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DRAFT ENVIRONMENTAL REPORT
ON
THE PHILIPPINES

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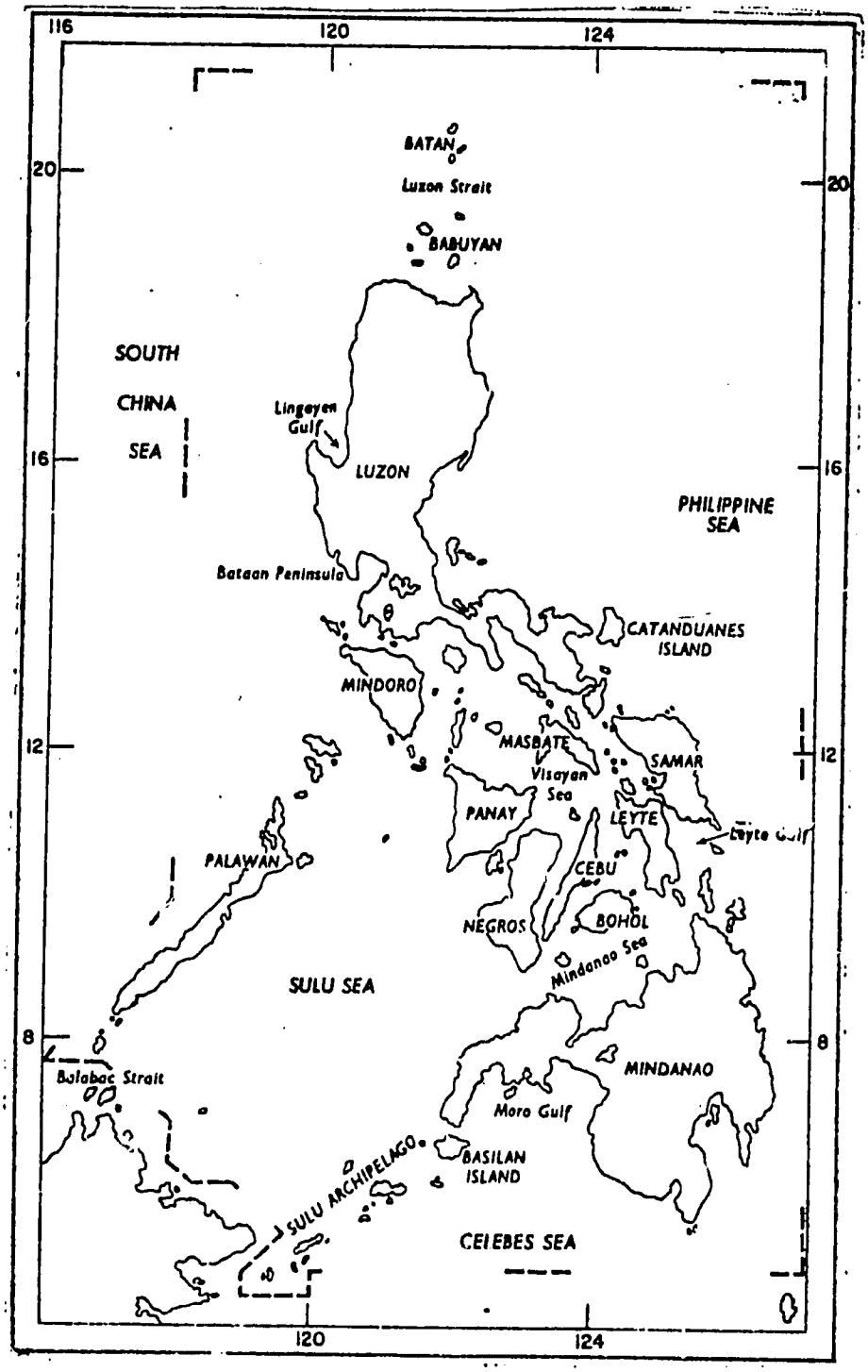
DRAFT ENVIRONMENTAL PROFILE OF THE PHILIPPINES



Source: Vreeland, Nena et. al. 1976. Area Handbook for the Philippines. Foreign Area Studies, The American University, Washington, D.C.

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THE PHILIPPINES: ENVIRONMENT AND NATURAL RESOURCES

0.0 INTRODUCTION AND SUMMARY

Located along the southeastern rim of Asia, the Philippines is an archipelago extending 1,770 kilometers north to south. The Philippines consists of over 7,100 islands, of which two, Mindanao and Luzon, comprise 69% of the total land area. The country is divided geographically north to south into Luzon; Mindoro; the Visayan Islands of Masbate, Samar, Bohol, Leyte, Cebu, Panay, and Negros; Palawan; Mindanao; and the Sulu Archipelago. Most of the islands have central mountain areas with flat coastal plains along the shorelines. The Philippines is a tropical country, with temperatures that vary only 5°C during the year from an average annual temperature of 27.2°C. About 60% of the country experiences a hot, dry summer season from April through June and a wet rainy season from June through October. Rainfall varies from 944 millimeters annually in South Cotabato, to 4360 millimeters in Surigao del Sur, both in Mindanao. Vegetation is relatively uniform throughout the islands, with differences due to altitude and location in relation to mountain ranges rather than temperature. The climate is moderated by the country's maritime location, although the Philippines is subject to typhoons and hurricanes, and an occassional tidal wave.

The main crops grown in the Philippines are for domestic consumption and include rice and corn, fruits, vegetables, coffee, and tobacco. Export crops are mainly sugarcane, copra, and coconut oil, but also include abaca, bananas, pineapples, cacao, and coffee. Agriculture, including forestry and fisheries, accounts for 27% of the Gross National Product (GNP), while industrial production accounts for 35%. Industry includes manufacturing, mining, and construction.

Population in the Philippines is distributed fairly evenly over the country with the exception of the island of Luzon which accounts for over 54% of the total population. The Manila metropolitan area has a population of 4.9 million, and the estimated urban growth rate is 3.9% annually. The Philippines has an active population control program and the growth rate has dropped from a high of 3.0% in the 1960's to 2.2 to 2.8% in 1979.

Fifty-seven percent of the Philippines is considered forested, although only 11 million hectares of productive forest land is left. Deforestation is more a result of commercial logging for the Philippine hardwoods such as teak and mahogany than of slash and burn agriculture, although such practices often follow commercial logging operations in previously inaccessible areas. Erosion is a problem throughout the country, though especially severe on Cebu, Luzon, Panay, Masbate, and Bohol. Erosion also affects the coral reefs ringing the Philippines, as does the destruction of coral beds for fishing and construction materials.

The Philippines has legislation that deals with air and water pollution, exploitation of forest resources, exploration and exploitation of mineral resources, control of dumping of wastes, protection of wildlife and forest resources, promotion of fishery development, conservation of soil, and control of noise pollution. The government agencies concerned with the environment and natural resources include the Ministries of Agriculture, Natural Resources, Education and Culture, Human Settlements and Ecology, Public Works, Transportation, and Communication, and Local Government and Community Development,

and the National Environmental Protection Council, the National Pollution Control Commission, the National Science Development Board, and the National Economic and Development Authority.

MAJOR ENVIRONMENTAL PROBLEMS

The major environmental problems of the Philippines are deforestation and soil erosion, water and air pollution in urban areas, and the loss of specialized habitats such as mangrove swamps and coral reefs.

1) Deforestation and soil erosion - An estimated 5 million hectares of forests have been cut in the Philippines, of which 1.4 million ha. were in critical watershed areas. A survey done in one watershed, the Agno River watershed, concluded that 2,500,000 cubic meters of silt had already been deposited in the reservoir behind Ambuklao Dam as a result of such logging practices. Analysts predict that, at current rates of extraction, all virgin forests of commercial value will be gone by 1990. Deforestation is proceeding at a rate of 80,000 hectares per year, of which one-half is illegal. The government does require replanting by loggers when areas are clear-cut, but enforcement is not easy in the remote areas where much of the cutting takes place. Erosion is already severe to excessive in Cebu, Luzon, Masbate, Panay, and Bohol.

2) Water and air pollution - Water pollution from industrial processes and from municipal and domestic use of water for waste disposal is creating many problems in the Philippines, especially around urban areas such as Manila. Biologists at Silliman University conducted a study in 1979 on the country's rivers and lakes and found that 38 rivers in the country are being polluted by industrial wastes. Such pollution ranges from suspended solids to toxic substances such as pesticides, heavy metals, and radioactive substances. Major sources of this pollution are mining operations, sugar mills, food processing plants, breweries and distilleries, and factories producing plastics, paper, detergents, and chemicals. The National Pollution Control Commission has the authority to fine factories for water pollution and recently began fining a mining operation in Benguet Province for causing damage to agricultural crops, irrigation facilities, and aquatic life from mine tailings.
   Air pollution in Manila is as bad as any in the United States. The National Pollution Control Commission has started a clean-up campaign aimed at smoke-belching motor vehicles, but little has been done concerning air pollution from industry.

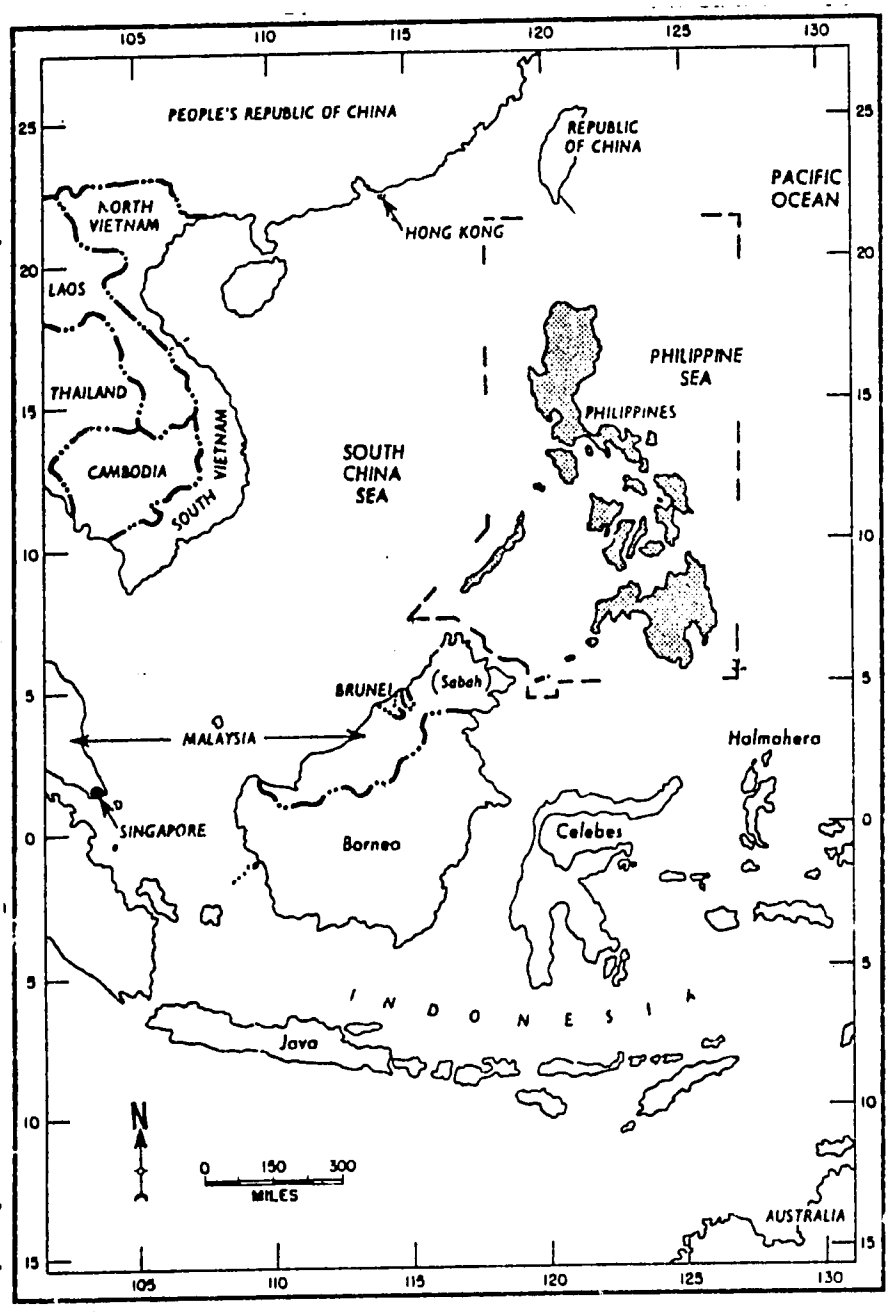
3) Loss of specialized habitats - Dynamiting of coral reefs to stun fish and collect coral for use in jewelry and the construction trade continues in the Philippines. Coral reefs are also damaged by siltation. The University of the Philippines Marine Center estimates that 50% of the 27,000 km^2 of coral reefs ringing the Philippines are dead or dying. Mangrove swamps once covered 400,000 hectares of coastal area in the country, but only 200,000 ha. are left. Mangrove forests are cut for fuelwood, charcoal, tanbark, and other forest products, and for development as fish ponds. Such destruction eliminates the protective function swamps and reefs provide and their use as spawning habitat by important commercial fish and shellfish species. In general there is little environmental management of these and other fragile, specialized habitats.

