows:

Office of the Provincial Planning and Development Coordinator (OPPDC). The OPPDC is tasked with the consolidation of the province's overall plans, including the preparation of the land use and zonation plan, physical framework plan, and environmental protection.

Environment and Natural Resources Office (ENRO). The ENRO of Batangas is under the Office of the Provincial Governor serving as its environmental management arm. The ENRO has the following functions:

- enforcement of pollution control and environmental protection laws, rules and regulations; issuance of Environmental Compliance Certificates (ECCs) for small projects and businesses, such as those under *Kalakalan 20*; adjudication of cases involving complaints against businesses under *Kalakalan 20*; apprehension and testing of smoke-belching vehicles; and collection of appropriate fees and charges;

- formulation of environmental management systems and services related to general hygiene and sanitation, such as the implementation of solid wastes and other sewage disposal mechanisms;

- implementation of cease-and-desist orders issued by the Pollution and Adjudication Board;

- issuance of permits for guano collection, special permits for pebble-picking operations along beaches and shorelines subject to existing mining laws (such as the *Batas Pambansa Bilang 265*), and permits for the extraction of sand and gravel and other quarry resources for areas not more than 20 hectares.

The ENRO of Batangas Province currently employs 27 permanent and seven contractual staff. Four of the technical staff were previously connected with the DENR's Social Forestry Program. Thus, staff expertise is limited to forestry-related activities. The ENRO does not yet possess qualified staff to handle the pollution control aspects of environmental management.

Provincial Tourism Office (PTO). The PTO, under the Batangas Provincial Government is responsible for the licensing and regulation of the operation and maintenance of resorts, hotels, tourist inns, apartment hotels, professional congress organizers, travel agencies, tourist guides, and tourist transports. Other functions of the PTO include the following:

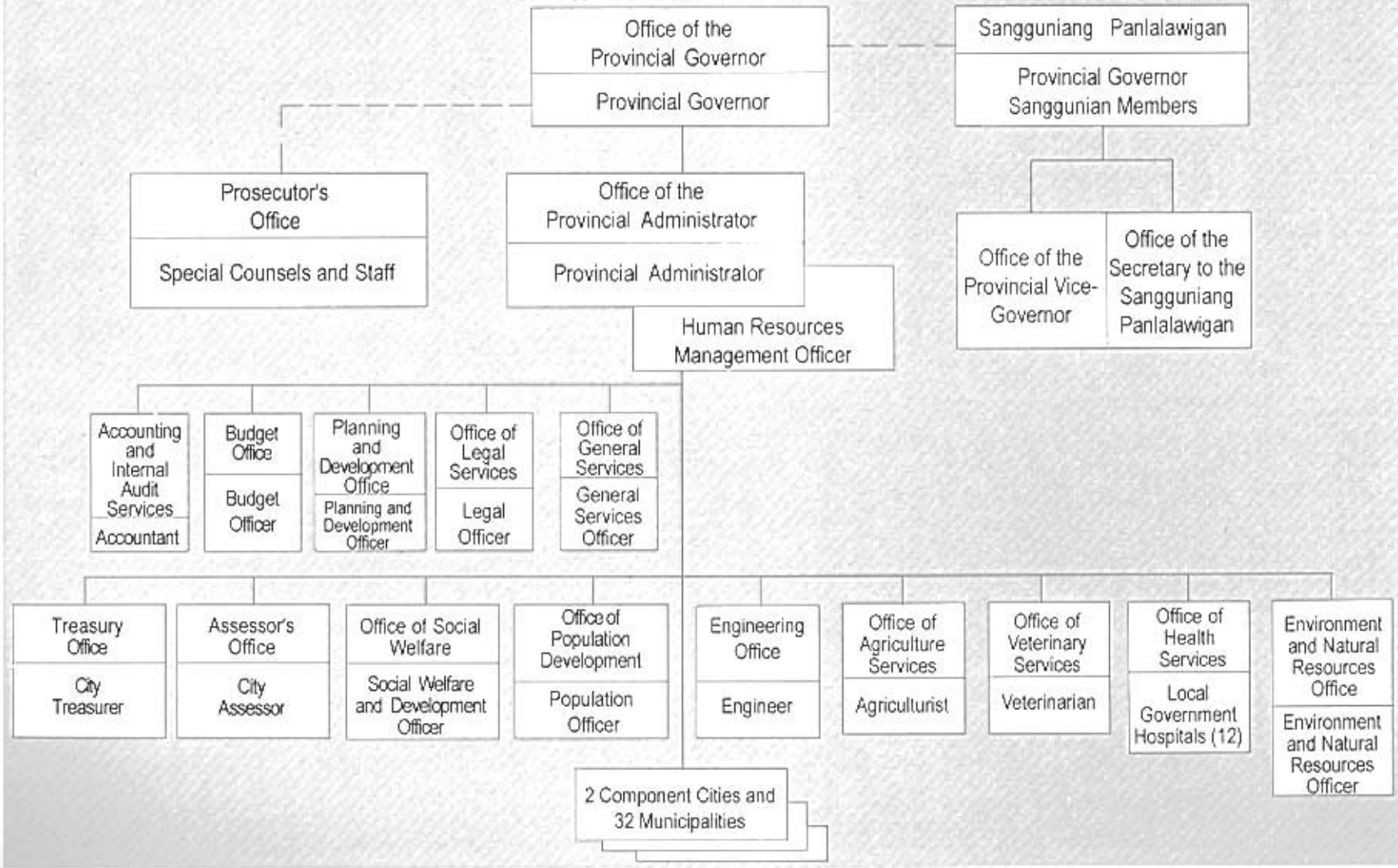
- approval of the construction and establishment of all development projects for tourism purposes;

- development of social tourism infrastructure projects, such as public plazas, parks, lightings, and landscaping of main thorough-fares; and

- protection of coastal resources which attract tourists in the region.

Provincial Agriculture Office (PAO). The PAO is responsible for the implementation of fisheries programs and projects in the coastal and island municipalities of Batangas. The PAO

Figure 8.1. Organizational chart of the Provincial Government of Batangas.



was recently absorbed by the provincial government from the DA as a result of devolution promulgated under the LGC.

In general, the PAO is given the responsibility for promoting the sustainable development of agriculture in the province. Its efforts focus on the improvement of the quality of life of small farmers and fisherfolk through better production and increased income. Specifically, it is mandated to provide the necessary services and support that will facilitate sustainable production by small farmers and fisherfolk. It also aims to increase the real income of small farmers and fisherfolk by helping them establish self-help organizations that will aid in the realization of profitable agribusiness enterprises in the long term.

(b) Municipal/City Government

The municipal and city governments jurisdiction with respect to environmental management has been expanded following the implementation of the Local Government Code of 1991. They are now vested with powers and functions giving them greater latitude in the management of natural resources in their localities.

Part of their responsibilities lies in maintaining the cleanliness of their surroundings through the proper disposal of wastes, conservation of natural resources, and enforcement of rules, regulations, and ordinances to support and operationalize existing environmental laws.

In the bay region, some of the municipalities have taken active roles in environmental management with the issuance and implementation of ordinances and the launching of environmental awareness and consciousness programs. However, coordination among the coastal municipalities for the protection of the bay still remains weak.

The organizational charts of the city of Batangas and the municipality of Bauan are shown in Figures 8.2 and 8.3 to illustrate the typical units or offices comprising these local governments. Except for the ENRO and the PTO, the city and municipal governments also have the Planning and Development and the Agriculture Offices, which are directly involved in local environmental planning and management. They also have two separate offices for the issuance of permits and licenses and for the maintenance of health and sanitation services.

The Private Sector

The industries located along Batangas Bay claim that they are equipped with environmental protection units that handle the proper disposal of their wastes. There are no adequate data nor completed studies that assess the technical capability of these units and the efficiency of the pollution control facilities of these industries.

Nongovernment Organizations (NGOs)

(a) Batangas Coastal Resources Management Foundation, Inc. (BCRMF)

The BCRMF was organized in 1991 and composed of representatives from the 12 firms operating within the bay and the provincial governor. The functions of BCRMF are:

- to promote sustainable develop-

Figure 8.2. Organizational chart of the Batangas City Government.

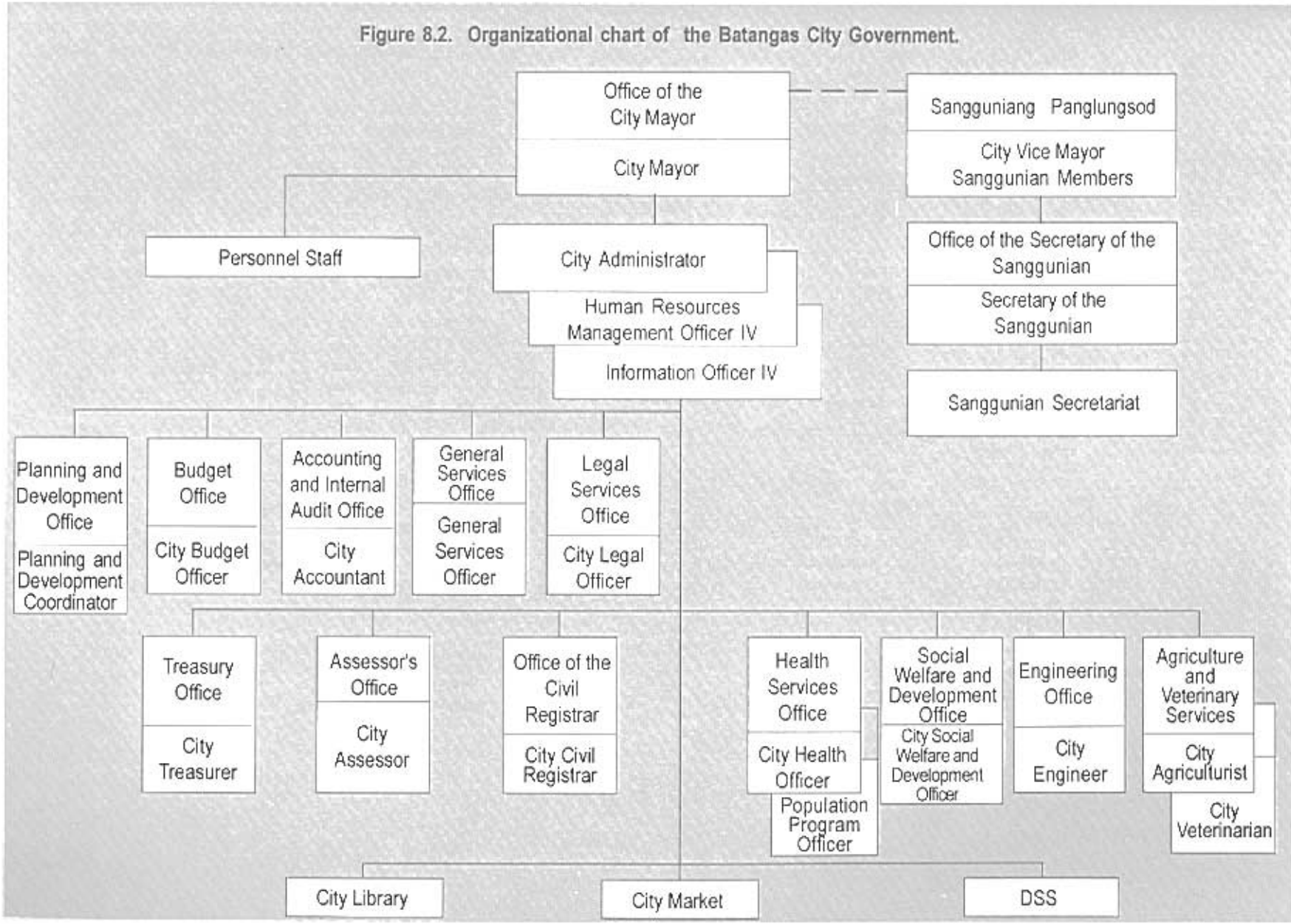
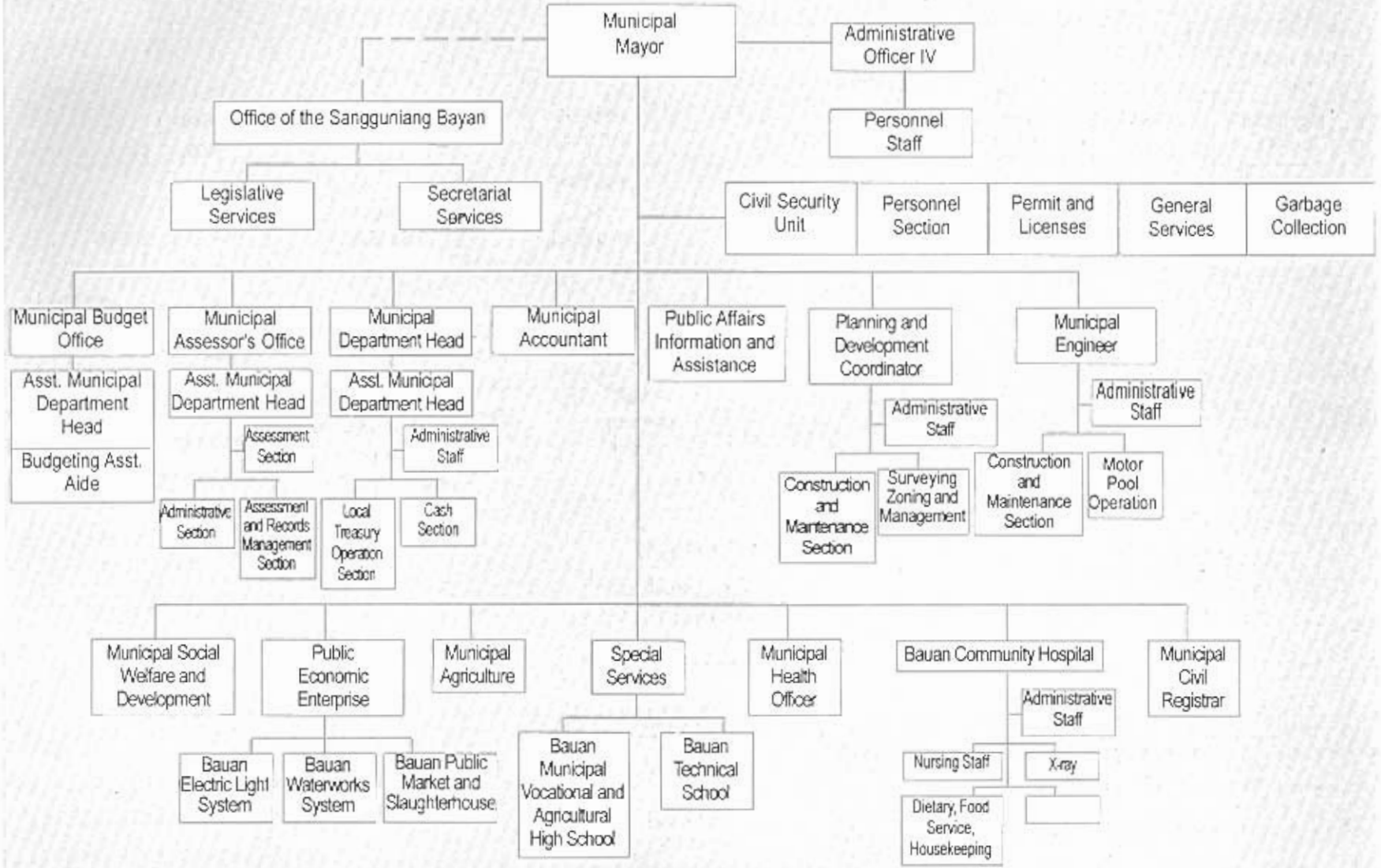