1.0 POPULATION CHARACTERISTICS

1.1 General Information

The Republic of the Philippines is composed of an estimated 7,100 islands in an archipelago that stretches 1,770 kilometers (km) north to south along the southeastern rim of Asia. With a total area of 299,679 km^2, the Philippines is slightly larger than the State of Arizona but has a population more than 23 times greater. The population of the Philippines has increased five-fold between the 1903 census (7.6 million) and 1975 (42.3 million) with the current population estimated to be 46.4 million (1979). The Philippines is divided for administrative purposes into 13 regions and 77 provinces.

Figure 1. Geographical Setting of the Philippines



Source: Vreeland et. al., 1976. Area Handbook for the Philippines.

Regions

Region I - Ilocos

Region II - Cagayan Valley

Region III - Central Luzon

Region IV - Southern Tagalog*

Region V - Bicol

Region VI - Western Visayas

Region VII - Central Visayas

Region VIII - Eastern Visayas

Region IX - Western Mindanao

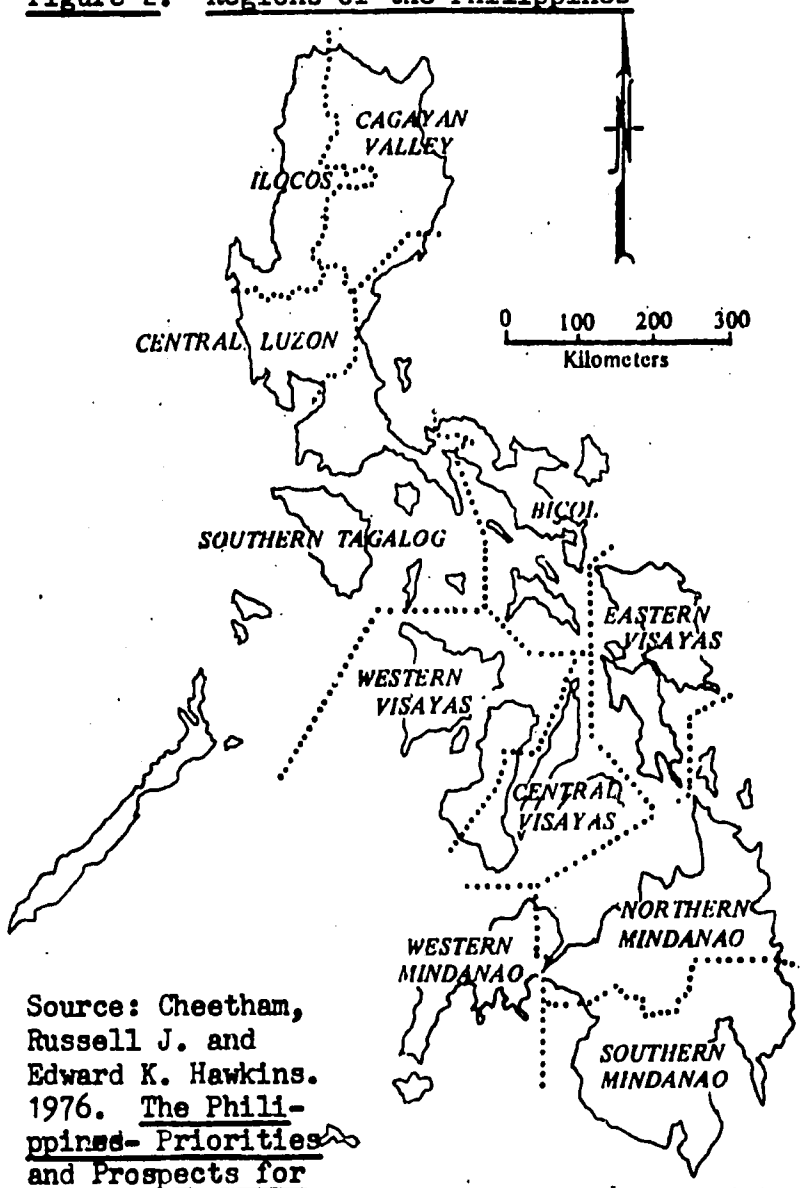
Region X - Northern Mindanao

Region XI - Southern Mindanao

Region XII - Central Mindanao

Region XIII - Metro Manila*

Figure 2. Regions of the Philippines



Source: Cheetham, Russell J. and Edward K. Hawkins. 1976. The Philippines- Priorities and Prospects for Development. The World Bank, Washington, D.C.

Table 1. Population by Region, 1975

Region	Population
I	3,254,117
II	1,930,686
III	4,170,961
IV	5,191,966
V	3,178,615
VI	4,135,911
VII	3,363,416
VIII	2,585,797
IX	2,070,945
X	2,305,150
XI	2,711,278
XII	2,068,839
XIII	4,863,364

Source: Evaluation Technologies, Inc. 1979. The Philippines: A Country Profile. Office of U.S. Foreign Disaster Assistance, Department of State, Washington, D.C.

*The Philippine Government lists 12 regions, with Metro Manila considered a sub-region of Southern Tagalog, or Region IV-A.

1.2 Population Statistics

Present population growth rate: 2.2 to 2.8%

Number of years to double population: 29

Population under age of 15: 43%

Population over age of 64: 3%

Projected population by year 2000: 77.9 million

1.3 Population by ethnic membership

The Philippine people are primarily composed of a common Malay-Indonesian stock with a few cultural minorities including ethnic Chinese, Negritos (the islands' earliest people), and Caucasians (Spaniards and Americans). Intermarriage between these groups has resulted in a general cultural homogeneity with most differences attributed to language rather than race or religion, and to location by province or island group. The eight major linguistic groups who make up 90% of the population are called the Lowland Christians. There are three small minority groups that make up the rest of the population - the Moros (Muslim Filipinos), the ethnic Chinese, and small pagan tribes of the interior. Relations between the Lowland Christians and these minorities have at times been marked by conflict, most recently in open rebellion by the Moros of Southern Mindanao against government troops. This conflict ended in a cease-fire in 1975.

1.4 Regional distribution of ethnic groups

Lowland Christians are found on the coast and in low-lying plains throughout the Philippines and are composed of:

- Tagalogs - Central Luzon Plain
- Cebuanos - Visayas
- Ilokanos - western coast of Luzon and Central Luzon Plain
- Ilongos - Visayas
- Bikolanos - Bikol Peninsula, Cataduanes, Burias, Ticao, and Masbate
- Waray-Waray - Visayas, Samar, and eastern Leyte
- Pampangans - interspersed with Tagalogs and Ilokanos
- Pangasinans - interspersed with Tagalogs and Ilokanos

The Moros, Muslim Filipinos, inhabit southern Mindanao, Palawan, and the Sulu Archipelago. The Chinese, about 600,000 ethnic and 100,000 alien as of 1970, are integrated among all groups throughout the islands. Most small pagan tribes live in the relatively remote and inaccessible areas of the interior mountains and dense tropical forests.

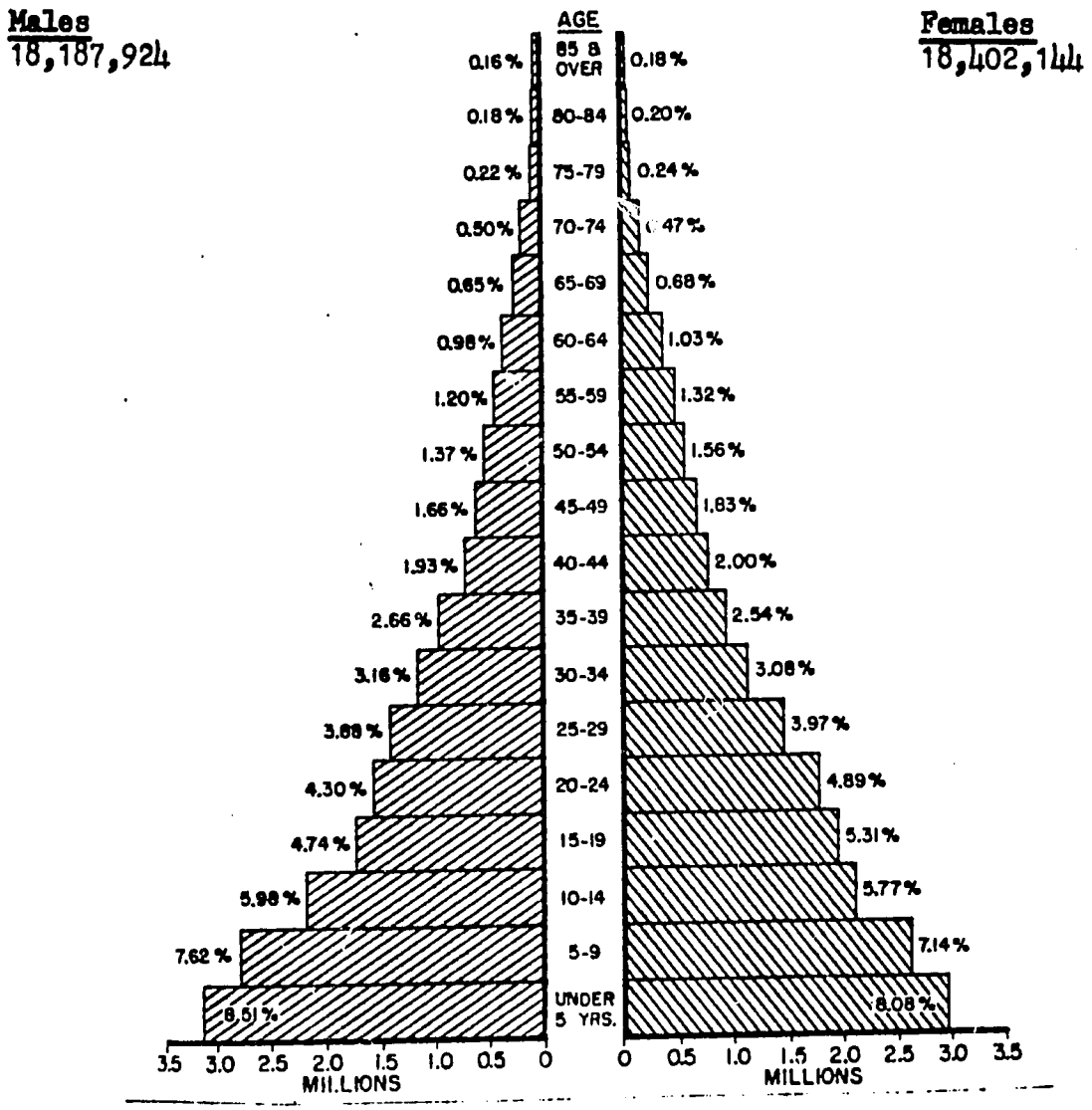
More than 70 languages and dialects are spoken in the Philippines, most of the Malayo-Polynesian language family. Small isolated tribal groups in the interior may only be separated by a valley yet have mutually unintelligible languages, although most Filipinos are bilingual. The government has promoted the use of Pilipino, the national language based

on Tagalog, and it is understood by 55% of the population. English is used for government, commerce, communications, and education and is understood by 45% of the population. Other languages spoken include Chinese, Spanish, and local dialects of the Moros.

1.5 Rural-urban distribution of the population

In 1977, 54% of the total population lived in Luzon, 22.4% in the Visayas, and 23.6% in Mindanao. The most densely populated provinces were the urban provinces of Rizal, Cavite, Laguna, Cebu, and Batangas, while the most sparsely populated provinces were the rural provinces of Palawan, Kalinga-Apayao, Agusan del Sur, North Cotabato, Nueva Vizcaya, Occidental

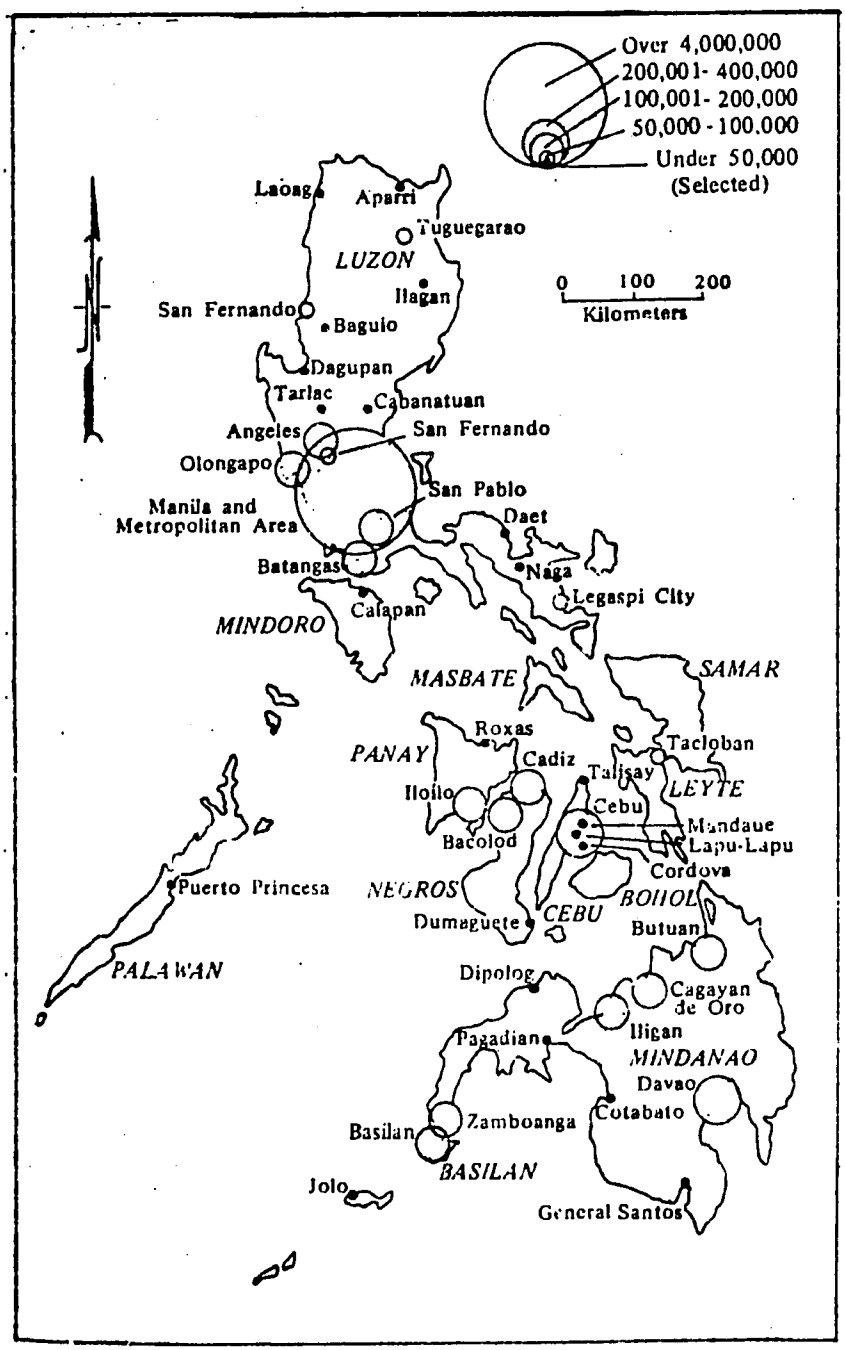
Figure 3. Population by Age and Sex, 1970



Source: Vreeland, Nena, et. al. 1976. Area Handbook for the Philippines.

Mindoro, and Abra. Rizal Province, adjacent to the Metro Manila area, had the greatest population at 3.67 million. In 1970 32% of the population was classified as urban, living in the 60 cities of the Philippines. Metro Manila maintains its status as the most densely populated area in the country with 4.9 million in 1975. The estimated urban growth rate in the Philippines is 3.9% annually.

Figure 4. Major Urban Areas



Source: Cheetham and Hawkins, 1976. The Philippines - Priorities and Prospects for Development.

There are two trends in internal migration in the Philippines: migration from rural areas to the cities, especially to Manila; and migration from the central cities to the suburbs and from the more populous areas to Mindanao for resettlement. There is also some seasonal migration by workers looking for employment, especially during the dry season from January to May.

1.6 Educational characteristics of the population

Primary education in the Philippines is compulsory and free. There is a complete educational system in the country of public and private facilities from elementary to university level offering general, vocational, and specialized training. There are 44 universities and 7,000 colleges in the Philippines, with several universities recognized internationally. Education is very important to the Filipinos, and this is reflected in the high literacy rate of 83% nationally. However, the rate varies considerably with the region as follows (1970 figures):

Ilocos - 83.1%
Cagayan Valley - 78.8%
Central Luzon - 90.3%
Metro Manila area - 96.7%
Southern Tagalog - 92%
Bicol - 86.4%
Western Visayas - 82.1%
Central Visayas - 77.8%
Eastern Visayas - 77.7%
Western Mindanao - 65.4%
Northern Mindanao - 83.4%
Southern Mindanao - 81.8%
Central Mindanao - 66.6%

In general school is taught in English, with primary grades being taught in local dialects or Pilipino up to a certain grade. All children are expected to learn Pilipino in order to bring the country together with a common language bond.

1.7 Health characteristics of the population

1.7.1 Vital statistics, 1979

Birth rate per 1,000 population per year: 34

Death rate per 1,000 population per year: 10

Infant mortality rate: 80 per 1,000 live births

Life expectancy at birth: 58 years

The major health problems in the Philippines continue to be communicable diseases, although such diseases have declined as a cause of death. In the early 1970's, the ten leading causes of death included pneumonia, tuberculosis, gastroenteritis, bronchitis, heart and vascular diseases, and

undiagnosed disease among infants. High infant mortality figures reflect malnutrition, lack of health education, and poor environmental sanitation. Different regions have different health problems as well. Malaria is found mainly in the Cagayan Valley, in Southwestern Mindanao, Palawan, and Isabela Province on Luzon, while schistosamiasis is common in Mindanao and the Eastern Visayas. Filariasis is seen in the provinces of Laguna, Northern Samar, and Agusan del Sur, while leprosy is found in Western Mindanao. Beriberi is commonly found, but cholera (El Tor) appears to be under control.

1.7.2 Medical facilities and health personnel

The medical and health delivery system in the Philippines is administered by the Ministry of Health on a central, regional, provincial, and local level by 60 city health officers, 1,700 main health centers in municipalities, 236 community hospitals and health centers, and 100 hospitals. Rural health units are composed of a main health center staffed with one doctor, one nurse, two or three midwives, and a sanitary inspector. The number of people per hospital bed is estimated at 880.

The availability of health care is about 4 times greater in the Manila area than in the Cagayan Valley, Bicol, Eastern Visayas, and the Mindanao region. Nearly one-third of the population has access to private health care, one-third receives little or no health care, and one-third are served by rural health units and barangay health stations.

Table 2. Existing Health Facilities, 1978

Region	Health Centers	Health Stations	Hospitals Government	Hospitals Private	Total
I	183	412	30	63	93
II	115	217	33	24	57
III	180	510	28	105	133
IV	272	-	29	109	138
V	118	93	24	47	71
VI	130	103	32	33	65
VII	133	244	22	27	49
VIII	125	214	44	21	65
IX	69	105	-	23	23
X	112	159	24	40	64
XI	77	44	15	62	77
XII	84	120	13	21	34
XIII*	230	662	49	145	194
Total	1,828	2,883	343	720	1,063

*Region XIII corresponds to Region IV-A, Metro Manila.

In 1977 there were a total of 48,500 health care workers in the country, including 13,100 doctors, 8,200 nurses, 7,000 midwives, and 2,700 sanitary inspectors. Of these, about 30% are in public service. However, health personnel are not evenly distributed, with approximately one doctor per 600 people in the Manila area and only one doctor per 9,000 in rural areas. Traditional beliefs concerning illness and health practices are in conflict with modern treatment methods and prevent extension of health care in rural areas. However, increasing attention is being given

to the training of health paraprofessionals to increase the number of rural health workers and to bridge the cultural gap.

Table 3. Total Number of Health Personnel, 1977

Physicians	13,107
Nurses	8,283
Midwives	6,915
Dentists	4,124
Sanitary Engineers	86
Health Educators	97
Sanitary Inspectors	2,654
Social Workers	779
Nutritionists	320
Dieticians	278
Other	11,896
Total	48,539

1.7.3 Health problems

In the Philippines the most common health problem is malnutrition. A survey taken in 1977 found that 78% of the more than 4 million pre-school children were malnourished; 6% severely, 25% moderately, and 47% slightly. Only 22% of the children were of normal height for their ages. Such widespread malnutrition is caused by low food production, unequal distribution of income (45% of families cannot afford minimal food requirements), poor dietary habits and ignorance of food values, and large family size. Nutritional deficiency diseases that occur in the Philippines include beriberi where diet consists mostly of polished rice, and xerophthaimia, an eye disease leading to blindness in areas where Vitamin A is lacking in the diet.

1.7.4 Sanitation and water supply

Modern waste disposal methods, safe water supplies, and toilet facilities are not generally available to the majority of the Philippine population. Most people obtain water from force pumps, open wells, springs, rivers, or lakes, and only half have access to safe drinking water. Slightly over one-half of the population are believed to have toilet facilities, but spitting and urinating by both adults and children wherever convenient is the rule in both cities and rural areas. The most modern facilities are found in Manila and the surrounding provinces, but even these systems are plagued by maintenance problems, contamination during dry seasons, and lack of understanding of proper operating procedures.