Figure 8.3. Organizational chart of the Municipality of Bauan, Batangas.



Source: *Municipal Government of Bauan, Batangas.*

ment of the Batangas Bay coastal resources;

- to encourage the development and implementation of integrated, interdisciplinary, and comprehensive coastal resources management plans;

- to strengthen the management capabilities of government and nongovernment organizations responsible for the management of coastal resources;

- to explore ways and means by which the public and private sectors can cooperate and benefit from the efforts to develop Batangas Bay coastal resources;

- to implement and rigorously enforce effective regulations and support incentive schemes for the promotion of sustainable uses of Batangas Bay coastal resources;

- to increase the awareness of the coastal population regarding their critical dependence on the continued productivity of the coastal resources; and

- to promote community-based participation in coastal area management.

The BCRMF — in coordination with the local governments and the different national line agencies — launched a public awareness program called *Kilos Kabayan para sa Kalikasan* or KKK (Citizen's Action for Nature). The KKK's mission is to organize an environmental movement which will foster the reorientation of values and practices necessary for the sustainable development of the environment. Its primary goal is to increase environmental awareness, geared towards systematic waste management in the Batangas Bay area. For its first project, the organizers held a contest in search of the cleanest barangay, participated in by the four towns along Batangas Bay. KKK municipal chapters have already been organized in all coastal municipalities and cities, except the municipality of Mabini.

The presence of an active multisectoral organization, dedicated to the protection of Batangas Bay, facilitated the passage and approval of a Memorandum of Understanding on the Integrated Coastal Zone Management (ICZM) of Batangas Bay. This agreement was signed by the official representatives of the UNDP and IMO (the initiators of this agreement), the DENR, the provincial and local governments, and the BCRMF. The member agencies committed to forge an alliance for the management of the bay through the Batangas Bay Demonstration Project.

The foundation members are given the following responsibilities in the ICZM Program:

- UNDP and IMO takes charge of technical guidance, training, and logistical support to the project.

- DENR is tasked to detail staff to help implement the project, provide office facilities, extend support from its CENRO and PENRO, provide data/information, and undertake monitoring of project activities.

- The provincial and municipal governments are responsible for establishing a management task force to participate in the project and provide office space, facilities, and support staff.

- BCRMF provides information and shares its facilities with the project. It has recommended the use of the KKK as a medium for communication and information.

(b) Other NGOs

There are reportedly other NGOs, mostly community associations of local communities, operating along Batangas Bay. Secondary information gathered from the provincial government concerning the activities of these NGOs is very limited. A survey of these NGOs and their role in the utilization, conservation, and protection of coastal resources in Batangas Bay is important to determine their potentials in contributing to the management of the bay.

(c) Pollution Control Association of the Philippines (PCAPI)

The PCAPI is a national association concerned with training, research, and advocacy on pollution control and waste management. It also provides assistance to its member companies and other industries on matters relating to compliance with government environmental standards and regulations and in the adjudication of pollution cases. No information is available regarding the membership of industries located in the Batangas Bay area to this association.

OVERALL LEGAL FRAMEWORK

Profile of Environmental Legislation

The country is replete with environmental laws, regulations, and implementing guidelines. The main problem always lies with enforcement. The mediocre performance of the government in the enforcement of environmental laws is deeply rooted in its lack of funds, manpower, facilities, and equipment. The tedious process of monitoring and law enforcement exhausts both the meager resources of government agencies and the patience of their personnel. Unless the necessary support infrastructures and mechanisms are put in place, enforcement will remain a difficult task for most agencies of the government.

The following section presents an inventory of laws, rules, regulations, implementing guidelines on marine environmental protection, and other related laws both at the national and local levels. Ordinances issued by the coastal municipalities of Batangas Bay are also included.

National Legislation

(a) The Philippine Environmental Policy (Presidential Decree No. 1151)

This decree promulgates the state policy on environmental protection and natural resource conservation that is necessary to sustain the development of the national economy. Under this decree, an Environmental Impact Statement (EIS) is required in any development undertaking that will affect the quality of the environment. Compliance to this EIS provision is required from both the public and private sectors.

(b) The Philippine Environment Code (Presidential Decree No. 1152)

This decree elaborates on the provisions of PD 1151 by providing guidelines and standards for air and water quality, land use management, natural resource management, conser-

vation of fisheries and aquatic resources, wildlife/forestry and soil conservation, mineral resources, and waste management. Among the provisions of the decree applicable to the management of the bay are the sections on water quality, land use, natural resources, conservation, and waste management.

Under the provisions on waste management, guidelines have been drawn to include the responsibility of local government to define measures facilitating efficient and effective waste management. The section also prohibits the dumping of solid and liquid wastes into the sea lanes, shorelines, and river banks.

(c) Water Code of the Philippines (Presidential Decree No. 1067)

This decree contains provisions prohibiting the dumping of sewage, industrial wastes, or any substances that will pollute water supply sources or water bodies, such as rivers and waterways. It also penalizes the dumping of mine tailings and sediments into rivers and waterways.

(d) Establishing an Environmental Impact Statement System (Presidential Decree No. 1586)

This law institutionalizes the environmental impact statement system, required by the Philippine Environmental Policy. Submission of an Environmental Impact Statement (EIS) is required for every proposed project and undertaking which will significantly affect the environmental quality. It applies to all agencies and instrumentalities of the national government, including the government-owned and controlled corporations, private corporations, firms, and other business entities.

(e) Declaration of Environmentally Critical Projects and Areas (Proclamation No. 2146)

This proclamation provides a list of areas and projects which are environmentally critical and subject to the EIS system. Environmentally critical projects include: heavy industries, resource extractive industries, large-scale fishery projects, and infrastructure projects. Environmentally critical areas are those areas declared as national parks, watershed reserves, wildlife reserves and sanctuaries; potential tourist spots; habitats of any endangered or threatened species of indigenous Philippine wildlife; areas with unique historical, archaeological, or scientific interests; areas occupied traditionally by cultural minorities; areas frequently hit by natural calamities; areas with critical slopes; prime agricultural lands; recharge areas of aquifers; water bodies tapped for domestic purposes, declared as protected areas, and support wildlife and fishery activities; mangrove areas; coral reefs with 50 percent or more live coralline cover, spawning and nursery grounds for fish; and natural breakwaters of coastlines.

(f) Letters of Instruction (LOIs) 549 and 1179

LOI 549 establishes an administrative system for the evaluation of environmental impact projects; while LOI 1179 vests the EMB with the authority to issue Environmental Compliance Certificates (ECCs) or Certificates of Environmental Exemption (CEEs) for projects complying with the requirements of the EIS System.

(g) DENR Administrative Order No. 21 Series of 1992 (Revised Rules and Regulations Implementing PD 1586)

This order provides the amendments to the Revised Rules and Regulations implementing PD 1586. It prescribes the procedures for the review of EIS, the processing of ECC applications, and the system of penalties and administrative sanctions. It also assigns to the bay region the review of Project Documents (PD) and the issuance of ECCs or CEEs for projects falling under environmentally critical areas.

Procedures for Obtaining an ECC

The procedures for obtaining an ECC are illustrated in Figure 8.4 and briefly described below:

- The project proponent, with the assistance of the EMB or the Regional Office, initially determines if a project falls within the EIS System by filling up ENFORM 1. If the project does not fall under the EI system, the project proponent shall be issued with a Certificate of Exemption upon payment of the prescribed fees and may proceed with project implementation.

- If the project falls under the EIS System, the EMB/DENR RO determines whether it is an Environmentally Critical Project (ECP) or is located in an Environmentally Critical Area (ECA). If it is an ECP, the project will require an EIS and the proponent shall file his application with EMB.

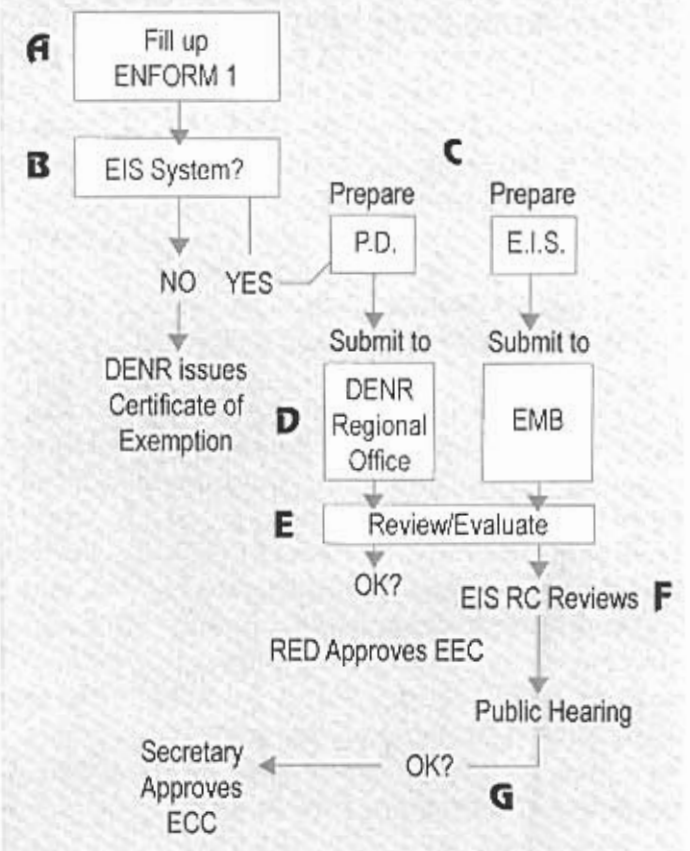
- If the project is not an ECP but is located in an ECA, the proponent shall submit a project description to the DENR Regional Office.

- The project proponent pays a total fee of ₱310 covering the processing, filing, and research legal fees.

- The proponent shall prepare the EIS or PD according to DENR's prescribed outline.

- The proponent shall bill the proponent for expenses incurred in the preparation of the EIS or PD to be submitted to the DENR.

Figure 8.4. Procedures for obtaining an environmental compliance certificate from DENR.



- For PDs, the Regional Office reviews and evaluates the documents. The evaluation process involves an ocular inspection of the project site. Once all the pertinent data are validated, the ECC may be approved or denied by the Regional Executive Director (RED).

- The regional office decides if the project requires an EIS instead of a PD and informs the proponent accordingly. An EIS is then prepared by the proponent, submitted to the regional office for preliminary evaluation (i.e., check the completeness of document), and forwarded to the EMB.

- The EMB reviews and evaluates the documents pertaining to the EIS. An ocular inspection may be conducted to check the veracity of the data contained in the EIS.

- The EIS may be referred to the Review Committee for further review and evaluation. In a few cases, the Committee may require the holding of a public hearing to be conducted by the DENR.

- After a thorough evaluation of all papers, the Review Committee recommends approval or rejection of the ECC.

(h) Prevention and Control of Marine Pollution (Presidential Decree No. 600)

This decree upholds the government's policy to prevent and control the pollution of the seas by the dumping of wastes and other substances that create hazards to human health, harm living resources and marine life, damage resources, and interfere with the legitimate uses of the sea within the Philippines' territorial jurisdiction. It declares unlawful for any person to dump or discharge any kind of harmful substances from or out of any ship, vessel barge or any other floating craft, or other man-made structures at sea. The Philippine Coast Guard is tasked to ensure compliance to this decree, which was amended by PD 979.

The following Memorandum Circulars issued by the Philippine Coast Guard (PCG) Headquarters provide the implementing rules and regulations of the Marine Pollution Decree of 1976.