In the 1970's there was growing concern with water and air pollution from industry and agriculture as well as from municipalities. Actions taken by the National Pollution Control Commission and the National Environmental Protection Council to control pollution appear to be having an effect on the lakes and rivers in the Manila area and elsewhere.

Table 4. Population with Access to Waste Disposal Systems

Urban:	1970	%	1975	%
Public sewerage systems	480,000	4	845,000	5
Household systems	11,185,000	-	11,580,000	-
Total	11,665,000	90	12,425,000	76
Rural:				
Population with adequate disposal	10,000,000	40	12,797,000	44

Source: World Health Statistics Report, Vol. 29 (10), 1976.

1.7.5 Family planning and birth control

The Philippine Government has as a goal the reduction of the population growth rate from its present 2.2 to 2.8% to 1.6% by the year 2000 in order to keep the population stable at 70 million. The present growth rate is down from 3% during the 1960's. Family planning activities began in the 1960's by two private institutions, and in 1969 the Commission on Population (POPCOM) was established in response to increasing concern. POPCOM was given the duty to organize and implement programs to promote a broad understanding of the adverse effects of unlimited population growth on the national welfare and on family life, and to make available all acceptable methods of contraception. By the end of 1974 there were 2,192 clinics offering family planning services, and in that year there were 763,000 new family planning acceptors. Of these, 56% chose to use oral contraceptives, 23% chose condoms, 12% chose intrauterine devices, and 9% chose rhythm and other methods. Attitudes are changing towards contraception use as a result of POPCOM's broad educational program. By 1974 over 50,000 teachers and lay persons had been trained in population control information to facilitate the program's growth. In the past religious beliefs had interfered with population control, especially since over 83% of all Filipinos are Roman Catholic. With a softening of Catholic attitudes towards contraception, more women are accepting family planning services. Contraceptives are now generally available and their use by women of child-bearing age had increased from near zero in 1970 to 24% in 1975, although the rate of new acceptors has remained stagnant since 1974.

2.0 ORGANIZATIONS WITH INTEREST IN ENVIRONMENT AND NATURAL RESOURCES

2.1 GOVERNMENT AGENCIES

Since the declaration of martial law in the Philippines in 1972, the country has been governed by a mixture of provisions of both the 1935 and the 1973 Constitutions and by a series of presidential decrees, proclamations, and orders. President Ferdinand E. Marcos performs both legislative and executive functions, aided by an executive office, the Office of the President, and by the Cabinet. The Office of the President, headed by a Cabinet-level executive assistant, performs administrative, coordinative, and support functions including drafting of policy guidelines and legislation, monitoring government activities at central and local government levels, and preparing reports on particular subjects of interest to the President. Under this office are several commissions, committees, and boards. The Cabinet is composed of the President, the Vice President, the secretaries of all executive departments (or ministries), and other Cabinet-level officials such as the chairmen of the National Economic and Development Authority and the National Science Development Board. The Cabinet recommends actions to the President, but only he has the authority to act upon those recommendations.

The Ministries with interest in the environment and natural resources include the Ministries of Agriculture, Energy, Health, Human Ecology and Settlements, Industry, Local Government and Community Development, Natural Resources, and Public Works, Transportation and Communication. Agencies directly under the Office of the President that deal with the environment include the National Pollution Control Commission and the National Science Development Board. Directly under the President himself is the new National Environmental Protection Council, an advisory board composed of Cabinet members who deal with the environment and natural resources.

2.1.1 National Environmental Protection Council

The National Environmental Protection Council (NEPC) was created in 1977 by Presidential Decree No. 1121 (see Section 3.1.3). The Council is composed of the President, the Secretaries of Natural Resources, Public Highways, Local Governments and Community Development, Industry, National Defense, Public Works, Transportation and Communication, the Presidential Assistant for Development, the National Pollution Control Commission, the Human Settlements Commission, and the Environmental Center of the Philippines. The powers and functions of the NEPC include the formulation of policies and issuance of guidelines for the establishment of environmental quality standards and environmental impact assessments, recommendation of new legislation or amendments to existing legislation to cope with changes in the environmental status of the country, and coordination and integration of government agencies charged with environmental protection and with the enforcement of environmental laws. The Council also is charged with preparing annual environmental status reports and conducting a continuing educational and training program on the enhancement of life through environmental improvement. The Council deals with environmental policy on a national level, while the Environmental Center of the Philippines, a

participatory agency of the Council, deals with dissemination and propagation of the value of environmental planning and management at the regional and local levels.

2.1.2 Office of the President

2.1.2.1 National Pollution Control Commission

The National Pollution Control Commission (NPCC) is the primary agency responsible for the prevention and control of environmental pollution in the Philippines. The NPCC has divisions that deal with air and water pollution, research and development, and legal and administrative matters, and is charged with determining the location, magnitude, extent, severity, causes, effects and other pertinent information regarding pollution of the air, water, and land resources of the country. The NPCC is also charged with taking the necessary measures to prevent or abate such pollution and conducting continuing research and study on the most effective means for the control and abatement of pollution (see Section 3.1.2 for complete list of functions of the NPCC).

Presidential Decree No. 984, which reorganized the NPCC and placed it under the Office of the President, also created an Inter-Agency Advisory Council attached to the Commission. The Council is composed of representatives of the Departments of Agriculture, Health, Industry, Justice, Labor, Natural Resources, and Public Works, Transportation and Communication, the heads of the Laguna Lake Development Authority, the National Economic and Development Authority, the National Science Development Board, and the Human Settlements Commission. The Commissioner of the National Pollution Control Commission heads this Council.

2.1.2.2 National Economic and Development Authority

The National Economic and Development Authority (NEDA) was created in 1972 to serve as the link between policymaking and planning and program and project implementation. It is chaired by the President and is composed of Cabinet-level officials involved in formulating and executing sectoral development activities. The Authority's major function is the planning and implementation of overall development in the Philippines through five, ten, and twenty-year development plans.

2.1.2.3 National Science Development Board

The National Science Development Board (NSDB) was created in 1958 as a national coordinating agency for the promotion of science in the Philippines. The NSDB oversees and supervises the activities of a wide variety of commissions, centers, and institutes to integrate science and technology activities in the country. Agencies under NSDB's aegis include the National Institute of Science and Technology, the Philippine Atomic Energy Commission, the Philippine Textile Research Institute, the Metals Industry Development Center, and the Forest Products Research and Industries Development Commission. The NSDB agencies are also under the Office of the President.

2.1.3 Ministry of Agriculture

The Ministry of Agriculture, until 1974 part of the Ministry of Agriculture and Natural Resources, is the agency concerned with the development and improvement of agricultural production in the Philippines. Through its various bureaus the Ministry conducts research and studies on all aspects of plant and animal production and improvement, including experiments on cross-breeding for improved milk and meat production of cattle, introducing breeding of new food species such as rabbits, and improving rice production through the use of new varieties of rice developed by the Ministry and elsewhere. The Ministry also maintains agricultural extension services which disseminate new information to farmers and provide technical advice on all agricultural questions. Divisions of the Ministry of Agriculture include:

Bureau of Animal Industry
Bureau of Plant Industry
Bureau of Soils
National Irrigation Administration
Bureau of Agricultural Economics
Bureau of Agricultural Extension

Minister: Arturo Tanco, Jr. (August 1979)

2.1.4 Ministry of Education and Culture

The Ministry of Education and Culture is required by law to integrate subjects on environmental education in its school curricula at all levels and endeavor to conduct special community education emphasizing the relationship of man and nature as well as environmental sanitation and practices. Schools at all levels have programs in gardening and health practices which teach the importance of good nutrition and the relationship between contaminated water and poor health.

Minister: Onofre D. Corpuz (August 1979)

2.1.5 Ministry of Human Settlements and Ecology

The Ministry of Human Settlements and Ecology, in coordination with other appropriate government agencies, is required by law to formulate and recommend to the National Environmental Protection Council a National Land Use Scheme which includes a determination of land uses, a comprehensive and accurate determination of the adaptability of the land for community development, agriculture, industry, commerce, or other activities, a method for identifying areas where uncontrolled development could result in irreparable damage to important historic, cultural, or esthetic values or natural systems or processes of national significance, and a science-based and technology-oriented land inventory and classification system (for components see Section 3.4.1).

Minister: Imelda R. Marcos (August 1979)

2.1.6 Ministry of Local Government and Community Development

The Ministry of Local Government and Community Development is responsible for promulgating guidelines for the formulation and establishment of waste management programs for provinces, cities, and municipalities. Each province, city, or municipality must provide for the collection, transportation, processing and disposal of waste within its jurisdiction and may request funds for that purpose from the National Environmental Protection Council.

Minister: Jose A. Roño (August 1979)

2.1.7 Ministry of Natural Resources

The Ministry of Natural Resources, created by Presidential Decree No. 461, has as its goals both conservation and development in the areas of forestry, fisheries, lands, minerals, and wildlife. The Ministry's objectives are:

- to assess the status of the country's natural resources with the view of maximizing their utilization, programming their exploration, and providing for their replacement
- to meet the necessary demands for mineral, aquatic, and forest products brought about by the growing population
- to conserve, revitalize, develop, and manage the country's natural resources for present and future generations
- to increase the productivity of natural resources with reference to their utilization and exploration.

The Ministry is composed of four Bureaus, and several advisory and policy-making bodies:

Bureau of Forest Development
Bureau of Fisheries and Aquatic Resources
Bureau of Mines
Bureau of Lands
Forest Research Institute
Fishery Industry Development Council
Presidential Committee on Wood Industry Development
National Committee on Mineral Exploration

The programs undertaken by the Ministry include conserving vanishing forest species and wildlife species, formulating policies to check environmental pollution in the mining industry, conducting inventories of natural resources, remote sensing projects, parks and wildlife development, and forest ecosystem management.

Minister: Jose J. Leido, Jr. (August 1979)

2.1.8 Ministry of Public Works, Transportation and Communication

The Ministry of Public Works, Transportation and Communication is the agency responsible for administering clean-up campaigns, controlling polluting motor vehicles, and administering the National Water Resources Council. The Council has regulatory and coordinating powers to integrate the country's

water resources development within the context of national plans and policies. Divisions within the Ministry include:

Bureau of Public Works
National Water Resources Council
Land Transportation Commission

Minister: Alfredo L. Juinio (August 1979)

2.1.9 Other government or semi-governmental agencies

2.1.9.1 Natural Resources Management Center of the Philippines

The Natural Resources Management Center of the Philippines, created in 1977, is the primary agency for gathering, analyzing, and compiling data about the physical environment of the country. The Center also assists other government agencies and private companies in detecting sources and causes of pollution, crop protection, disease control, and potential oil and mineral sites.

2.1.9.2 Development Academy of the Philippines

The Development Academy of the Philippines is a public corporation founded in 1973 to train government officials in career executive service development. The Academy's program for government officials includes academic and applied aspects of communications, theories and strategies of development, reforms and innovations in Philippine government, and development management. The Academy also provides advanced training to top and middle level executives in business and industry.

2.1.9.3 Laguna Lake Development Authority

The Laguna Lake Development Authority (LLDA) is a semi-governmental agency responsible for the conservation and development of the resources of the Laguna de Bay region to promote the socio-economic well-being of the people. Laguna de Bay is a 93,000 hectare freshwater lake located 50 kilometers from Manila, and is the location for several power plants and other industry along the shoreline as well as many municipalities. The LLDA conducts research and experiments to understand the ecology of the lake and assess environmental damage to the lake and to its fish and aquatic resources. The LLDA coordinates its functions with the Bureau of Fisheries and Aquatic Resources in the Ministry of Natural Resources.

2.2 NONGOVERNMENTAL AGENCIES

2.2.1 International Rice Research Institute (IRRI)

The International Rice Research Institute, located in Los Banos, Laguna, is an institution concerned with the testing and development of improved foodgrains, particularly rice, and the technologies used to cultivate and harvest grains. The IRRI biologists have developed "miracle" rice varieties that produce amazing results in farmers' fields, and small, low-cost planting and harvesting machinery usable by average farmers in small farm plots.

Several rice varieties developed and tested by IRRI served as the basis for the "Green Revolution" in Philippine agriculture.

2.2.2 International Center for Living Aquatic Resources (ICLARM)

The International Center for Living Aquatic Resources is an international, nonprofit scientific center which conducts and stimulates research on all aspects of fisheries and other living aquatic resources to assist the people of economically developing nations to meet their nutritive, economic, and social needs. Although the interests of ICLARM are world-wide, the initial focus of this organization is Southeast Asia and the Southwest Pacific. The Center's research attacks problems in aquaculture, traditional fisheries, resource development and management, marine affairs, and education and training.

2.2.3 Underwater Ecological Society of the Philippines

The Underwater Ecological Society of the Philippines is a nonprofit organization dedicated to the creation of an ecological conscious society. The Society has as long-term goals the establishment of a Marine Biological and Information Center, marine reserves, marine biological scholarshipe, professional chairs, and the collection and distribution of scientific data on marine ecology, the environment in general, its value for the present and the future generations of Filipino people, and the destruction of the environment that is occurring.

2.2.4 Other nongovernmental agencies

Other agencies that deal with environment and natural resources include the following:

Southeast Asia Fisheries Development Corporation (SEAFDEC)
Philippine Wildlife Conservation Foundation
Society of Filipino Foresters

No information on these organizations was available at the time of this report.

3.0 LEGISLATION DEALING WITH ENVIRONMENT AND NATURAL RESOURCES

The Philippine people ratified a constitution in 1935 while still a colony of the United States, but the country did not become independent until 1946. The 1935 Constitution provided for separate judicial, legislative, and executive branches of government, including a Congress and a President. In 1972, then-President Ferdinand E. Marcos declared martial law based upon a state of emergency due to Communist uprisings and severe economic problems. Under martial law the Congress was dissolved and all legislative powers reverted to the President. A new Constitution was promulgated in 1973 that called for an elected National Assembly, a Prime Minister, and a President. President Marcos was granted full executive and legislative powers under that constitution until such time as elections could be held. From 1973 until 1978 President Marcos ruled by decree, with assistance from an appointed Cabinet. In 1978 National Assembly elections were held and President Marcos was confirmed as Prime Minister. The National Assembly consists of 200 members; 165 are elected directly, and the remaining 35 seats are divided between the President, 20 members of his Cabinet, and 14 elected representatives from youth, labor, and agricultural organizations. Legislation, however, continues to be issued by Presidential Decree upon the advice of the National Assembly and Cabinet. Legislation, regulations, and decrees are published for public information in the Official Gazette and are compiled several times a year in volumes entitled Vital Legal Documents in the New Society. Laws and regulations in force before the imposition of martial law remain in force unless abrogated by subsequent laws.

3.1 GENERAL ENVIRONMENTAL LEGISLATION

3.1.1 Constitution of the Republic of the Philippines, 1973

Provisions: The provisions of the 1973 Constitution that relate to environment and natural resources can be found in Article XIV, General Provisions, and in the preamble which states as a general goal the "promotion of the general welfare" of the Philippine people. Sections of Article XIV include the following provisions:

- All lands of the public domain, waters, minerals, coal, petroleum and other mineral oils, all forces of potential energy, fisheries, wildlife, and other natural resources of the Philippines belong to the State. With the exception of agricultural, industrial or commercial, residential, and settlement lands of the public domain, natural resources shall not be alienated, and no license, concession, or lease for the exploration, development, exploitation or utilization of any of the natural resources shall be granted for a period exceeding 25 years,

renewable for not more than 25 years, except as to water rights for irrigation, water supply, fisheries, or industrial uses other than development of water power, in which cases beneficial use may be the measure and limit of the grant.

- Lands of the public domain are classified into agricultural, industrial, or commercial, residential, resettlement, mineral, timber or forest, and grazing lands, and such other classes as may be provided by law.
- The National Assembly will take into account the conservation, ecological, and development requirements of the natural resources when determining the size of lands of the public domain which may be developed, held or acquired by, or leased to a any qualified individual, corporation, or association. No individual citizen may hold alienable lands of the public domain except by lease not to exceed 500 hectares (ha.) or acquire by purchase or homestead in excess of 24 ha. No private corporation or association may hold such lands except by lease not to exceed 1,000 ha. No private corporation or association may hold by lease, concession, license or permit timber or forest lands or other timber or forest resources in excess of 100,000 ha., but such area may be increased by the National Assembly upon recommendation of the National Economic and Development Authority (see Sec. 2.0).

3.1.2 Presidential Decree No. 984, 1976

Provisions: This decree revises Republic Act No. 3931, known as the Pollution Control Law. The decree declares as a national policy the prevention, abatement, and control of pollution of water, air and land for the more effective utilization of the natural resources of the country. Pollution is described as any alteration of the physical, chemical and biological properties of any water, air, and/or land resources of the Philippines, or any discharge thereto of any liquid, gaseous or solid wastes as will or is likely to create or to render such water, air and land resources harmful, detrimental, or injurious to public health, safety or welfare or which will adversely affect their utilization for domestic, commercial, industrial, agricultural, recreational, or other legitimate purposes. This decree reorganizes the National Pollution Control Commission to make it more effective in the discharge of its functions and responsive to the demands of the country's accelerated industrialization program. The National Pollution

National Pollution Control Commission:

Control Commission, as the primary agency responsible for the prevention and control of environmental pollution, will have a Water Pollution Control Division, an Air Pollution Control Division, a Research and Development Division, a Legal Division, an Administrative Division, and any other such units or divisions as may be needed. The Commission's powers and functions include the following:

NPCC Powers and Functions:

- Determine the location, magnitude, extent, severity, causes, effects and other pertinent information regarding pollution of the water, air, and land resources of the country and take such measures to prevent or abate such pollution, and conduct continuing research and study on the effective means for the control and abatement of pollution.
- Develop comprehensive multiyear and annual plans for the abatement of existing pollution and the prevention of new or imminent pollution.
- Issue standards, rules and regulations to govern the approval of plans and specifications for sewage works and industrial waste disposal systems and issue permits in accordance with the provisions of this Decree, and inspect the construction and maintenance of such systems for compliance to plans.
- Adopt, prescribe, and promulgate rules and regulations governing the procedures of the Commission with respect to hearings, plans, specifications, designs, and other data for sewage works and industrial waste disposal systems, the filing of reports, the issuance of permits, and other rules and regulations for the implementation and enforcement of this Decree.
- Issue orders or decisions to compel compliance with the provisions of this Decree.
- Make, alter, or modify orders requiring the discontinuance of pollution specifying the conditions and the time within which such discontinuance must be accomplished.
- Issue, renew, or deny permits under such conditions as the Commission may determine to be reasonable for the prevention and abatement of pollution, for the discharge of sewage, industrial waste, or for the installation or operation of sewage works and disposal systems or their parts.
- Set up effluent, stream, ambient, and emission standards and promulgate rules and regulations for compliance with the standards.

The Commission is also charged with serving as the arbitrator for the determination of reparations or restitution of the damages and losses resulting from pollution.

Prohibitions: This Decree also contains prohibitions including the following:

- No person shall throw, run, drain, or otherwise dispose into any of the water, air, and/or land resources of the Philippines or cause, permit, suffer to be thrown, run, drain, allow to seep or otherwise dispose of any organic or inorganic matter or any substance in gaseous or liquid form that shall cause pollution of those resources.
- No person shall perform any of the following activities without first securing a permit from the Commission for the discharge of all industrial wastes and other wastes which could cause pollution: the construction, installation, modification or operation of any sewage works, the increase in volume or strength of any wastes in excess of the amounts allowed under existing permits, or the construction, installation, or operation of any industrial or commercial establishments or any extension or modifications thereof which would cause an increase in the discharge of wastes directly into the water, air, or land resources of the Philippines or would otherwise alter their physical, chemical, or biological properties in any manner not already lawfully authorized.

The Decree also contains penalties and fines for non-compliance with any of the above provisions.

Inter-Agency Advisory Council: This Decree also creates the Inter-Agency Advisory Council attached to the Commission which shall be composed of representatives of the Departments of Agriculture, Health, Industry, Justice, Labor, Natural Resources, and Public Works, Transportation, and Communications; the heads of the Laguna Lake Development Authority, National Economic and Development Authority, the National Science Development Board and the Human Settlements Commission. The Commissioner of the National Pollution Control Commission will head this Council.

3.1.3 Presidential Decree No. 1121, 1977

Provisions: This Decree creates the National Environmental Protection Council (NEPC) under the supervision and control of the President of the Philippines. The Council is composed of the President of the Philippines (chairman), the Secretary of Natural Resources (executive officer), and as members, the Secretaries of Public Highways, Local Governments and Community Development, Industry, National Defense, Public Works, Transportation

National Environmental Protection Council:

and Communications; the Presidential Assistant for Development; the Budget Commissioner; and the Chairmen of the Energy Development Board, the National Pollution Control Commission, the National Science Development Board, the Human Settlements Commission, and the Board of the Environmental Center of the Philippines. The powers and functions of the NEPC are to:

- Rationalize the functions of government agencies charged with environmental protection and with the enforcement of environment-related laws in order to achieve effective, coordinated and integrated systems of environmental protection, research, and implementation and enforcement of such laws,
- Formulate policies and issue guidelines for the establishment of environmental quality standards and environmental impact assessments,
- Recommend new legislation or amendments to existing legislation to cope with changes in the environmental status of the country,
- Undertake a comprehensive and continuing research program for environmental protection,
- Review environmental impact assessments of projects submitted by government agencies,
- Monitor development projects initiated by government and private agencies to see that they are in in line with priorities of the government on environmental protection,
- Conduct public hearings or conferences on issues of environmental significance,
- Conduct a continuing educational and training program on the enhancement of the quality of life through environmental improvement,
- Organize the most appropriate implementing mechanism to perform these duties,
- Call on any department, bureau, office, agency or state university or college for assistance in the form of personnel, facilities, and other resources as the need arises in the discharge of its functions,
- Prepare annual environment status reports, and
- Promulgate rules and regulations to carry out the provisions of this Decree.

3.1.4 Presidential Decree No. 1151, 1977

Provisions: This Decree declares that it is a policy of the State to:

- Create, develop, maintain, and improve conditions under which man and nature can thrive in productive and enjoyable harmony with each other,

- Fulfill the social, economic and other requirements of present and future generations of Filipinos, and
- Insure the attainment of an environmental quality that is conducive to a life of dignity and well-being.

To pursue this policy, it is the responsibility of the government to use all practicable means to promote the general welfare so that the Nation may recognize, discharge, and fulfill the responsibilities of each generation as trustee and guardian of the environment for succeeding generations; assure the people of a safe, decent, healthful, productive and esthetic environment; encourage the widest exploitation of the environment without degrading it or endangering human life, health, and safety or creating conditions adverse to agriculture, commerce, and industry; preserve important historic and cultural aspects of the Philippine heritage; attain a rational and orderly balance between population and resource use; and improve the utilization of renewable and nonrenewable resources.