1) *Memo Circular No. 01-91*. This memo outlines the procedures for the prevention, containment, abatement, and control of marine pollution. It also mandates the PCG to regulate the disposal of wastes in shorelines, rivers, or lakes. This regulation covers all sources of marine pollution, such as ports, harbors, lakes, rivers, and their tributaries.

2) *Memo Circular No. 02-91*. This memo regulates and outlines the procedures for the proper disposal of wastes and other harmful matters into the sea to prevent sea pollution. It provides a list of substances or materials that are prohibited from dumping and those which are allowed to be dumped into the sea, provided that a permit is issued by either the PCG or EMB. The memo also designates the areas for waste dumping. In Batangas, dumping is allowed in Liban Island within the geographic coordinates of 13°25' N and 119°50' E.

3) *Memo Circular 06-91*. This memo provides the rules and regulations for tank-cleaning operations of

vessels/oil tankers. It also requires the accreditation of tank cleaning contractors and provides a list of accredited oil dispersants.

4) *Memo Circular 08-91*. This memo provides guidelines for the conduct of marine pollution inspection, apprehension in case of non-compliance, and report preparation.

5) *Republic Act No. 6969, Toxic Substances and Hazardous Nuclear Waste Control Act of 1990*. This law regulates the disposal of hazardous wastes in the country. Its implementing rules and regulations are defined in DENR Administrative Order (DAO) 29, which specifies the kinds of hazardous wastes subject to regulation and includes the responsibilities of waste generators and transporters in their disposal.

6) *Presidential Decree (PD) No. 984, Pollution Control Law of 1976*. This law regulates the disposal or dumping of industrial and hazardous wastes from land- or sea-based sources. The law requires compliance of all industries and establishments with environmental quality criteria, effluent discharge, and emission standards. Implementing guidelines for this law are embodied in DAO No. 34, which provides the regulations for discharge of industrial wastes into inland freshwater and the sea and the specifications for water classification and quality criteria; DAO No. 35, which provides effluent standards; and DAO No. 14, which specifies the rules and regulations pertaining to air-pollution control and the revised version of air-quality standards.

7) *PD No. 857, Port Regulations*. This presidential decree empowers the Philippine Ports Authority (PPA) to prohibit and regulate the dumping by sea vessels of industrial and hazardous wastes into the sea.

8) *PD No. 856, Sanitation Code of the Philippines*. This code includes provisions regulating the disposal of domestic wastes, industrial wastes, and other types of wastes that will pollute the environment and cause harm to human health and the environment. It also vests the local government units with the responsibility for establishing an adequate solid waste disposal system in their area of jurisdiction.

9) *PD No. 704, Fisheries Decree of 1975*. This presidential decree upholds the state policy on the preservation of fish resources for production through conservation and protection. It penalizes the use of explosives, toxic substances, and electricity to catch fish; fishing with fine mesh nets; trawl fishing in shallow waters; and exportation of milkfish (*bangus*) fry. It also prohibits the discharge of pollutive substances into the fishing grounds which may be deleterious to aquatic life. Laws related to this are: PD 1015, which bans the operation of commercial fishing and trawls in waters within a distance of seven kilometers from the shoreline; PD 1058, which increases the penalties for illegal fishing practices; and PD 1219, which embodies the protection of corals to ensure the preservation of the country's marine environment.

Local Legislation

The provincial government and a few of its municipal units are presently implementing ordinances on environmental protection and natural resources conservation. Table 8.2 provides a summary of the ordinances being implemented by the provincial government and the city/municipalities along the coast of Batangas Bay. This section will briefly describe these ordinances.

(a) Provincial Ordinances

Ordinance No. 5, Series of 1993. Environmental Awareness Program. This ordinance established a program on environmental awareness, catering to elementary school children. This program consists of the following activities: 1) regular contests on essay writing and poems, declamation, painting, and other means to express environmental protection; 2) regular information dissemination on rules and regulations related to environmental protection; 3) conduct of regular recitations on current events, relevant stories, and anecdotes; and 4) field trips to areas to be protected for impact observations.

Ordinance No. 4, Series of 1994. Providing for a Continuing Greening Program. The greening program consists of operation and maintenance of provincial nurseries, establishment of municipal nurseries, adoption of a year-round schedule of planting and replanting, establishment of mini-forest parks, and undertaking of plaza beautification projects.

(b) Municipal Ordinances

Batangas City

Ordinance No. 6, Series of 1991. Comprehensive Waste Disposal and Management System. This ordinance specifies the garbage collection fee by type of establishment, provides instructions on the manner of disposing wastes (plastics or containers) and time of collection, and stipulates penalties for violators for dumping of wastes in places other than those designated as accessible to garbage trucks. It also includes a provision supporting the provincial greening program.

Table 8.2. Inventory of ordinances on environment protection in Batangas and the coastal municipalities along Batangas Bay.

Environmental Ordinance	Province	Batangas City	San Pascual	Bauan	Mabini	Tingloy
Fishery conservation/ protection	X			X	X	
Environmental awareness	X					
Anti-littering/ solid-waste disposal		X	X	X	X	
Greening program	X	X				
Land use/zoning	X	X		X	X	

Municipality of Bauan

Ordinance No. 3, Series of 1989. An Ordinance Amending the 1983 Bauan Basic Fishery Ordinance. The ordinance provides zoning regulations, identifies covered barangays, and sets the minimum bid for acquiring fishery rights or user's rights. The ordinance classifies the municipal waters of Bauan and designates certain barangays for: 1) the erection of fish corrals (minimum bid); 2) the operation of oyster culture beds; and 3) harvesting of *bangus* fry or of other species for propagation (designating certain barangays as *bangus* fry reservation).

1983 Fishery Ordinance. This ordinance requires fishing boats to get a license from the municipal mayor before they are allowed to fish within the municipal waters, to operate fish corrals and oyster culture beds, and to harvest *bangus* fry.

Other provisions of the Fishery Ordinance include: 1) the zoning of barangays for various fishing purposes; 2) setting a fee schedule for acquiring fishing rights in delineated areas; 3) requiring fish corrals to be entirely opened during "closed" fishing seasons – that is, the periods established by DENR to allow the free passage of fishes and to enable a considerable number to reach the spawning grounds; 4) regulating and requiring a mayor's permit for the operation of baby trawls only in areas at least four fathoms deep; and 5) disallowing any structure that will obstruct free navigation in any stream or lake flowing through fish corral and impede the tidal flow to and from the area.

Ordinance No. 9, 1993. Ordinance on Garbage Collection. This ordinance requires all households to pay a garbage collection fee of ₱10.00 per month.

Ordinance No. 6, 1989. Anti-littering Ordinance. This ordinance prohibits and penalizes littering of any kind.

The municipality of Bauan launched a contest, searching for the cleanest barangay, with 27 barangays competing. It submitted proposed ordinances for municipal council approval on tree planting, cleaning of rivers, and the use of ornamental plants as fences.

Municipality of Mabini

Mabini passed several ordinances concerning the disposal of garbage, smoking, and illegal fishing. The municipality also declared some of its fishing areas as marine sanctuaries.

Anti-littering Ordinance. This ordinance prohibits the throwing of garbage in public places not designated as disposal areas by the *Sanggunian Bayan*. Penalties for violators include fines and imprisonment. The municipality has also banned smoking in public places and business establishments.

Ordinance No. 8-90. Anti-spearfishing Ordinance. This ordinance prohibits spearfishing while scuba diving in Mabini. Penalties for violators of this ordinance include fines and imprisonment.

Ordinance No. 9-90. Illegal Fishing. This ordinance prohibits the use of sodium cyanide when fishing in the municipal waters of Mabini.

Municipality of San Pascual

According to the mayor of San Pascual, the municipal government

passed an ordinance in July 1994 against littering, prohibiting the dumping and throwing of garbage in streets and public places.

(c) Permit Systems

Land development in the towns and villages is regulated and monitored by the local government units through a system of permit and license requirements imposed on the developers. Through this system, the provincial, city, or municipal government is able to check whether the proposed land development conforms with their land use and zoning regulations, local ordinances, and national laws and standards. The requirements and procedures for securing permits for the following selected land development activities that significantly affect the environment, including the Batangas Bay, are briefly described below.

For Building Construction

(1) The proponent is required to submit the following documents:

- Five sets of plans signed by civil, electrical, and sanitary engineers, together with their bills of materials, design specifications, tax declarations, and tax receipts.
- Three copies of the notarized consent by the landowner of the lot, in case the lot is not owned by the proponent.
- Three copies of the lot plan approved by the surveyor.
- One copy of the structural design analysis if the building is two stories high or more.
- One copy of a Barangay Clearance.

(2) These documents are evaluated to determine whether they conform with the building laws and standards.

(3) A permit is then issued or denied, on the basis of the evaluation of the documents submitted.

For Small-scale Mining Project (Guano and Other Mineral Products)

(1) The proponent is required to submit the following documents:

- A location plan, signed by a geodetic engineer, defining the geographical location of the site, including topographic and man-made features, such as rivers, slopes, elevation, road, etc.
- Affidavit of the Barangay Captain relative to the nature of the land where the project is to be sited.
- Project study and operational plan.
- If the proponent belongs to a partnership or corporation, the articles of partnership or corporation duly registered with the Securities and Exchange Commission.
- Barangay/municipal clearance to the effect that there is no objection in the said application for mineral exploitation.
- Permit or authorization by the property owner in case the area for operation is private property.
- Certification from the PENRO that the area applied for is not covered by the ISFP project and is not within preservation or proclaimed watershed areas.

(2) After assessing the completeness of the documents submitted, the area is then inspected and verified by the Provincial Engineer and Environment and Natural Resources Officer. A report is submitted to the governor and provincial treasurer recommending approval or denial of the proposed project.

(3) A surety bond, which is determined upon verification, is paid by the proponent.

Requirements for Obtaining an Industrial/Quarry Revocable Permit

(1) An application for 8 ha, but not more than 20 ha, with a minimum extraction of 1,000 m^3/ha, may be granted to a partnership or corporation.

(2) Photocopy of by-laws registered with the Securities and Exchange Commission.

(3) Surety bond amounting to P20,000 per hectare.

(4) Survey plan and vicinity map certified by a geodetic engineer.

(5) Permit or authority of the property owner in case the quarry site is privately owned.

(6) Barangay and mayor's clearance to the effect that they have no objections to the application for concession.

(7) Clearance from the DENR concerning environmental restoration and rehabilitation of the site.

(8) Insurance for the operators of the machinery for protection purposes.

9) Inspection and verification report of the area made by the concerned authorities of the government (i.e., Provincial Engineer and Environment and Natural Resources Officer).

(10) Program/operational plan of extraction or project study.

(11) Payment of governor's permit to operate business.

(12) Payment of mayor's permit to operate business.

(13) Payment of scheduled fees per cubic meter of gravel or boulder to be extracted before issuance of permit.

In the case of large-scale land development projects, such as industrial estates, residential subdivisions, power plants, roads, and other public utilities, an EIS is required to ensure conformity with the government's environmental management requirements and standards. Such development projects are required to meet EIS requirements before being issued with a building permit.

FUNDS FOR ENVIRONMENTAL PROTECTION AND MANAGEMENT

Funds for the protection and management of the bay region come from the regular annual budgetary allocation of line government agencies, such as the DENR, DA, PCG, PPA, and the local government units (provincial and municipal governments). Other government funds come from the taxes and fees imposed for garbage collection and disposal fees, fishing, and mining.

Other funds come from the

private sector, including members of the BCMRF and other concerned industries along the coastal area, and foreign-funding institutions with projects covering the province, its cities, and municipalities. In rare occasions, national-level NGOs were also reported to have provided modest funding for environmental management activities in Batangas Bay.

Information on the amount of money actually spent annually in the protection and management of the region is not available because it is difficult to extract it from the total budget allocation of the aforementioned institutions. This aspect merits further research in order to ascertain the adequacy of existing management interventions in the area as it appears that the bay's condition is continuously deteriorating.