In addition, the Decree states that it is the duty and responsibility of each individual to contribute to the preservation and enhancement of the Philippine environment.

Environmental Impact Statements

Section 4 of the Decree states that all agencies of the government and private organizations shall prepare, file, and include in every action, project, or undertaking which significantly affects the quality of the environment a detailed environmental impact statement that describes:

- The environmental impact of the proposed action, project, or undertaking
- Any adverse environmental effect which cannot be avoided should the proposal be implemented
- Alternatives to the proposed action
- A determination that the short-term uses of the resources of the environment are consistent with the maintenance and enhancement of the long-term productivity of the same
- Whenever a proposal involves the use of depletable or nonrenewable resources, a finding must be made that such use and commitment are warranted.

Before an environmental impact statement is issued by a lead agency, all agencies involved in, having jurisdiction over, or a special expertise in the subject matter shall comment on the draft environmental impact statement made by the lead agency within 30 days from its receipt.

This Decree also stipulates that agencies charged with environmental protection shall submit to the National Environmental Protection Council their respective

guidelines, rules, and regulations to carry out the environmental impact statement provisions within 60 days.

3.1.5 Presidential Decree No. 1152, 1977

Provisions: This Decree, also known as the Philippine Environment Code, contains the following titles: Air Quality Management, Water Quality Management, Land Use Management, Natural Resources Management and Conservation, Waste Management, and Miscellaneous Provisions. Each of these subjects are reported on under the major heading under Section 3.2, Renewable Resources.

3.2 RENEWABLE RESOURCES

3.2.1 Water Resources

3.2.1.1 Presidential Decree No. 274, 1973

Provisions: This Decree implements the Pasig River Development Program to preserve, beautify, improve and utilize the Pasig River and to regulate and control pollution of the river and its banks. The program includes projects and public works activities such as the construction of drainage ditches, navigation devices, low and medium cost housing, parks, and small-scale industries along the river bank. To achieve these objectives, industries and persons undertaking activities towards beautification of the Pasig will receive incentives in the form of reimbursement for expenses and tax exemptions.

3.2.1.2 Presidential Decree No. 281, 1973

Provisions: This Decree creates the Pasig River Development Council to oversee the implementation of the Pasig River Development Program. The Council consists of the following members:

- Secretary, Department of Public Works, Transportation, and Communications - Chairman
- Secretary, Department of Tourism - Vice-chairman
- Director, Bureau of Public Works
- Commissioner, Bureau of Public Highways
- Director, Bureau of Lands
- Flag Officer-in-Command, Philippine Navy
- Commandant, Philippine Coast Guard
- Commissioner, National Pollution Control Commission
- Officer in Charge, Presidential Assistant on Housing and Resettlement Agency
- Director, Bureau of Cooperatives
- Governor, Rizal Province
- Mayor, City of Manila

The Council will work in close association and coordination with the Chairman of the Environmental Center of the Philippines in order to ensure the proper ranking of priorities in undertaking the integrated development of the Pasig River.

3.2.1.3 Presidential Decree No. 424, 1974

Provisions: This Decree creates the National Water Resources Council attached to the Department of Public Works, Transportation and Communications. The Council has the following duties, powers, and functions:

- coordinate and integrate water resources development activities of the country within the context of national plans and policies for social and economic development,
- determine, adjudicate, and grant water rights, amending Act No. 2152 and other laws relating to the appropriation and utilization of surface and ground water,
- formulate and promulgate general criteria, methods, and standards for basic data collection, project investigation, planning and design and rules and regulations for the exploitation and utilization of water resources,
- review and approve water resources development plans and programs of any agency within the context of overall national plans,
- undertake river basin survey, inventory and appraisal of water and related resources and develop comprehensive basin-wide plans of storage and control to maximize the conservation and multipurpose use of water in the basin,
- undertake hydrologic surveys and establish, operate, and maintain observation stations networks and a centralized water resource data center necessary for a scientific survey and appraisal of surface and ground water potentials of the country, and
- conduct and/or promote special studies and research with other government or private agencies on all related aspects of water resources development.

The Council is composed of the following members:

Secretary, Department of Public Works, Transportation and Communications - Chairman
Secretary, Department of Agriculture and Natural Resources
Director General, National Economic and Development Authority
Administrator, National Irrigation Administration

General Manager, National Power Corporation
Director, Bureau of Public Works

3.2.1.4 Presidential Decree No. 600, 1974

Provisions: This Decree declares as a national policy the prevention and control of the pollution of seas by the dumping of wastes and other matter which create hazards to human health, harm living resources and marine life, damage amenities, or interfere with the legitimate uses of the sea within the territorial jursidiction of the Philippines. This Decree is also known as the Marine Pollution Decree of 1974. Section 4 of the Decree states that it is unlawful to throw, discharge, or deposit, or cause, suffer, or procure to be thrown, discharged, or deposited either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment or mill of any kind, any refuse matter of any kind or description whatever other than that flowing from streets and sewers into any navigable water or any tributary of any water of the Philippines. It is also unlawful to deposit, or cause, suffer, or procure to be deposited materials of any kind in any place on the bank of any navigable water or tributary where the material is liable to be washed into the water.

Discharge of Oil: In addition, it is unlawful for any person to discharge, or suffer, or permit the discharge of oil, noxious liquid substances and other harmful substances by any method, means or manner into or upon the territorial and inland waters of the Philippines, except in case of emergency or unavoidable accident. Any ship, tank vessel, tank barge or any other watercraft which accidentally or otherwise discharges oil or oily mixtures in Philippine waters must immediately notify the Philippine Coast Guard, giving all particulars.

3.2.1.5 Presidential Decree No. 602, 1974

Provisions: This Decree establishes an Oil Pollution Operations Center in the Philippine Coast Guard Headquarters. The Center may call upon any department, bureau, office, agency or instrumentality of the government for such assistance as it may need in the form of personnel, facilities and other resources. The Center will also serve as the point of contact with similar national operations centers of ASEAN member countries and shall call for their assistance to help control oil pollution. The Center will, in turn, respond to calls for assistance from ASEAN member countries.

3.2.1.6 Presidential Decree No. 1152, 1977

Provisions: This Decree, the Philippine Environment Code, is primarily concerned with water quality management. The National Pollution Control Commission is charged with classifying Philippine waters according to their best use. In classifying the NPCC will take into account the existing quality of the body of water at the time of classification, the size, depth, surface area covered, volume, direction, rate of flow, gradient of stream, and the most beneficial uses of these bodies of water and lands bordering them for residential, agricultural, commercial, industrial, navigational, recreational, and esthetic purposes. Where public interest requires, the NPCC shall reclassify a body of water based on the intended beneficial use and take such steps as may be necessary to upgrade the quality of said water. Other government agencies may adopt higher standards for a particular body of water upon the approval of the NPCC.

The Decree states that where the quality of water has deteriorated to a degree where its state will adversely affect its best usage, the government agencies concerned will take such measures as may be necessary to upgrade the quality of the water to meet prescribed water quality standards.

Water Quality Standards: The National Pollution Control Commission will prescribe quality and effluent standards consistent with the guidelines set by the National Environmental Protection Council and the classification of waters prescribed in this Decree taking into consideration:

- the standard of water quality or purity may vary according to beneficial uses; and
- the technology relating to water pollution control.

Regulation and Enforcement The appropriate government agencies will regulate the following:

- the production, utilization, storage and distribution of hazardous, toxic and other substances such as radioactive materials, heavy metals, pesticides, fertilizers, and oils.
- the disposal, discharge, and dumping of untreated wastewater, mine tailings and other substances that may pollute any body of water of the Philippines resulting from normal operations of industries, water-borne sources, and other human activities as well as those resulting from accidental spills and discharges.

It is the polluter's responsibility to contain, remove and clean up water pollution incidents at his own expense.

Monitoring: The various government agencies concerned with environmental protection shall establish a water quality surveillance and monitoring network with sufficient stations and sampling schedules to meet the needs of the country. Each agency will report the results of the monitoring activities to the National Environmental Protection Council as the need arises.

3.2.1.7 Other laws relating to water resources

The other laws relating to water resources in the Philippines are the New Civil Code, Articles 502 to 518, the Law of Waters of 1866, the Irrigation Act, Act 2152 of 1912, and the Republic Act No. 8601 of 1963 creating the National Irrigation Administration. Points regarding water resources found in these laws include:

- Water can be either public or private. Private ownership applies to water running through private land while it is so running, lakes and lagoons and their beds found on private land, rain water, subterranean water, and beds of flowing water formed by rainwater found on such lands. Other waters are of public ownership.
- The use of public waters can be acquired by administrative concession or by prescription for ten years. Public waters cannot be owned, only used.
- Rivers are considered navigable if in their natural state they are capable of being used for commerce; that is, if there is sufficient water for floating any kind of vessel.
- Anyone may make use of public waters for drinking, washing clothes, bathing, and for watering grazing animals, subject to police regulations.
- The coast of the maritime frontier and the coast of the sea and its shores are treated as property of public use and domain.
- When water use is granted for irrigation, water supply, fisheries, or industrial uses other than the development of water power, such use is forfeit if the beneficial use is not taken advantage of for a period of five years. Such waters may be returned to public use.
- The order of preference for water rights when there is not enough water for all purposes is: for domestic purposes, for agricultural purposes and industrial development for agricultural purposes, for industrial purposes, for fish ponds, and for mining purposes connected with milling.
- All users of private or public water must register their claim to that use with the National Water Resources Council. Nonregistration may be sufficient grounds for cancelling the right to such use.

3.2.2 Forest Resources

3.2.2.1 Presidential Decree No. 705, 1975

Provisions: This Decree revises the Forestry Reform Code of the Philippines and is known as the Revised Forestry Code

of the Philippines. In this Decree, the following policies are adopted:

- The multiple uses of forest lands shall be oriented to the development and progress requirements of the country, the advancement of science and technology, and the public welfare.
- Land classification and survey shall be systemized and hastened.
- The establishment of wood-processing plants shall be encouraged and rationalized.
- The protection, development and rehabilitation of forest lands shall be emphasized to ensure their continued production.

Bureau of Forest Development: As part of this Code, all departments concerned with forestry have been incorporated into the new Bureau of Forest Development. This includes the Bureau of Forestry, the Reforestation Administration, the Southern Cebu Reforestation Development Project, and the Parks and Wildlife Office. The Bureau of Forest Development has jurisdiction over all forest land, grazing land, and all forest reservations including watershed reservations administered by other agencies.

Powers and Duties: The Bureau is also responsible for:

- the protection, development, management, regeneration, and reforestation of forest lands,
- the regulation and supervision of the operation of licensees, lessees and permittees for the taking or use of forest products,
- the implementation of multiple use and sustained yield management in forest lands,
- the protection, development and preservation of national parks, marine parks, game refuges and wildlife,
- the implementation of measures and programs to prevent kaingin (slash and burn) agriculture and to manage the occupancy of forest and grazing lands,
- the enforcement of forestry, reforestation, parks, game, and wildlife laws, rules, and regulations,
- the regulation of establishment and operation of sawmills, veneer and plywood mills and other wood processing plants, and
- with other agencies, classifying all lands in the public domain.

The Bureau is directly under the control and supervision of the Department of Natural Resources, and has a Director and Assistant Director(s). The Bureau has these divisions: Planning and Evaluation, Administrative, Legal, Reforestation and Afforestation, Timber Management, Utilization, Forest Protection and Infrastructure, Parks, Range and Wildlife, Security and Intelligence, and the Forest Development Training Center. The Bureau is also to set up at least 11 regional offices as well. Functions of the Bureau are reported below.