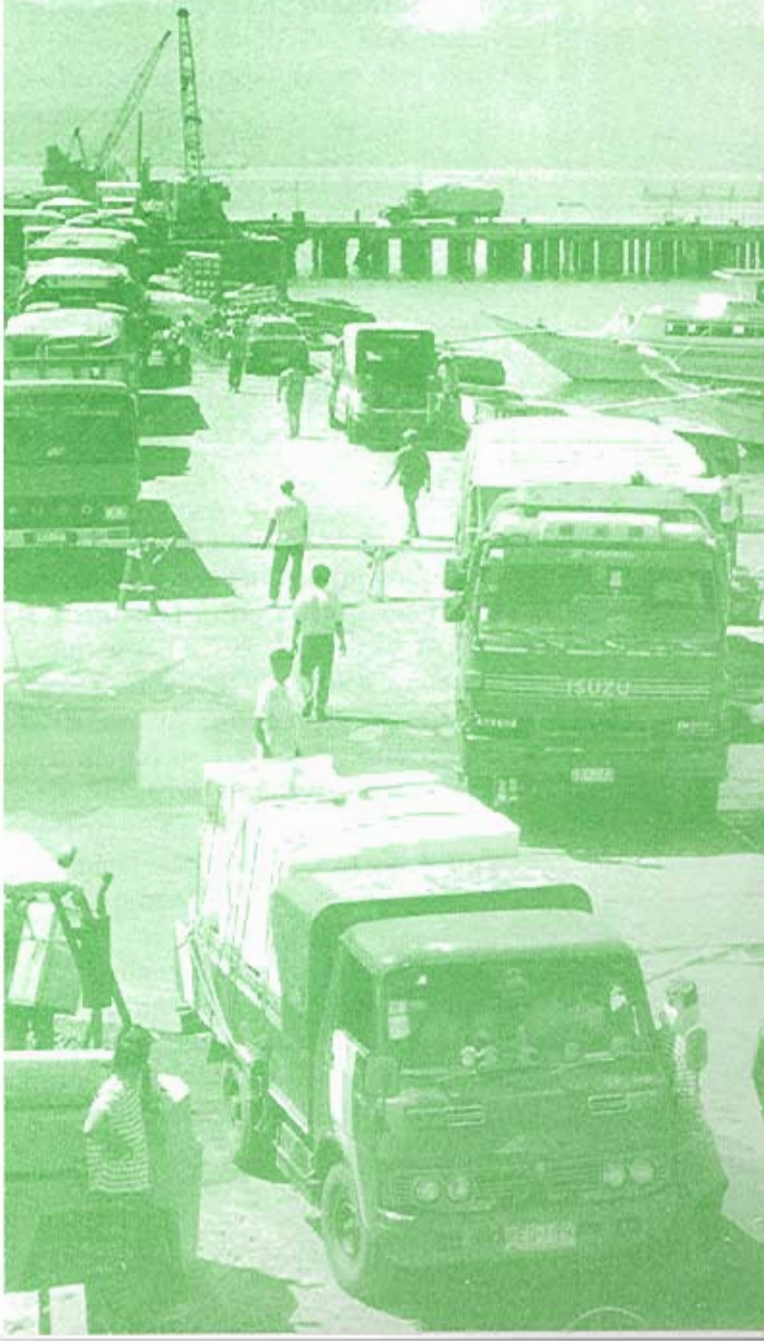
SUMMARY

Batangas Bay and its coastal resources are shared by different sectors of society and are governed by both national and local governments through various administrative instruments. The bay's terrestrial and aquatic endowments are managed by various branches of the government that plan, regulate, and encourage public investments. The private sector, particularly the industrial community, does its share by observing government's imposed environmental standards and by participating in public awareness campaigns and cleanliness programs. However, in spite of the existing efforts by both the government and the private sectors, pollution and degradation of the bay continue, seriously threatening its ecological integrity and economic utility.

Several factors contribute to the bay's continuous deterioration. Being the *catch-all* of wastes coming from land- and sea-based sources, the bay has become the most vulnerable ecosystem in the area. The degradation of its critical habitats and the depletion of its natural resources, such as mangroves, corals, seagrasses, and marine living resources, are caused by industrial, residential, and commercial land development and by exploitative and destructive activities of resource-dependent communities and entrepreneurs. The government institutions mandated to protect and conserve the bay and its resources have not been sufficiently expeditious and effective in handling the situation. The situation is further compounded by the uncoordinated efforts at managing the bay, the logistical constraints of sectoral agencies, the lack of participation by the local communities and the private sector, and the fast pace of urban and industrial development.

Although the number of government agencies assigned the tasks of protecting the bay appears sufficient and the laws and regulations necessary to protect and conserve the bay's resources seem adequate, these do not guarantee the bay's successful management. Other factors equally important to reinforce the institutional and legal framework of the Batangas Bay's management structure include: 1) better coordination among actors; 2) greater participation by the local governments and local communities; 3) increased cooperation, involvement, and support from the private sector; 4) competent planning and allocation of the bay's resources; 5) adequate public investment; 6) improved enforcement of laws and regulations; 7) enhanced capacity-building for enforcement and monitoring, including the beefing up of relevant facilities; and 8) close monitoring of activities significantly affecting the bay.

Development Plans



Chapter 9.
DEVELOPMENT PLANS

INTRODUCTION

In Philippine governance, development planning is generally regarded as a necessary tool for guiding the course of development in the whole country and its regions. Thus, development planning by government units at all administrative levels – municipal, provincial, regional, or national – has become a standard practice. This chapter reviews the development plans and evaluates how well they have responded to the environmental concerns, focusing on the province of Batangas in general and the Batangas Bay Region in particular. The review of development plans focuses largely on the coastal municipalities of the bay region, except Tingloy where information is not available.

REVIEW OF THE DEVELOPMENT PLANNING PROCESS IN THE PHILIPPINES

The Philippines has a long history of development planning, dating back to the years prior to independence. In recent years, long- and short-term plans have been periodically produced, shifting from long-term (6 to 10 years), to medium-term (2 to 5 years), and to annual plans. The National Economic and Development Authority (NEDA) has been tasked to coordinate the development planning process with the government agencies, private sector, and the general public at the national, regional, and local levels.

At the national level, NEDA's policy- and decision-making powers reside with its Board, composed of the President of the Philippines (concurrently acting as Chairman of the Board), a few cabinet secretaries, and the Central Bank Governor; while technical support is provided by its secretariat.

The Regional Development Councils (RDC) – composed of all provincial governors, government agency directors, and selected representatives of nongovernment organizations – coordinates development planning efforts at the regional level. The RDC receives technical support from the NEDA Regional Office.

The Provincial Development Council (PDC) – composed of the provincial governor, mayors, and private sector representatives – coordinates planning activities at the provincial level. It receives technical support from the Office of the Provincial Planning and Development Coordinator (OPPDC).

At the municipal and barangay levels, the task of development planning is handled by the Local Development Council (LDC) or Barangay Development Council (BDC), which is composed of the mayor or barangay captain, other municipal or barangay officials, and selected representatives of the private sector. The LDC is assisted by the technical staff of the local planning and development offices.

Development planning in the Philippines involves both the top-to-bottom and the bottom-to-top approaches. In the former approach, guidelines and preliminary objectives,

strategies, and targets for planning are first laid out at the national level. These outputs are forwarded to the regional councils to form the bases of their regional planning guidelines which, in turn, are submitted to the provincial council to form the bases of their guidelines for municipalities and barangays. In the other approach, the plans done by the municipalities and barangays are used to formulate the provincial plans. The provincial plans are adopted to prepare the regional plans which, in turn, are used together with the sectoral plans to formulate the national plans. In this process, several reviews are conducted by technical staff at the provincial, regional, and national levels to ensure that the plans from different sources become consistent with the set guidelines and objectives and with each other.

Planning is practiced at all levels of the government; but to what extent, especially at the barangay level, is not known. At the national level, NEDA produces the Medium-term Philippine Development Plan (MTPDP), the Medium-term Public Investment Program (MTPIP), and the Annual Plans. At the regional level, plans produced include the Regional Development Plan and the Multiyear and Annual Regional Development Investment Plans.

PLANNING AGENCIES AT THE REGIONAL, PROVINCIAL, AND MUNICIPAL LEVELS INVOLVING THE BATANGAS BAY REGION

Specific public agencies and offices at different administrative levels are mandated to produce development plans, including the province of Batangas and the bay region. The list of agencies and offices, their areas of coverage, and their latest development plans are shown in Table 9.1. Other government offices conduct planning sessions, particularly related to operations in their respective areas or sectors. Oftentimes, the operation plans generated by these agencies serve as inputs to the development plans of the planning agencies.

The RDC of Region IV, whose technical staff works at the NEDA Regional Office, is the planning agency of the Southern Tagalog Region, covering the provinces of Cavite, Laguna, Batangas, Rizal, and Quezon. The latest development plan produced by the RDC-NEDA was integrated into the 1993-1998 Medium-term Plan (MTP) for the Southern Tagalog Region.

Apart from the MTP, a Master Plan Study for the development of the CALABARZON Region was formulated in the mid-1980s by the Japan International Cooperation Agency (JICA) and the government of the Philippines. This plan established the contiguous provinces of Cavite, Laguna, Batangas, Rizal, and Quezon as potential industrial growth areas after Metro Manila.

From 1970 to mid-1980, development planning was initiated by the Provincial Development Staff (PDS) of the Batangas provincial government, producing the Annual and Medium-term Development Plans. Before it was dissolved, the PDS produced the Medium-term Capital Improvement Program for Batangas for the period 1983-1987. The OPPDC of Batangas, which was organized in the mid-1980s, replaced the PDS, absorbed its technical staff, and became the current planning agency of the province. Like its predecessor, the OPPDC produced Annual and Medium-term Plans, the latest of which are the 1994 Annual Investment

Table 9.1. Planning agencies relevant to the Batangas Province and/or Batangas Bay Region, area of coverage, and available plans made.

Planning Agency	Area of Coverage	Available Plans Made
1. Regional Development Council/ National Economic and Development Authority	Southern Tagalog Region (IV)	Southern Tagalog Regional Development Plan, 1993-98
2. Japan International Cooperation Agency/Department of Trade and Industry	CALABARZON (Cavite, Laguna, Batangas, Rizal, Quezon Provinces)	The Master Plan Study on the Project Calabarzon Executive Summary Report The Master Plan Study on the Project Calabarzon Appendix: Project Profiles The Master Plan Study on the Project Calabarzon Appendix J: Environment
3. Office of the Provincial Planning and Development Coordinator/ Provincial Development Staff, Batangas Province	Batangas Province	Capital Improvement Program, Province of Batangas, 1983-1987 Province of Batangas: Strategies and Projections, 1992-1995 Province of Batangas. Annual Investment Plan, 1994 Province of Batangas: Medium-Term Investment Plan, 1994-1998
4. Office of the City Planning and Development Coordinator, Batangas City	Batangas City, Batangas	1993-2000 Comprehensive Multisectoral Development Plan for Batangas City Batangas City Annual Investment Plan, CY 1995 Batangas City Capital Improvement Program 1995-1997
5. Office of the Municipal Planning and Development Coordinator, Bauan, Batangas	Bauan, Batangas	Local Development Plan, 1994-1997
6. Office of the Municipal Planning and Development Coordinator, San Pascual, Batangas	San Pascual, Batangas	Annual Investment Plan CY 1995

Plan, the Medium-term Public Investment Program for 1994-1998, and the Strategies and Projections for 1992-1995. The office is currently completing the Comprehensive Socioeconomic Development Plan for Batangas for the period 1995-2000.

Development planning work for Batangas City is the responsibility of the Office of the City Planning and Development Coordinator (OCPDC), composed of the technical staff of the City Development Council. On the other hand, planning for the municipal level is the task of the Offices of the Municipal Planning and Development Coordinators (OMPDC), composed of the technical staff of the town development councils. The OCPDC of Batangas City produced the Medium-term Development Plan for Batangas for the period

1993-2000, the Annual Investment Plan for CY 1995, and the Capital Investment Program for CY 1995-1997. The OMPDC of the coastal town of Bauan produced its own Local Development Plan for the period 1993-1997, while the OMPDC of San Pascual produced an Annual Investment Plan CY 1995.

Development planning is also the task of Barangay Development Councils. Unfortunately, data are not available to show the number of barangay governing units in the coastal municipalities of Batangas Bay that actually made plans and those that established their development councils. However, first-hand information recounts that some barangay governments now actively contribute to the development plans of their respective municipalities.

THE RDC-NEDA DEVELOPMENT PLAN FOR THE SOUTHERN TAGALOG REGION, 1993-1998

The RDC-NEDA Plan of 1992 focused on the regional sectoral development, concentrating on the economic and social development of the whole Southern Tagalog Region, rather than on province-specific development. The plan expressed alarm over the rapidly worsening environmental and natural resources conditions in the Southern Tagalog Region. Inland and coastal waters are among the most critical environmental problems in the area due to pollution from household and industries.

However, even as natural resource and environmental concerns were raised, the RDC-NEDA Plan was ambiguous about the means by which these concerns could be addressed. For instance, the plan cited "sustainable and modern economic growth" as a long-term objective but it did not address the critical environmental problems, particularly pollution in more concrete terms (i.e., specific actions to be undertaken). Since its coverage was regional, addressing the critical issues of a more localized nature (i.e., provincial) were too qualitative and general and largely sectoral in outlook despite its long-term objective of sustainable development.

THE JICA MASTER PLAN STUDY ON THE PROJECT CALABARZON

The JICA Master Plan Study covers development from the plan's completion in 1991 until the year 2010. The objective of the plan was to hasten the integrated socioeconomic growth in the provinces comprising the CALABARZON. Unlike the RDC-NEDA Plan, the CALABARZON Plan clearly recognized the environmental issues in the covered provinces. The plan also included a special report reviewing the region's environmental situations. Of the 59 projects under this plan, only four projects (or less than 10 percent of the total number of projects) actually discussed natural resources and the environment but did not cover the bay region.

Unlike the RDC-NEDA Plan, the JICA Plan explicitly identified the region as a high growth area for agro-industrial development. Its projects for the bay region included the upgrading of the port of Batangas, development of the Calamba-Sto. Tomas-Batangas expressway, urban development of the Batangas-Bauan area, and upgrading of the Batangas Regional Hospital. Despite the plan's environmental concern, the formulated projects have no clear components to ensure environmental protection. As these are mega-projects, the implementation would certainly require EIS.

THE PROVINCIAL DEVELOPMENT AND INVESTMENT PLANS OF BATANGAS BAY REGION

The PDS Capital Improvement Program (1983-1987)

The PDS Capital Improvement Program outlined the different projects planned for the province of Batangas. This plan provided information on the various investment projects to be undertaken within a given year and included the costs of individual projects and the sources of funds to meet them.

Most of the projects under the program dwelt on infrastructure, such as the construction of roads, bridges, buildings, and repairs. Projects on improving water supply, including repair of water works and drilling of artesian wells, were undertaken in various parts of province and in the bay region; a large part was concentrated in the interior municipalities.

The OPPDC Annual Investment Plan (1994) and Medium-term Public Investment Program (1994-1998)

The OPPDC Annual Investment Plan provided information on the planned projects for 1994 by each municipality, their estimated costs, and their funding sources. The plan differed from the Capital Improvement Program of PDS, as it stated resources and environmental protection as a major objective.

Although quite a few projects dealt with forestry and sanitation, the environmental concerns were very minimal or none at all. In the 1994 provincial annual investment program plan, solid waste and mangrove reforestation were some of the concerns with respect to environmental improvement, including social forestry (largely for landscaping of urban areas). However, only the mangrove reforestation project was listed but no description was given except that it is a proposed project under the Provincial ENRO covering the province (coastal areas).

The OPPDC Medium-term Public Investment Program of 1994-1998 covered a longer duration as compared to the 1994 Investment Plan. In fact, the latter served as input to the medium-term Program. The medium-term program lined up several projects for the natural resource and environment sector, including forest and watershed management, soil and water conservation, cadastral survey, protection of wildlife, maintenance of tree parks and tourist sites, mining management, farmer training, staff development, and community organization. Some of these ongoing and proposed projects covered the bay region's areas. With a few exceptions, the projects would be financed through national or local government sources.

Both the annual and medium-term investment plans tackled natural resource and environment issues. However, a common shortcoming of the plans was the absence of projects dealing with the protection of the marine waters of the Batangas province, particularly the Batangas Bay. Also, except for the project on mangrove replanting, the plans gave little attention to the coastal environment of the province.

The OPPDC Strategies and Projections (1992-1995)

The OPPDC Strategies and Projections document listed the different projects planned for Batangas province over the medium-term period of 1992-1995. Like the annual and me-

dium-term investment plans of the OPPDC, the plan designed environmental projects, including reforestation, integrated social forestry, watershed management, and protected areas and wildlife management. Some of the interior areas of the bay region, especially in the town of Lobo, were the beneficiaries of the Reforestation and Integrated Social Forestry Programs of the plan. There was more emphasis on forestry projects and so the plan's environmental concern suffered similar deficiencies like the other provincial plans with respect to marine pollution.

THE LOCAL DEVELOPMENT AND INVESTMENT PLANS OF THE COASTAL COMMUNITIES OF THE BATANGAS BAY REGION

Like their provincial counterpart, the OPPDC, the City and Municipal Planning Units, the OCPDC of Batangas City, and the OMPDCs of the various municipalities produced development and investment plans for their respective areas. These city and town plans served as inputs to the provincial plans and included those with both annual and medium-term plans. However, not all of these plans were available for this review. A few coastal municipalities of the bay region did not have recent development and investment plans at this time.

For Batangas City, the latest development plan on hand was the Medium-term Comprehensive Multisectoral Development Plan for the period 1993-2000. Although this plan was oriented towards socioeconomic development like the regional and provincial plans, it assigned top priority to the promotion of ecological balance and environmental protection.

In view of the goal of environmental protection, the Batangas City plan's fundamental strategy involved the strict enforcement of city laws, rules, and regulations related to the environment. In addition, the plans proposed projects for natural resources and environment, including the creation of a general services office that would take care of environmentally-related matters, efficient garbage collection, dumpsite upgrading and relocation, recycling of solid wastes, beautification and cleanliness campaigns, tree planting, pollution monitoring, dredging of clogged canals, spraying of dumps, and construction of an efficient sewerage system.

Like the provincial plans, the investment projects of environmental concern in the city plan have been minimal, especially for watershed rehabilitation, solid and liquid waste management and disposal, and water quality management (surface and ground water resources).

Aside from the Medium-term Development Plan, the OCPDC of Batangas City also produced the Annual Investment Plan for CY 1995. There was no listing of projects of environmental concern. However, the Medium-term Batangas City Capital Investment Program for CY 1995-1997, which outlined the different project investments for the city within the covered period, included the fencing of the existing dumpsite and the location of a new dumpsite. However, there were no projects involving environmental concerns for the Batangas Bay. In the coastal towns, the Local Development Plan for the town of Bauan was the only one reviewed. So far, this plan appeared to be among the most environment-friendly, as manifested in the number of projects planned for the en-

vironment for the period 1993 to 1997.

Bauan plan's main objective was to provide sufficient drainage, solid waste management, and maintenance of ecological balance in the town, within the years 1993 to 1997. To achieve this objective, the plan programmed projects, including an information drive on pollution control, reforestation and tree planting, and the hiring of a pollution control officer for the town. For solid waste management alone, the Bauan plan allotted a budget of about ₱10 million to be financed through a variety of sources, including loans and equity or local counterpart.

San Pascual, the town adjacent to Bauan, had a 1995 Annual Investment Plan that aimed at the attainment of a clean and green environment. For 1995, it allocated approximately ₱10,000 for a cleanliness and sanitation project. In addition, it allocated around ₱1 million for the construction of an incinerator and another ₱1.2 million for the purchase of a public dump site, which the town lacked. No development plan for San Pascual was available for this review.

To recapitulate, the town plans of Bauan and San Pascual have lined up some projects for natural resources and environmental improvement. Again, as in the case of the provincial plans, none of the planned projects dealt directly with the marine environment of Batangas Bay.

SUMMARY

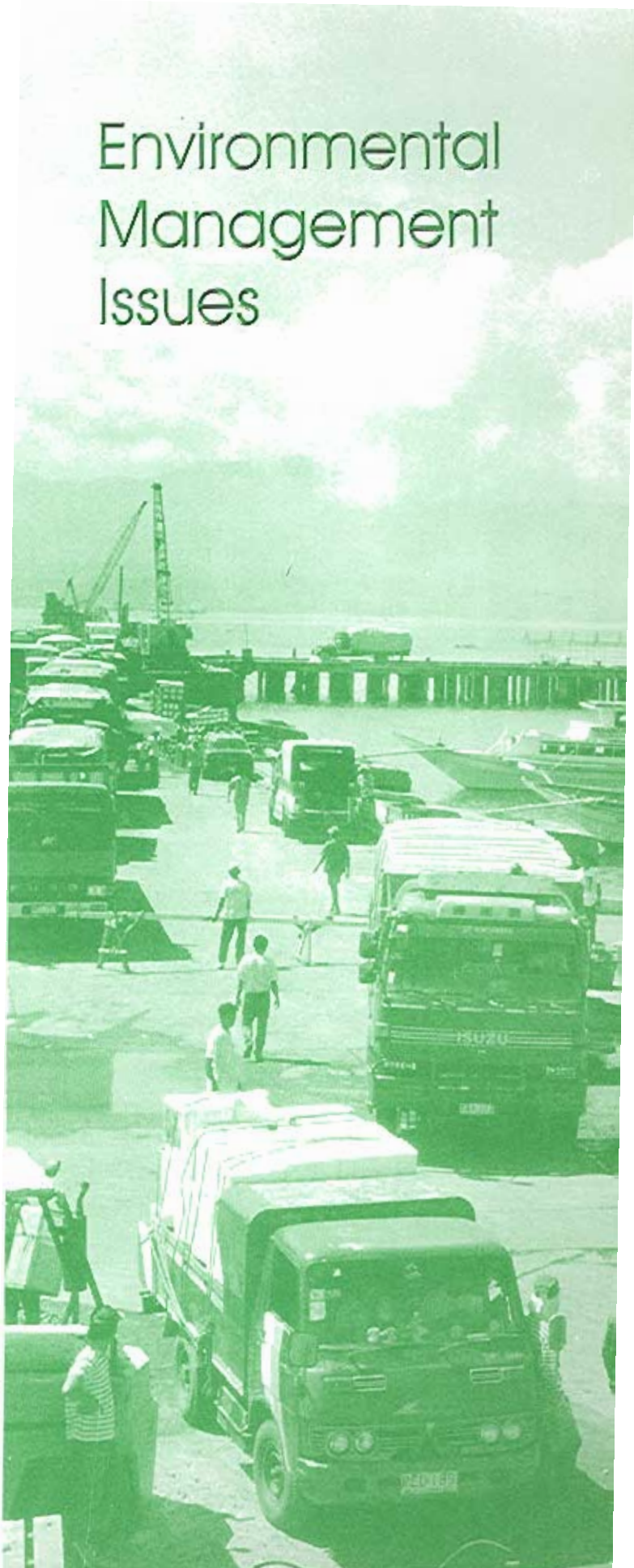
The above review indicates that development planning affecting the bay region and the coastal areas of Batangas Bay has been conducted at the regional, subregional, the provincial, and municipal levels. In fact, several Medium-term and Annual Develop-ment and Investment Plans have been produced by the agencies involved in development planning.

In general, at the regional and subregional levels, the plans have been quite deficient in projects related to natural resources and environmental concerns. In addition, most of the proposals for the environment lacked specific actions. In fact, the environment of the bay region has been afforded little attention in the regional and subregional plans geared at socioeconomic development.

In contrast to the regional and subregional plans, the provincial and municipal plans have given relatively more attention to natural resources and environmental issues. These plans have programmed several projects which directly impact on the natural resources and environmental problems in their areas of jurisdiction. Unfortunately, the emphasis on environmental concern of these plans was on forestry and none related to marine pollution.

The above review highlights the need to include the projects related to marine pollution, such as the minimization and management of solid and liquid wastes, rehabilitation of damaged critical habitats, and improving environmental quality if there will be a realistic attempt at sustainable development, particularly for the bay region.

Environmental Management Issues



Chapter 10.
ENVIRONMENTAL MANAGEMENT ISSUES

INTRODUCTION

The previous chapters of this environmental profile of the Batangas Bay Region revealed problems and issues which need to be addressed. This chapter identifies and enumerates the management issues affecting the region. To resolve these management issues, a strategic management plan should be developed that will identify and determine immediate actions to mitigate, minimize, or eliminate the problems and issues, if resources are to be sustainably used and maintained.

In the course of profiling, some important data were either unavailable or not collected due to time and resource constraints. These have been listed as information gaps in the appendix for which further research/survey should be undertaken to address them.

PHYSICAL AND SOCIOECONOMIC ISSUES

Solid Waste Management

With expanding economic development, especially the industrialization of the Batangas Bay municipalities and the concomitant increase in population, potential adverse impacts on the environment of the bay region can be significant threats. Such impacts include the generation of wastes by the various sectors/stakeholders. In the region, the increasing solid wastes generated, compounded by the inadequate waste transport and disposal facilities, are among current environmental problems. Several types of wastes are produced by the different sectors in the area, such as solid wastes from household, market places, hospitals and ships.

At present, the number of dump trucks is not able to collect the domestic solid wastes generated, notably in the coastal municipalities as these are not only insufficient but also inefficient. About 60 percent of the wastes generated at any one time are collected and the rest are indiscriminately dumped either into the rivers and bay or elsewhere. The solid wastes collected by the dump trucks are deposited in dumping sites which are already close to full capacity but plans are underway to open new dump sites. Inspite of the plans to build new ones, new dump sites are unlikely to keep pace with the increase in waste load in the future. Thus, majority of the people has little option but to continue to burn their wastes or to throw them indiscriminately into open areas.

One important issue arising from the indiscriminate dumping of solid wastes is littering, particularly plastics which are ubiquitous in the beaches and water bodies. There is a growing concern over the environmental impact of plastics on marine organisms. Being non-biodegradable and generally buoyant, these plastics interfere with the benthic primary production once deposited in the sediments, cause entanglement in swimming organisms (fishes and mammals), and clog drainage systems.

The wastes from industrial establishments are not collected by mu-

nicipal sanitary units. Wastes generated by these firms are usually kept in storage tanks or in a designated storage area for later disposal, either at sea, elsewhere, or at the municipal dump site; but this latter mode is usually done with prior permission from the municipal government.

Leaching of pollutants into aquifers and other water bodies potentially poses health problems and contributes to environmental degradation. At present, various types of liquid waste and uncollected solid wastes are either deliberately discharged into the rivers and coastal waters or, as in the case of the latter, are indiscriminately dumped in the same water bodies. It is imperative, therefore, that water-quality monitoring and proper management of solid wastes be established by the bay management in order to counteract or prevent further degradation of the bay waters.

Pollution from Industrial Establishments and Agroindustrial Activities

At present, the Batangas Bay area has already several industries which are expected to increase with the upgrading of the Batangas City Port into an international seaport as part of the CALABARZON industrialization plan. Among the important issues in the bay region, associated with industrialization, are air and water pollution. Air pollution is significant in some areas but is localized within the vicinity of the emitting industries; at certain times, however, it spreads over a wide area due to prevailing wind conditions. Directly linked to industrialization is the potential increase of vessel and vehicular traffic in the bay region, thereby exacerbating the air pollution problems.

Water pollution is a more serious issue of current concern. Industrial waste loading into the bay comes from the oil refineries, power-generating plant, shipyard, and chemical-manufacturing plants, among others. Although some treatments are undertaken to recover the oil and lower oil concentration usually using emulsifying agents, oily wastes are still being discharged into the bay. Most of these wastes are found along the coastal waters adjacent to the aforementioned establishments. Chemical wastes, such as caustic soda from oil refineries, are dumped at sea although spent ones are also reused. Sulfur is being recovered from emissions associated with hydrogen sulfide production in oil refineries. Thermal pollution, associated with the use of seawater for industrial cooling, may present a significant localized problem with respect to marine organisms; but no information is available. Given the current level of industrialization, the water quality of the Batangas Bay is relatively good as compared to Manila Bay. However, the increasing industrialization of the area will severely affect the bay's environment not only from land-based sources but from maritime activities as well.