Classification and Survey: The Secretary of the Department of Natural Resources will study, devise, determine and prescribe the criteria, guidelines and methods for the proper and accurate classification and survey of all lands of the public domain into agricultural, industrial or commercial, residential, resettlement, mineral, timber or forest, and grazing lands. The Secretary will determine which of the unclassified lands are needed for forest purposes and declare them as permanent forest reserves. Existing pasture leases and permits in forest lands remain classified as forest lands until reclassified as grazing land. All boundaries between permanent forests and alienable and disposable lands shall be clearly marked and maintained on the ground. No lands of the public domain of 18% slope or over shall be classified as disposable, nor any forest land of 50% slope or over as grazing land.

Marine Parks: The President of the Philippines may establish forest reserves and forest reservations for the national park system for preservation as critical watersheds and thus modify boundaries of forest lands. Any offshore area needed for the preservation and protection of its educational, scientific, historical, ecological, and recreational values including the marine life present may be classified and established as marine parks.

Utilization and Management: The numerous beneficial uses of the timber, land, soil, water, wildlife, recreation value and grass of forest lands shall be evaluated before allowing the utilization, exploitation, occupation or possession of such lands. Critical watersheds and national parks, however, are not open to logging operations. No person may utilize, exploit, occupy, possess or conduct any activity within any forest land or establish any wood processing plant unless authority has been granted through a permit, license, lease, or license agreement. All measures shall be taken to achieve an approximate balance between growth and harvest or use of forest products in forest lands.

Timber Management: The Bureau will conduct an inventory of harvestable timber in all forest lands, and no timber may be harvested until it has been subject to at least a 5% inventory or other statistically accurate timber estimate. Silvicultural and harvesting practices used must be consistent with sustained yield management, and the most proper harvest method should be used for different types of forests and forest products. The annual allowable cut of any particular forest land will be determined on the basis of the established rotation and cutting cycle and the volume and kind of harvestable timber and healthy residual trees, seed trees, and natural reproduction observed.

Licenses may be given for logging for a period up to 25 years, renewable for another 25 years. The license shall automatically terminate the moment all harvestable timber has been utilized. A condition of the license states that the licensee shall reforest all the areas designated by the Bureau.

Wood Processing: Incentives shall be offered for the establishment of an integrated wood industry in designated wood industry centers or economic areas. While establishment of wood processing plants shall be encouraged, their locations and operations shall be regulated. No new plants shall be established unless adequate raw materials are available in the area on a sustained-yield basis. Wood processors may only accept logs cut by or purchased from licensees of good standing.

Reforestation: The following lands shall be reforested and covered with suitable and sufficient trees:

- bare or grass-covered tracts of forest lands with at least 50% slope, or with less than 50% slope but with highly erodible soil
- brushlands or tracts of forest lands generally covered with brush
- open tracts of forest lands with slopes exceeding 50% interspersed with patches of forest each of which is less than 250 hectares in area
- denuded areas proclaimed as forest reserves and reservations as critical watersheds, national parks, game refuges, bird sanctuaries, national shrines, and national historical sites
- inadequately-stocked forest lands within forest concessions
- river banks, easements, road rights-of-way, deltas, swamps, former river beds, and beaches.

Leases can be granted to qualified individuals to plant tree plantations and tree farms up to a period of 25 years. No leases shall be granted within critical watersheds. Incentives shall be given to encourage qualified persons in the form of sale of seedlings at cost, free technical advice, and exemption of certain taxes when forest products are sold.

Forest Protection: All measures shall be taken to protect the forest resources from destruction, impairment, and depletion. Towards this goal, no utilization of timber will be allowed without license agreements. The utilization of timber in alienable and disposable lands, private lands, and civil reservations and the establishment of saw mills shall also be regulated through a permit system.

Other measures for forest protection include:

- Mangrove forests along the coast will be protected and kept free of artifical obstructions.
- Surface-mined areas shall be restored to as near their former natural configuration as possible prior to.

abandonment by the mining concern.

- No location, prospecting, exploration, utilization, or exploitation of mineral resources within forest concessions is allowed without prior approval of the Director of the Bureau of Forest Development.
- Roads and other infrastructure in forest lands shall be constructed with the least impairment to the resource values as possible.
- Logging roads must be strategically located and widths regulated to minimize clear-cutting, unnecessary damage or injury to healthy residual trees, and erosion.
- Any occupancy in forest land which results in erosion, sedimentation, reduction in water yield and impairment of other resources to the detriment of community and public interest shall not be allowed.
- Forest lands which are being used for pasture shall be maintained with sufficient grass cover to protect soil, water, and other forest resources.

Wildlife: Wildlife may be destroyed, killed, consumed, eaten or otherwise disposed of without the necessity of a permit for the protection of life, health, safety and property and the convenience of the people. However, the Director of the Bureau may regulate the killing and destruction of wildlife in forest lands to maintain an ecological balance of flora and fauna. Any person who destroys wildlife regulated by the Bureau without permits shall be fined and denied a permit for three years.

Recreation: The Bureau shall identify and provide for the protection of scenic areas in all forest lands which are potentially valuable for recreation and tourism and plan for the development and protection of such areas to attract visitors and meet their demands.

Offenses and Penalties: Persons who take the following actions shall be penalized by fines, imprisonment, or both. Actions prohibited by the Code include:

- cutting, gathering, collecting or removing timber or other forest products from any forest land or timber from alienable and disposable public lands without proper authorization
- entering, occupying or possessing forest lands without authorization
- causing destruction or damage to the forest stand such as fires
- occupying for any length of time any portion of the national parks system or in any manner cutting, destroying, damaging, or removing timber or any vegetation or other natural resources in national parks
- selling or offering for sale any wood products that have not been graded according to rules established by the government.

3.2.2.2 Presidential Decree No. 1152, 1977

Provisions: The Philippine Environment Code, under Natural Resources Management and Conservation, contains provisions for forestry and soil conservation. According to the Decree, the Department of Natural Resources will undertake a system of rational exploitation of forest resources and shall encourage citizen participation to keep the country's forest resources at maximum productivity at all times. Measures for this exploitation include regulating the marketing of threatened forest resources, conserving threatened species of flora as well as increasing their rate of propagation, the banning of destructive modes of exploitation, kaingin (slash and burn) cultivation, indiscriminate harvesting of minor forest products, the recycling of waste materials, and carrying out a continuing effort on: reforestation, timber stand improvement, forest protection, land classification, forest occupancy management, agri-silviculture, range management, industrial tree plantations, parks and wildlife management, multiple use forest, timber management and forest research.

3.2.3 Wildlife Resources

3.2.3.1 Presidential Decree No. 705, 1975

Provisions: See Section 3.2.2.1

3.2.3.2 Presidential Decree No. 1152, 1977

Provisions: The Philippine Environment Code states that the Department of Natural Resources will establish a system of rational exploitation and conservation of wildlife resources and encourage citizen participation in the maintenance and/or enhancement of their continuous productivity. Measures for exploitation shall include regulating the marketing of threatened wildlife resources and conserving the threatened species of fauna, increasing their rate of reproduction, maintaining their original habitat, habitat manipulation, determining bag and creel limits, population control in relation to the carrying capacity of any given area, banning of indiscriminate and/or destructive means of catching or hunting wildlife.

3.2.3.3 Other laws relating to wildlife resources

The other laws relating to wildlife resources are those that deal with the creation and protection of national parks. Legislative Act No. 3915 of 1932 marked the birth of national parks in the country, but little

attention was given to the protection of wildlife resources until the creation of the proposed National Park System developed in 1975 divided equivalent reserves into wildlife sanctuaries and strict nature reserves. Under this system, wildlife sanctuaries are established to protect wildlife species no longer capable of surviving or multiplying in an unprotected environment. Such areas also serve as scientific research sites. According to the proposed National Park System there are seven wildlife sanctuaries in the country:

Mt. Iglit - Mt. Baco in Mindoro Occidental
Mt. Calavite in Mindoro Occidental
Cleopatra's Needle in Palawan Province
Mt. Mantalingajan in Palawan Province
Culion Island in Palawan Province
Liguasan Marsh in Cotabato Province
Monkey-eating Eagle Reservation in Davao Oriental Province

3.2.4 Fishery Resources

3.2.4.1 Constitution of the Republic of the Philippines, 1973

Provisions: In addition to the provisions outlined in Section 3.1.1 Article I, Section 1 of the Constitution states that the national territory comprises the Philippine archipelago, with all the other territories belonging to the Philippines by historic right or legal title, including the territorial sea, the air space, the subsoil, the seabed, the insular shelves, and the other submarine areas over which the Philippines has sovereignity or jurisdiction. The waters around, between, and connecting the islands of the archipelago, irrespective of their breadth and dimension, form part of the internal waters of the Philippines.

3.2.4.2 Presidential Decree No. 704, 1975

Provisions: This Decree revises and consolidates all laws and decrees affecting fishing and fisheries, and is known as the Fisheries Decree of 1975. The Decree is divided into seven Chapters: Declaration of Policy-Definition of Terms, The Bureau of Fisheries and Aquatic Resources, The Fishery Industry Development Council, Utilization and Exploitation of Fishery/Aquatic Resources, Reserve Fisheries and Fish Sanctuaries, Prohibition and Penalities, and General Provisions.

Declaration of Policy: This section declares as a policy of the State the acceleration and promotion of the integrated development of the fishery industry and conserving and protecting the fishery resources of the country in order to keep

them in optimum productive condition. The government shall promote and encourage the organization of, provide assistance to, and help integrate the activities of persons, associations, cooperatives and corporations engaged in the industry. The government shall also encourage and promote the exportation of fish and fishery/aquatic products to enable the fishery industry to contribute to the development and growth of the national economy.

Definition of Terms: Some important definitions as used in this Decree are the following:

Fish and fishery/aquatic products - all fishes and other aquatic animals such as crustaceans (crabs, prawns, shrimps and lobsters) and mollusks (clams, mussels, scallops, oysters, snails and other shellfish). Fishery/aquatic products include all other products of aquatic living resources in any form.

Fishery - the business of catching, taking, handling, marketing, and preserving fish or other fishery/aquatic products, the fishing grounds, and the right to fish or take such products from the grounds.

Fishery industry - includes fish producers, fish processors, fish traders, both wholesalers and retailers, and owners of refrigerating and cold storage plants serving the industry.

Municipal waters - include not only streams, lakes, and tidal waters within the municipality and not owned privately or part of parks or reserves, but also marine waters included between two lines drawn perpendicular to the general coastline from points where the boundary lines of the municipality touch the sea at low tide and a third line paralled with the general coastline and three nautical miles from such coastline.

Philippine waters - include all bodies of water within Philippine territory such as rivers, streams, creeks, brooks, ponds, swamps, lagoons, gulfs, bays and seas and other bodies of water now existing or which may later exist, and the sea or fresh water around, between, and connecting each of the islands of the archipelago and all other waters belonging to the Philippines.

Bureau of Fisheries and Aquatic Resources: The Bureau of Fisheries and Aquatic Resources (BFAR) is part of the Department of Natural Resources. The Bureau shall have jurisdiction and responsibility in the management, conservation, development, protection, utilization, and disposition of all fishery and aquatic resources of the country except municipal waters which are under the municipal or city government concerned. The Bureau has the authority to regulate and supervise the production, capture, and gathering of fishery and aquatic products. The Bureau shall prepare and implement,

upon approval of the Fishery Industry Development Council, a Fishery Industry Development Program.