Apart from industrialization along the coastal areas, other sources of pollution of the bay are from inland activities associated with agriculture, particularly agrochemical runoff and discharge of wastes from livestocks. Agroindustrial wastes come from hog raising, poultry, feed milling, and rice milling which are largely found in the interior municipalities of the bay region. Aside from organic wastes, drugs or their metabolites are also being discharged from livestock production, arising from administered prophylactics like antibiotics. On the other hand, pesticides and herbicides, including both or-

ganochlorine and organo-phosphate, are being used extensively, especially in rice cultivation. While there are no quantitative estimates of these pollutants in the river systems and in the bay, the unregulated discharge of these pollutants can contribute to the water-quality deterioration, as well as health problems. While not being an agroindustrial waste, domestic wastes have similar effect, if not much more, as the wastes being discharged from livestock raising. Both types of wastes, which are seldom treated before being disposed off, can lead to the spread of pathogenic organisms contaminating aquifers and other water bodies and are health hazards (i.e., to humans and livestock), aside from the nutrient enrichment of water bodies.

While agroindustrial wastes are under the jurisdiction of the regional line agencies, particularly by DENR, the local government needs to be involved in monitoring. This is to ensure the compliance of regulations, as well as in preventing deliberate and indiscrimate disposal of such wastes. Action plans to address nonsolid wastes arising from residential areas need to be formulated alongside solid waste management. Such plans should include the improvement or establishment of the necessary infrastructure (e.g., sewerage and treatment systems) and capacity-building (technical manpower, enforcement, and monitoring).

Vessel Traffic and Potential Oil Spill in Batangas Bay

The ports in Batangas Bay are intensively used to ferry cargoes and passengers, particularly to the southern islands. Of the privately owned ports, particularly from the industries, these are being used for transhipment of raw materials and finished products. In February 1995, about 1,323 vessels docked at the ports of Batangas Bay, of which 94 percent were domestic vessels. With the implementation of the plan to develop the Batangas City port into an international one, the volume of vessels will definitely increase. Because the Batangas Bay is relatively a small one, its development as part of the industrial zone and the Batangas City port into an international one can create maritime traffic congestion, intensify the resource use conflicts (fishing and coastal tourism) and occurrence of oil and chemical spills, undermine navigational safety, and increase marine pollution. These interrelated issues will be compounded by the already weak intersectoral cooperation in addressing spills, noncompliance of navigational safety, lack of a viable traffic separation scheme, poor enforcement, inadequate manpower and facilities, especially for monitoring, and a host of other problems, such as those associated with land-based activities.

Settlement Expansion and Population Growth

With the industrialization of the coastal areas of the bay region, population growth is expected, especially migrants from other areas. Settlement expansion will likewise result to accommodate increasing population. While plans have been formulated by the local governments to address population growth, including the infrastructure needed, a more realistic scheme may be required given current conditions. This is particularly true in terms of the delivery and management of basic services, such as adequate water supply, efficient collection and disposal of domestic wastes (solid and liquid), and proper health services. Unemployment, rising population of displaced residents and squatters in the coastal areas, lack of

proper zoning within the industrial corridor, unsustainable and over-exploitation of natural resources, poor environmental awareness of many inhabitants, and pollution need also to be addressed along with infrastructural and local manpower development. It is also important to accelerate rural development, particularly in the interior municipalities of the bay region, to stem migration into the coastal areas.

Sustainability of the Municipal Fisheries Sector

The Batangas Bay — a smaller embayment — is effectively classified as municipal waters under RA 7160. There are already existing resource-use conflicts between the municipal and commercial fisheries sectors, apart from the high-fishing pressures within each sector. Thus, there appears to be a declining catch per unit effort for municipal fishing, small fish catch volume and use of illegal fishing methods, especially in coralline areas in Tingloy. A significant coastal population in the bay area is economically dependent on fishing (about 70 percent in 1994). Baseline information of the fisheries resources of the Batangas Bay is insufficient, however. It is, therefore, necessary to undertake fish stock assessment to ascertain the current status of the bay fisheries resources. In addition, socioeconomic survey should also be conducted to assess the impact of fishing on the coastal populations and vice versa. The industrialization of the bay area will have significant impact on the fisheries sector as well; and this must be assessed, particularly on marine pollution and vessel traffic. A comprehensive and integrated plan covering fisheries resources management and conservation, economic upliftment of coastal fishing communities, zoning of the bay waters, and marine pollution prevention and management should be formulated to ensure the sustainability of the bay's marine fisheries resources, provide better economic opportunities to the coastal fishing communities, and minimize resource use conflicts and marine pollution.

Land Use Conflicts and Zoning

Although there are various regional, provincial, and municipal land use plans for Batangas, including zone plans, there is no systematic assessment of these plans to determine the extent of area overlap, incompatibility, and complementarity. In the municipality of Mabini, for instance, about one-third of the coastal area at the south-southwestern portion facing Batangas Bay is set aside as tourism zone, while two-thirds of its coastal strip located at the western side is devoted to industrial use. This is clearly an incompatible allocation as the siting of industries near resorts could lead to poor water quality due to pollution from these industries.

Most of the zone plans are very generalized and do not provide adequate geographical information on the zones (i.e., exact boundaries), including the criteria used in zoning. Also, the data used in the zone maps are outdated and do not reflect actual ground situation. Thus, overlap and incompatibility of use occur, especially where zone boundaries are fuzzy and not well-defined as well as in areas where there were land conversion. Subzoning within a zone is absent and thus, a mix of uses typically occurs; for instance, residential, commercial, and industrial establishments, even agriculture, can be found within a supposedly defined industrial zone.

Aside from incompatible land use, there is the issue of land conversion. In the upland areas and interior munici-

palities of the bay region, the decreasing area of forestland can be attributed to modification and conversion. The decrease in the agricultural area is typically due to conversion to settlements, commercial and industrial areas. Certainly, the decreasing aquaculture areas in Batangas City can be attributed in part to conversion, which was probably hastened by pollution of waterways from nearby settlements and enterprises. Land conversion, especially in the coastal areas and urban centers, is probably extensive although no quantitative assessment has been made at this point. As land prices in Batangas are soaring, especially for residential, commercial, and industrial purposes, conversion – either by selling and/or leasing the lot parcels to an investor or directly by the lot owners – is a lucrative investment. While there are regulations about land conversion, enforcement and monitoring are problematic. With proper zoning, indiscriminate land conversion can be controlled. Also, zoning must be made within the context of multiuser and integrative perspective to reduce land use conflicts.

Mining and Quarrying

Mining in the region is still relatively underdeveloped. Except for quarrying limestone as raw materials in cement manufacture, most mining firms were into ore mining and beach/river quarrying. Mining – either open pit or underground – is highly pollutive in terms of mine tailings and chemicals used in extraction. In the coastal areas and along river systems, mining and quarrying contribute to sedimentation and increased water turbidity. Mining and quarrying are under the jurisdiction of the regional office of DENR. While mining is limited, quarrying is extensive, especially for sand and gravel. These activities are located along the river systems and the coasts contributing to sedimentation. Monitoring of these activities is weak and compliance by the operators of environmental laws is poor. Thus, there is a need to address monitoring and enforcement for both mining and quarrying activities within an institutional setting, such as technical manpower development and improvement/upgrading of facilities for monitoring and enforcement.

INSTITUTIONAL AND LEGAL ISSUES

Poor Land Use Monitoring by Local Government

For Bauan, San Pascual, and Tingloy, the absence of a clearly defined land use and zoning plan has resulted in their failure to prevent land use incompatibility and conflict in their municipalities. In the case of Batangas City and Mabini, the mechanism to monitor changes in land use in their respective areas of jurisdiction still has to be developed, even as a system for monitoring zoning compliance may already be in place.

Weak Planning Capability of Local Governments

The capability of the provincial and local government units to undertake planning for the Batangas Bay coastal zone is still weak. Most of the planning staff do not have the experience in preparing an integrated coastal zone plan and need some form of training and exposure before they will be able to prepare such plan. Also, there is a need to improve mapping facilities in these municipalities which are very deficient.

Similarly, most of the planning

staff of San Pascual, Bauan, Mabini, and Tingloy still lack the skills in preparing land use and zoning plans. They require on-the-job training on land use planning and zoning to be able to update and revise their plans.

Noncoverage of Environmental Concerns in Local Planning

The land use plans of provincial and coastal municipalities do not take into account the implications or impacts on the bay's coastal waters and other coastal natural resources. Thus, their land use plans do not relate to water use and do not integrate the coastal zone management approach. Such narrow planning perspective does not ensure the sustainable development of the bay's coastal resources in general.

Noncoverage of Natural Hazards and Their Likely Impacts on the Environment and Economic Development in Planning

A large part of the province is vulnerable to natural hazards given its proximity to the Taal volcano and several faults. Yet, natural hazards and their probable impacts on the environment and economic development have not been seriously considered in the development plans and related plans of the province and the bay region. Adequate consideration must be given to the event of natural hazards to minimize economic losses and safeguard the population.

Poor Enforcement of Fisheries and Environmental Laws

In the coastal areas of the bay region, at the least, fisheries and environmental laws have not been effectively enforced. A case in point is the easement regulations for beaches which have not been followed by some resorts. Structures are built too close to the beach and coastal waters that they obstruct free passage and movement along the coastline.

Another case is the poor enforcement of fisheries laws, such as illegal fishing occurring in municipal waters. It has been reported that blast fishing, cyanide fishing, and use of fine mesh nets are still being practiced. In addition, the encroachment of commercial vessels into the municipal waters is still prevalent.

Operation of the Environment and Natural Resources Office (ENRO) Below Capacity

The ENRO is tasked to implement the devolved functions of the DENR by virtue of the Local Government Code. The ENRO staff, under the provincial government, comprised of 27 permanent and seven contractual personnel; and an ENRO officer has been appointed. However, the present staff have not yet started implementing most of the DENR functions devolved to them, due to lack of technical capability and the necessary facilities.

Poor Compliance Monitoring by the Government Units

Some pollutive firms in the bay region are reportedly able to operate without full compliance to environmental standards set by law. Several firms have no wastewater treatment facilities; while others operate below standards.

Lack or poor monitoring of industries by the units of the DENR encourages this practice to continue. The lack of necessary equipment, facilities, and technical capability to monitor in-

dustrial pollution has contributed to the poor monitoring by the regional and provincial offices of the DENR. These units asserted that the function of pollution monitoring was recently devolved to them without the necessary infrastructural support.

Poor Coordination Among Line Agencies of the Government

At present, there is no single office coordinating the efforts of line agencies with respect to the protection and conservation of Batangas Bay and its coastal resources. The line agencies are mandated by law to manage the Batangas Bay but they implement their activities independent of each other. This leads to noncomplementarity and duplication of work in many cases. Hence, government resources are not maximized and, in some instances, are put to waste.

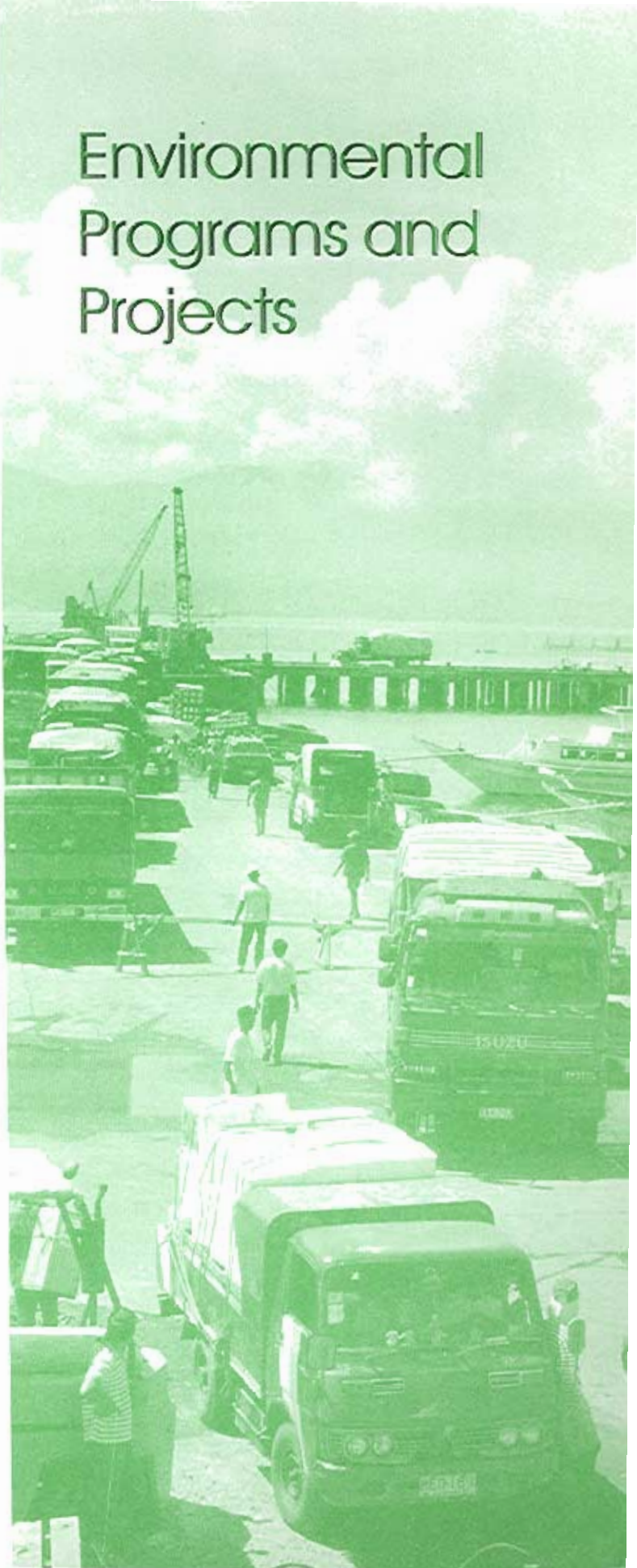
Weak Coordination Among the Local Government Units

The local governments by virtue of the Local Government Code of 1991, have been empowered to pass ordinances and perform some of the functions of the national government within their area of jurisdiction. This arrangement will provide opportunity to the local government units to do what is best for their areas of jurisdiction. At present, there is a weak coordination among them, particularly in the shared responsibility of managing the bay within the framework of integrated management and sustainable development.

Lack of Effective Organizations of Coastal Communities

In general, the coastal communities of the region are not well-organized to enable them to address environmental concerns within the government planning and management frameworks. The coastal fishermen, for example, are poorly organized and have not participated in any management planning for Batangas Bay. Moreover, they are not well-aware of what should be done to improve their lives. Well-organized fishing communities in Batangas Bay can assist in the improvement of the marine environment, primarily in the protection of natural fish habitats, by policing fishing grounds against illegal practices. As important stakeholders in the area, they should be encouraged to participate in environmental management. Their involvement and concerns should be built into the overall framework for the region's environmental management, as well as other users.

Environmental Programs and Projects



Chapter 11.
ENVIRONMENTAL PROGRAMS AND PROJECTS

INTRODUCTION

This chapter summarizes the environment-related programs and projects that cover the bay region. The objective of this chapter is to get an overall picture of the significant efforts of national and local governments and international donor agencies to address the bay area's environmental issues.

INTERNATIONAL ENVIRONMENTAL PROGRAM AND PROJECT

The Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas (MPP-EAS) – through its Batangas Bay Demonstration Project – has been operating in the area since 1994. This UNDP-assisted Regional Programme is funded by the Global Environment Facility (GEF) and is being implemented by the International Maritime Organization (IMO). The goal of the Programme is to promote the reduction and proper management of marine pollution in the East Asian Seas region, including the Batangas Bay, on a long-term and self-reliant basis. The Programme will be implemented until 1998. Thereafter, the local governments are expected to take up the rein of managing the bay and to continue the Programme's activities of reducing and managing marine pollution.

NATIONAL ENVIRONMENTAL PROGRAMS AND PROJECTS

At the national level, the Industrial Environmental Management Project (IEMP), supervised by the DENR's Environmental Management Bureau (EMB), operates projects in the bay region. The IEMP derives its funds primarily from the United States Agency for International Development (USAID). It started in 1992 and will end by 1996. The project provides technical assistance to industrial and agribusiness firms for the prevention of pollution and other industrial wastes.

Another project, financed by the USAID, administered by the EMB, and covering the bay region, is also implemented in accordance with RA 6969 (Regulation on Hazardous Waste Disposal). This project has been developing guidelines and procedures for the DENR Department Executive Order 29, which outlines the implementing rules and regulations for RA 6969. It intends to pilot-test the guidelines and procedures among the selected firms in the bay region for two years – from 1994 to 1995.

A third project, implemented by the EMB which also covered part of the bay region, is the Urban Environmental and Solid Waste Management Study. This study developed solid waste management plans for three cities, including Batangas City and its adjacent areas. It sourced its funds from a Japanese grant administered by the World Bank. The completed study was conducted from 1993 to 1995.

PROVINCIAL ENVIRONMENTAL PROGRAMS AND PROJECTS

There are also environmental projects at the provincial level which cover parts of the bay region. These projects have been implemented by the local offices of the DENR, PENRO, and CENRO *(See Table 11.1)*.

Table 11.1. International and national environmental programs and projects covering the Batangas Bay Region.

Program/Project Title	Program/Project Description	Implementing Agency	Present Status	Time Frame	Areas of Coverage	Source of Funding
1. International Level						
a. Regional Programme for the Prevention and Management of Pollution in the East Asian Seas	Programme for the Prevention and Management of Marine Pollution in East Asian Seas	IMO	Ongoing	1994-1998	East Asian Region	GEF/UNDP
a.1 Batangas Bay Demonstration Project	Project for the Prevention and Management of Marine Pollution in Batangas Bay from Land-based sources	IMO	Ongoing	1994-1998	Batangas Bay Region	GEF/UNDP
2. National Level						
a. Industrial Environmental Management Project	Project promoting pollution reduction in the industrial sector	EMB	Ongoing	1992-1996	Includes Batangas Bay Region	USAID
b. Implementation of RA 6969	Project developing and piloting specific guidelines and procedures for DENR Dep. Exec. Order 29, the implementing rules and regulations for RA 6969	EMB	Ongoing	1994-1995	Includes Batangas Bay Region	USAID
c. Urban Environmental and Solid Waste Management Study	Study on solid waste management in selected cities	EMB	Completed	1993-1995	Incluces Batangas City and adjacent areas	Japanese grant funds administered by the World Bank

In 1995, five provincial programs and projects were operational in some areas of the bay region. Three of these were administered by the CENRO, one by the PENRO, and one by both. The total budget of the projects for one year amounted to about a third of a million pesos, financed by the national government. However, none of the projects dealt with the marine environment directly as the focus was land-based concerns, like forestry.

CITY AND TOWN ENVIRONMENTAL PROGRAMS AND PROJECTS

In Batangas City, two environmental programs – the solid waste management and the clean-and-green programs – are currently in operation. In 1995 alone, the total allocated budget for these programs amounted to more than ₱21 million. In addition, a project on the relocation of the current dumpsite to a new one was proposed, with an estimated total cost of ₱172 million.

In Bauan, the solid waste management and the clean-and-green programs are also being implemented. In 1994, the total budget for these was half a million pesos. Also, other projects were proposed that included hiring of a pollution control officer, reforestation, and information dissemination, with the total cost estimated at ₱0.75 million.

Elsewhere in San Pascual, two environmentally-related projects are being proposed – the purchase of an incinerator and the acquisition of a dump site. These projects will cost a total of ₱2.2 million.

REVENUES FROM ENVIRONMENTALLY - RELATED PROGRAMS AND PROJECTS

The environmentally-related programs and projects at the international, national, and provincial levels that apply to the bay region are service-oriented and, are generally, not income-generating. However, a component of the MPP-EAS on sustainable financing does look at the long-term sustainability of marine pollution activities, with the aim of generating funds through their operations. The programs on solid waste management in Batangas City and Bauan are generating income for the local governments. It was reported that in Batangas City, a total of ₱233,275 from garbage fees were generated in 1994; while in Bauan, it was ₱535,915. The funds allocated by Batangas City is considerably bigger than the funds it generated from garbage collection fees *(See Table 11.2)*.

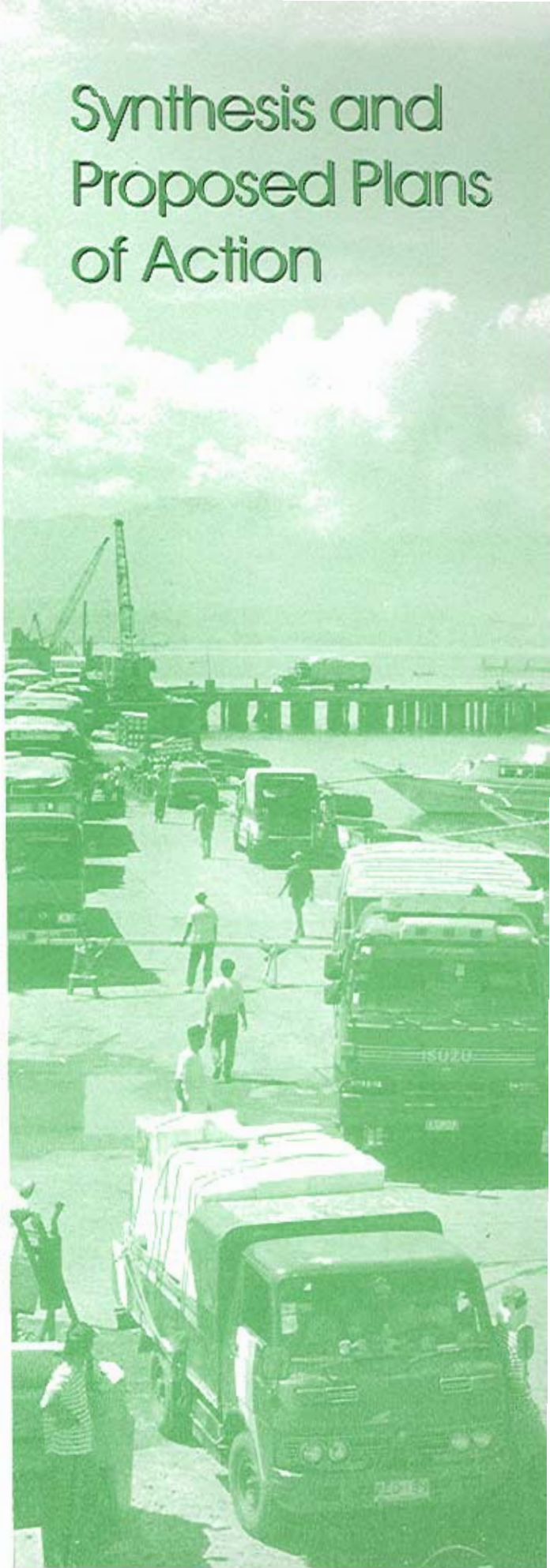
SUMMARY

There are already programs and projects initiated by various agencies in the bay region that relate to environmental management. The MPP-EAS, in particular, focuses on the bay region's marine pollution issues within the context of integrated coastal management. Likewise, three projects at the national level deal with the reduction of industrial and solid wastes that have direct implications on the water quality of the bay. While the projects at the provincial level deal with forestry, these have indirect bearing on marine pollution in so far as soil erosion and sedimentation are concerned. At the municipal level where pollution is a more urgent problem, the local governments have been implementing projects on solid waste management, in addition to complementing the activities of the regional offices of the DENR. While some municipal projects are income-generating, such as garbage collection, a more efficient and systematic approach needs to be done in order to make them sustainable.

Table 11.2. Environmental programs and projects of municipalities in the Batangas Bay Region.

Project Title	Project Description	Implementing Agency	Present Status	Time Frame	Budget Allocation (P)	Source of Funding
1. Batangas City						
a. Solid Waste Management/ Garbage Disposal Program	• Maintenance of garbage collecting equipment • Garbage collection • Upgrading of present dumpsite	City Government	Ongoing	Continuing Activity	15,000,000	Local
b. Clean and Green Program/Tree Planting	• Beautification campaign • Greening of Batangas City	City Government	Ongoing	Continuing Activity	8,230,380	Local
c. Acquisition of New Dumpsite	• Dumpsite relocation	City Government	Proposed	No Date	172,300,000	Local
2. Bauan						
a. Solid Waste Management/ Clean and Green Programs	• Maintenance of garbage collecting equipment • Garbage collection • Maintenance of dumpsite • Clean and green project	Municipal Government	Ongoing	Continuing Activity	517,823	Local
b. Information Drive/Pollution Control Project	• Information dissemination/training	Municipal Government	Proposed	1993-1997	200,000	Unidentified
c. Save the Environment Project	• Reforestation/tree planting	Municipal Government	Proposed	1993-1997	400,000	Unidentified
d. Hiring of Pollution Control Officer	• Personnel hiring	Municipal Government	Proposed	1993-1997	150,000	Unidentified
3 San Pascual						
a Purchase of Incinerator	• For solid waste disposal	Municipal Government	Proposed	1995	1,000,000	Local/National
b Purchase of Dumping Area	• For solid waste disposal	Municipal Government	Proposed	1995	1,200,000	Local/National

Synthesis and Proposed Plans of Action



Chapter 12.
SYNTHESIS AND PROPOSED PLANS OF ACTION

SYNTHESIS

The environmental situation in the Batangas Bay Region presents many challenges that demand intensified management effort for its improvement and protection. These challenges are primarily man-made interventions that encompass a wide area from the upland watershed to the coastal areas, requiring a cross-sectoral approach in management.

The bay region exhibits rapid population growth that is inclined to grow even faster than the planned economic development. This development tends to trigger a host of social, economic, and environmental problems, both land- and sea-based. A major focus of the environmental profile of the bay region is on marine pollution, arising largely from land-based sources. Increasing population and economic development pressures will exacerbate many of the environmental issues affecting the bay region, unless concrete actions are taken and implemented properly.

Management issues, identified in Chapter 10 of this profile, need to be addressed through the concerted efforts of all stakeholders — residents, private sector, and the government. The water quality of the Batangas Bay is relatively good at the current level of industrialization, urban development, and population growth. Enough examples of polluted water bodies, like the Manila Bay, Iligan Bay, and Laguna Lake, provide good case studies of what went wrong with respect to environmental management amidst economic development. Certainly, there are lessons to be gleaned from these areas which the stakeholders of the bay region can utilize to reduce and manage marine pollution and ensure the sustainable development of the bay region.

PROPOSED PLANS OF ACTION

An indispensable initial step for the development of action programs to address any problem is to adequately understand the nature and magnitude of the problem at hand. This environmental profile has achieved extensive mileage in that direction by identifying the different environmental problems and issues in the bay area, especially those related to marine pollution, including data gaps.

The bay region's environmental profiling is the first step in the planning process under the integrated coastal management approach. Succeeding activities should be conducted to achieve sustainable development in the area and its bay.

In brief, the following are the recommended activities for future planning:

a. continuous gathering of data and updating of the environmental profile;

b. conduct of a long-term strategic environmental management plan for the bay region;

c. preparation and implementation of short- and medium-term environmental management

plans for the bay region; and

d. establishment of an environmental management program that addresses the management issues identified in the profile.

The current profile is useful only within the limits of the information it provides. Thus, profile updating must be a continuing activity. Additional data should be gathered from other secondary sources not presently available or through the conduct of new research studies related to the data gaps mentioned in the profile. The new findings can then be used to reinforce or modify current findings.

Aside from profile updating and additional data gathering, the job of protecting the environment of the region and the Batangas Bay itself is a task that requires at least a strategic plan for environmental management. This plan should be of a long-term nature and acts as the guiding document for subsequent short-term environmental management for the area.

The strategic plan for the region must have, as a primary goal, the pursuance of a development approach that renders economic goals and environmental protection compatible with each other. Furthermore, the plan must be the handiwork not only of a multidisciplinary group of experts but also of representatives of the various stakeholders in the bay region — the government, private sector, and communities including the environmental NGOs.

Given their expertise and familiarity with the region, the local government planners must take active and leading roles in the formulation of this strategic plan. Under the MPP-EAS, specific activities addressing various issues affecting the bay region ranging from baseline survey, monitoring, and to capacity-building, have been formulated. The strategic plan should incorporate these activities where the issues identified by the profile are addressed while new ones will be developed.

To complement the profile and strategic plan, an environmental management program must be set up immediately in the region to address specific management issues identified in the profile. For instance, the problem of solid waste management must be addressed by developing and implementing specific action plans for the appropriate control, transport, and disposal of wastes from land- and sea-based sources. The lack of an institutional mechanism for the environmental management of the bay region can be addressed by establishing an appropriate institutional arrangement, considering existing set-up and legislation. To be effective, a public awareness program should also be instituted to enhance better appreciation of the actions being implemented to address the management issues affecting the bay region.

Appendix
LIST OF ENVIRONMENTAL DATA GAPS

The following data gaps are listed to aid future research and profile updating in the province of Batangas and its bay region:

ON NATURAL ENDOWMENTS

1. Data and maps on the exact location of faults (especially the active ones) and their current conditions in and around the Batangas Bay Region and to approximate the risks associated with the faults.

2. Historical data on the occurrence and intensities of earthquakes and other natural hazards in the Batangas Bay Region to assess potential impacts given current conditions and future development.

3. Data on disaster management programs and the degree of awareness of the population-related to the natural hazards in the Batangas Bay Region to assess the readiness and capability of the local government units to respond in the event of natural disasters.

4. Data on the incorporation into the development plans of the Batangas Bay Region's natural hazard contin-gency planning and pre-paredness to assess the sensitivity of plans to risks associated with natural disasters, which are hindrance to economic development.

5. Data on the climate, temperature, and wind conditions in the interior areas of the Batangas Bay Region to complement those of Batangas City, which primarily represents only the conditions for coastal areas.

6. Data on the circulation patterns of the whole Batangas Bay and its adjacent waters to enhance available current measurement data and circulation models which focus only on the sections of Batangas Bay, especially those fronting the proposed infrastructure projects.

7. Recent data and maps on the actual hectarage and location of forest reserves in the Batangas Bay Region to provide an accurate estimate of its actual forest location and cover.

8. Data on the types of flora and fauna existing in the forest areas of the Batangas Bay Region to gauge the level of biodiversity.

9. Data on the number of squatters living in upland and critical areas and their household practices to assess their socioeconomic impacts in these areas.

10. Data and maps on the estimated volume and actual location of mineral reserves in the Batangas Bay Region to estimate the total economic potential of mineral resources in the area.

11. Data and maps on the location of archaelogical sites, if any, in the land and water areas of the Batangas

Bay Region to provide information on the historical value of certain areas.

12. Data on the estimated stock of fish and other aquatic species in Batangas Bay to assess marine biodiversity and improve assessment of the bay's economic potential.

13. Data and maps on the coral reefs in Mabini, Tingloy, and other areas in the Batangas Bay Region to complement the coral reef data for Napayong Point, Batangas City, and Sombrero Island.

14. Data and maps on the number and location of man-made structures under the waters of Batangas Bay to ascertain the contribution of these structures to the bay's marine resources.

ON LAND USE PATTERNS

1. Recent data and information on actual and proposed land use plans, especially for the coastal municipalities of the Batangas Bay region, useful for the environmental management and planning.

2. Inventory of new land development projects, such as infrastructure, housing, etc., useful for environmental management and planning.

3. Data on manpower, facilities, and other resource capabilities of the ports and harbors in Batangas Bay, especially with regard to controlling wastes and marine pollution in the area and containing sea-based pollution.

4. Data on the amount of waste-producing activities (e.g., vending at stalls and other food service stores, in the individual harbors and ports in Batangas Bay) to determine the potential of ports and harbors to contribute to marine pollution.

5. Data on the average rate of pollution discharge by cars in the Batangas Bay region and, together with the number of cars registered, to provide information on the level of air pollution from vehicular traffic for which future projections can be made.

6. Data on the spatial distribution of population by barangay and along major road arteries and critical areas associated with industrial development, natural hazard zones, and nonbuilt-up areas.

7. Economic valuation of the physical impacts of air pollution (industries, vehicles, and ships) on the affected sectors, to estimate the total money value of air pollution damage.

ON WATER-USE PATTERNS

1. Time-series data on the actual volume of fish caught in Batangas Bay to replace current data on fish landed in the coastal areas of the bay and to include fish caught outside the bay.

2. Time-series data on the number/type of fishing families, boats, gear, and other related variables in Batangas Bay, to estimate the fishing efforts in the area over time.

3. Data on changes in fish stock estimates over time in Batangas Bay which, together with other data, will determine the maximum sustainable yields of fishing operation in the area.

4. Data on the prices of particular fish species and fisherfolk labor in the Batangas Bay area which, together with other data, can be used to estimate the maximum economic yields of fishing operation in the area.

5. Data and maps on the actual location of aquaculture farms, their sizes, and other physical features, to estimate the actual pollutive impacts of farms on coastal waters and vice versa.

6. Data on the volume of passengers and cargo of ships passing the Batangas Bay to assess the potential contribution of ships to marine pollution.

7. Data on the actual number, tonnage, and physical characteristics of vessels using private ports in Batangas Bay and the type, weight, and value of their cargo which, added to the data for the port of Batangas, will provide an actual measure of maritime traffic in the bay and the associated risks.

8. Data on the number, tonnage, and physical characteristics of tankers and the volume of oil they carry that are criticial in the determination of risks associated with the oil-based industries in the area.

9. Data on the occupancy rates, fee rates, origin of visitors, and other related information on beach resorts that will give information on the recreation value attached by the population to Batangas Bay.

10. Data on the economic value of tourist resorts, especially *vis-a-vis* alternative uses (such as housing, commerce, or industry), to assess the best economic use of resort areas.

ON THE ECONOMIC SECTOR

1. Total agricultural production, income, employment, capitalization and taxes collected by type of crop and livestock which, together with provincial level data, will assess the sector's importance to the provincial economy.

2. Number and value of environment-related projects sponsored by private firms in the agriculture sector, if any, to determine their relative contribution to environmental protection and enhancement of agriculture.

3. Data on the rate of chemical use per unit crop and livestock, (by chemical type and by type of crop and livestock) which, together with the production data, provide the estimated volume of agricultural chemical use in the Batangas Bay Region.

4. Data on technical and financial aspects of waste management and control methods, if any, used by livestock and poultry operators, to measure the amount of pollutive wastes draining into water bodies, the amount recycled for productive purposes (e.g., organic fertilizer for farms), and the marginal profit or cost that can be attributed to waste containment methods.

5. Data on the damage-response functions of affected sectors (such as farmers and fisherfolk) to chemical use in agriculture, to estimate its physical impacts on the affected sectors.

6. Economic valuation of the physical impacts of chemical use in agriculture on other sectors, to estimate the total money value of the damage.

7. Total industrial production, income, employment, capitalization, and amount of taxes collected in the Batangas Bay Region which, together with provincial-level data, will gauge the sector's importance to the provincial economy.

8. The number and value of environment-related projects sponsored by private industrial firms, if any, to determine their relative contribution to environmental protection and enhancement of industry.

9. Data on the actual types and rates of pollutive discharges at the industrial firm level, e.g., pollution coefficient per unit of output, to estimate their total pollutive capacity.

10. Data on the technical and financial aspects of waste management and control methods, if any, practiced by firms, to measure the intensity and costs of environmentally-sound practices among firms.

11. Data on the damage-response functions of affected sectors to pollutive discharges from firms, to estimate the physical impacts of industrial pollution.

12. Economic valuation of the physical impacts on the affected sectors of industrial pollution, to estimate the damage's total money value.

13. Total production, income, employment, capitalization, and taxes collected from commercial establishments (e.g., fastfood chains, wholesale and retail trading companies) in the Batangas Bay Region, to determine the sector's relative importance to the provincial economy.

14. The number and value of environment-related projects sponsored by the commercial establishments to measure the sector's relative contribution to environmental protection.

15. Data on the volume of solid and other wastes produced by commercial establishments, to provide an estimate of their total pollutive capacity.

ON THE STATE OF MARINE POLLUTION

1. Maps on the actual location of crop and livestock agriculture, in relation to the river systems and the Batangas Bay, to provide information on the potential impact of activities on marine waters.

2. Maps on the actual location of industrial firms, in relation to rivers and the Batangas Bay, to assess the potential impact of industrial firms on marine waters.

3. Data on the damage-response functions of the marine waters to the pollutive waste discharges of agricultural and industrial activities, to estimate the physical impacts of pollution from operations.

4. Economic valuation of the physical impacts of pollution caused by agricultural and industrial activities to the marine waters, to estimate the damage's total money value.

5. Data on the volume and composition of wastes produced by hospitals in the Batangas Bay Region, to

aid in the assessment of hospital-generated wastes.

6. Data and maps on the location of hospitals, especially *vis-a-vis* water bodies to provide information on waste flows into the water bodies.

7. Data on the methods of waste disposal practiced by hospitals, to determine health impacts.

8. Data on the amount and composition of solid and other wastes produced by public markets in the Batangas Bay Region, to assess market-generated wastes.

9. Data and maps of the location of public markets, especially *vis-a-vis* water bodies, to provide information on market wastes flowing into water bodies.

10. Data on the methods of waste-disposal practices of public markets, to determine if there are harmful effects to the public.

11. Data and maps on the actual location and area coverage of squatter colonies, especially in the coastal areas, to estimate the impacts of squatter areas on marine pollution.

SOCIOECONOMIC AND DEMOGRAPHIC DATA GAPS

1. Data on population migration, specifically between Batangas Province and other areas, between the Batangas Bay Region and other areas and between the coastal communities of Batangas Bay and other areas, to provide some indications on the impacts of industrial development in the bay region.
2. Number of inhabitants in environment-sensitive areas, such as forest lands, river banks, ports and harbors, and industrial sites, to assess which sector of the population tends to create potential damages on the environment and which sector tends to be most vulnerable to environmental hazards.

3. Labor force and employment data for the Batangas Bay region, especially all the coastal areas of Batangas Bay, to reinforce the available Mabini and San Pascual data. Also, data for the interior areas will be needed to ascertain the employment opportunities of interior populations.

4. Data on sectoral employment for the Batangas Bay region, such as in fishing and nonagriculture, needed to analyze the relative importance of the sectors to the employment and economic situation of the region.

5. Income data for the Batangas Bay Region by area and by sector as income has been known to influence the way people exploit the natural resources and environment sector. Furthermore, the data on income will help determine the willingness of different sectors of the population to pay for environmental improvement.

6. Data on teacher-student ratios and teacher qualifications at different educational levels in the Batangas Bay Region and data on the exposure of students and teachers to environ-mental education, to measure the institutional capability of the educational system to increase the level of awareness on issues related to the environment.

7. Data on the personnel capability of

the sector to meet the health needs of the population and on morbidity or mortality rates related to the exposure to contaminated environment (e.g., drinking water), to determine the extent of pollution effects on human health.

8. Recent data (after 1990) on household practices, particularly on the coastal barangays along Batangas Bay, which can be used to estimate the impacts of household practices on the bay's environment.

9. Time-series data on socioeconomic and demographic variables, other than population, that will give information on the changes over time of the variables and their impacts on the environment.

INSTITUTIONAL AND ORGANIZATIONAL DATA GAPS

1. Data and information on the environmental NGOs and community organization activities in the Batangas Bay Region, including data on their activities and areas of operation, to ascertain the intensity of activities of private sector groups and their contributions to environmental protection and management.

2. Data on the maritime command organization within the various regulatory/enforcement agencies, like the Philippine National Police, Marina, and Philippine Coast Guard, including functions, number of personnel, and activities in the Batangas Bay area to ascertain the level of participation in the protection of the coastal environment.

3. Data on the actual technical and management capabilities of both public institutions and private sector firms and organizations to combat marine pollution (including statistics on monitoring stations, environmental trainings conducted, and other relevant information), to evaluate such capability to monitor and combat pollution.

4. Data on the financial mechanisms of the public and private sectors for environmental protection, to ascertain the sustainability of the environmental protection activities in the Batangas Bay Region.

ON DEVELOPMENT PLANS

1. Development plans for all the towns, especially those located in the coastal areas of the Batangas Bay Region, including Tingloy and Mabini, to complement already available plans for Batangas City, Bauan, and San Pascual.

2. Flow charts indicating the planning processes at the national, regional, provincial, and municipal levels of government, to complement the textual presentation done in this profile.

ON ENVIRONMENTAL PROGRAMS AND PROJECTS

1. Data on the total and annual funding supports for ongoing and proposed international, national, and local programs and projects in the Batangas Bay Region, to estimate the total financial investment for environmental improvement in the area.

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