Functions of BFAR: The Bureau shall undertake or arrange special technical assistance and training programs for the enhancement of the fishery industry and provide assistance to fishery educational institutions in their research and instructional activities. The Bureau also shall conduct research and studies regarding fish and fishery/aquatic products; establish fish hatcheries, nurseries, and demonstration fish ponds; conduct experiment and demonstration services on fish capture and gathering of fishery and aquatic products, and the culture and processing of such products; conduct oceanographic and limnological surveys; and disseminate the result of such research, studies, and surveys.

To carry out these responsibilities, the following new Divisions are created under this Decree: Legal, Fisheries Conservation and Enforcement, Fisheries Extension, Fisheries Utilization, Fisheries Engineering, and Fisheries Training.

Fishery Industry Development Council: The Fishery Industry Development Council shall be composed of the following members:

- Secretary of Natural Resources - chairman
- Secretary of Agriculture
- Secretary of National Defense
- Secretary of Trade
- Secretary of Public Works, Transportation, and Communications
- Governor of the Central Bank of the Philippines
- Chairman of the Development Bank of the Philippines
- President of the Philippine National Bank
- Chairman of the Board of Investments
- Director of Fisheries and Aquatic Resources - executive officer
- A representative of the inland fisheries associations
- A representative of the marine fisheries associations

Functions: The Council shall formulate and establish comprehensive policy guidelines for the management, protection, conservation and utilization of the fishery/aquatic resources of the country and for the creation of a healthy investment climate for the development of the fishery industry. Each member agency has specific responsibilities to see that these functions are carried out. The executive officer is charged with implementing the policies and guidelines established by the Council.

Utilization and Exploitation of Fishery/Aquatic Resources: Section 16 states that no person shall exploit, occupy, produce, culture, capture or gather fish, fry or fingerlings of any species of fish or fishery/aquatic products, or engage in any fishery activity in Philippine municipal waters without a license, lease, or permit. No person shall operate a commercial fishing boat, pearl fishing boat or fishing boat for scientific, research, or educational purposes, or engage in any fishery activity or seek employment as a fisherman without a license from the Bureau of Fisheries and Aquatic Resources. No person shall import or export any fish or fishery/aquatic product, whether adult or young, fry or fish eggs, for propagation or other purposes without first securing a permit and paying for inspection and other fees. However, the export of milkfish (bangus) fry is totally banned, and the exportation of other fry is allowed only after the requirements of the domestic fishing industry are met. Steps will also be taken to promote the production of fish meal to complement the development of the animal industry.

Deep-sea or Offshore Fishing: No commercial fishing boat license shall be issued except to citizens of the Philippines or associations or corporations duly registered in the Philippines, at least 60% of the capital stock of which is owned by Filipinos. No person to whom a license has been issued shall sell, transfer, or assign, directly or indirectly, his stock or interest to any person not qualified to hold a license. Any such transfer is null and void.

Inland Fisheries: No public lands suitable for fishpond purposes shall be sold upon the effectivity of this Decree. Public lands available for fishpond development shall be leased only to qualified persons, associations, cooperatives or corporations subject to these conditions:

- the lease shall be for a period of 25 years, renewable for another 25 years
- 50% of the area leased shall be developed within 3 years and the rest within 5 years
- all areas not fully developed within 5 years from the date of execution of the lease contract shall revert to the public domain for disposition by the Bureau
- no portion of the lease area shall be subleased.

The maximum area leased for fishponds shall not exceed fifty hectares for individuals, and five hundred hectares for associations and corporations.

No person shall construct and/or operate a fishpen without first securing a license from the Bureau in addition to permits from the municipality claiming jurisdiction. The maximum area that can be licensed for a fish pen is 10 hectares for individuals, and 50 hectares for an association, partmership, cooperative, or corporation. Licenses are for a period of 5 years, renewable for another 5 years.

Nothing in the above sections shall be construed as permitting the lessee or licensee to undertake any construction which will obstruct the free navigation in any stream or lake, or impede the flow or ebb of the tide.

Municipal Fisheries: A municipal or city council may grant to the highest qualified bidder the exclusive privilege of constructing and operating fish corrals, oyster culture beds, or of gathering "bangus" fry (milkfish) or other fry in municipal waters for up to five years provided that one-fifth of the area earmarked for fry collection is set aside as government bangus fry reservation and that no fish corral be constructed within 200 meters of another in marine waters or 100 meters in fresh water. Councils may also issue licenses to qualified persons to operate fishing boats of three gross tons or less, or for the privilege of fishing in municipal waters with nets, traps, or other fishing gear, but it is not in the power of the councils to issue licenses for gathering marine mollusks or shells, for pearling boats or divers, or for prospecting, collecting, or gathering sponges or other aquatic products.

Reserve Fisheries and Fish Sanctuaries: Upon the recommendation of the Director, the Secretary of the Department of Natural Resources may designate any area in Philippine waters as fishery reservation for the use of the government, for fish culture, or for educational, research, and scientific purposes. The Secretary may also set aside areas as fish refuges and and sanctuaries. All streams, ponds, and waters within game refuges, bird sanctuaries, national parks, botanical gardens, communal forests and communal pastures are hereby declared fish refuges and sanctuaries.

Prohibitions: The following actions are prohibited, and persons taking such actions are liable to penalties as outlined below:

- to catch, take, or gather or cause to be caught, taken, or gathered fish or fishery/aquatic products in Philippine waters with the use of explosives, obnoxious or poisonous substances, or by the use of electricity. The use of chemicals in fishponds to eradicate pests is exempted from this prohibition.
- to fish with nets with mesh smaller than that which may be fixed by rules and regulations promulgated in conformance with this Decree. This does not apply to gathering of fry, glass eels, elvers, and such species as are small but already mature.
- to trawl in water less than seven fathoms deep.
- to export bangus fry.
- to place, cause to be placed, discharged or deposited,

or to pass or place where it can pass into Philippine waters, petroleum, acid, coal, or oil tar, lampblack, aniline, asphalt, bitumen, or residuary products of petroleum or carbonaceous material, molasses, mining and mill tailings, or any refuse, liquid or solid, from any refinery, gas house, tannery, distillery, chemical works, sugar mill, or factory of any kind, or any sawdust, shavings, slabs, edging, or any factory refuse or any substance or material deleterious to fish or fishery/aquatic resources.

Penalties: Penalties imposed range from imprisonment of from ten to twenty years if the use of explosives for fishing results in injury to any person, to a fine of ₱1,000.00 for the exportation of bangus fry. However, foreign fishing boats illegally engaged in fishing within Philippine waters will be seized and confiscated, and vessels entering fishery reserves and closed areas for the purpose of fishing shall be fined up to the sum of ₱5,000.00.

General Provisions: The General Provisions deal with loans and credit programs to aid the development of fishery industry, financing of municipal and small-scale fishing, and establishment and operation of refrigerating and cold-storage plants.

3.2.4.3 Presidential Decree No. 1152, 1977

Provisions: The Department of Natural Resources will establish a system of rational exploitation of fisheries and aquatic resources within Philippine territory and encourage citizen participation to maintain and/or enhance the optimum and continuous productivity of these resources. Measures for exploitation shall include regulating the marketing of threatened species of fish and aquatic resources and conserving vanishing species of fish and aquatic resources such as turtles, sea snakes, crocodiles, corals, as well as maintaining the mangrove areas, marshes and inland waters, coral reef areas and islands serving as sanctuaries for fish and other aquatic life.

3.2.4.4 Other laws relating to fisheries resources

The other laws relating to fisheries resources are the Fisheries Act of 1932, Republic Act No. 3512, and Presidential Decree No. 43, entitled "Providing for the Accelerated Development of the Fishing Industry of the Philippines." Most of the provisions of these laws have been incorporated into Presidential Decree No. 704 (see Section 3.2.4.2 above).

3.2.5 Air and the atmosphere

3.2.5.1 Presidential Decree No. 96, 1973

Provisions: This Decree declares it unlawful to use or attach sirens, bells, horns, whistles or similar gadgets that emit exceptionally loud or startling sounds, including domelights and other similar signalling or flashing devices on motor vehicles. Exceptions to this Decree are motor vehicles being used for official use by the Armed Forces of the Philippines, National Bureau of Investigation, Land Transportation Commission, Police Departments, Fire Departments, and hospital ambulances. Any such devices not used for official purposes will be confiscated and the offender will be prosecuted and his motor vehicle registration cancelled or revoked.

3.2.5.2 Presidential Decree No. 1152, 1977

Provisions: This Decree is known as the Philippine Environment Code. In Title I, Chapter 1, the Decree states that there shall be established ambient air quality standards which shall prescribe the maximum concentrations of air pollutants permissible in the atmosphere consistent with public health, safety, and general welfare. There will also be developed national emission standards for new and existing stationary and mobile sources of pollution which shall consider such factors as type of industry, practicable control technology available, location and land use, and the nature of pollutants emitted.

Air Quality Standards: Appropriate standards will be established for community noise levels considering locations, zoning, and land use classification. Standards will also be established for noise-producing equipment setting a limit on the acceptable level of noise emitted from a given equipment considering the magnitude and condition of use, degree of noise reduction achievable through the application of best available technology and the cost of compliance.

Regulation and Enforcement: The National Pollution Control Commission is responsible for the enforcement of ambient air quality emission and noise standards, while the Civil Aeronautics Administration is responsible for community noise standards around airports. The Land Transportation Commission, in coordination with the NPCC, will implement emission standards of motor vehicles. Radioactive emissions will be regulated by the Philippine Atomic Energy Commission. This includes the release

and emission of radioactivity into the environment incident to the establishment or possession of nuclear energy facilities and radioactive materials, handling, transport, production, storage, use, and disposal of radioactive materials.

Monitoring: The National Pollution Control Commission will establish an air quality monitoring network. However, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) will monitor meteorological factors affecting environmental conditions in order to effectively guide air pollution monitoring activities.

3.3 NONRENEWABLE RESOURCES

3.3.1 Mineral Resources

3.3.1.1 The Mining Act, 1936

Provisions: This Act is to provide for the conservation, disposition, and development of mineral lands and minerals. Chapter III of the Act states that all mineral lands of the public domain and minerals belong to the State, and their disposition, exploitation, development or utilization shall be limited to citizens of the Philippines or to corporations or associations of which at least 60% of the capital is owned by such citizens. The ownership of and right to use any land for agricultural, industrial, commercial, residential or for any purpose other than mining does not include the ownership of nor the right to extract or utilize the minerals which may be found on or under the land surface. With the exception of the soil which supports organic life, and ordinary earth, gravel, sand and stone which are used for building or construction purposes, all inorganic substances found in nature in solid, liquid, gaseous, or any indeterminate state are minerals within the purview of this Act.

Mineral lands: Mineral lands are those in which minerals exist in sufficient quantity or quality to justify the necessary expenditures to be incurred in extracting and utilizing such minerals. The President may set apart mineral land reservations and proclaim the establishment of such reserves and their boundaries, and thereafter such reservations shall be closed or open to mining as the President deems wise. The President may, with the concurrence of Congress, alter or modify the boundaries of any mineral reserve or revoke a reserve, returning it to the public domain. Whenever lands are reserved for purposes other than mining, holders of mining leases within such new reserves shall continue to enjoy all rights accorded them under such leases as if the reserve had not been

proclaimed. Lands within reservations for purposes other than mining, which are found to be more valuable for their mineral contents than for the original purpose may be withdrawn from such reservations by the President with concurrence of Congress, and such lands will then revert to the public domain and be subject to disposition under this Act.

Classification of Mining Land: Lands leased for mining purposes shall be classified as follows:

Metals or metalliferous ores - lands which contain any of the metallic elements or minerals or their combinations such as gold, silver, platinum, tin, chromium, iron, nickel, copper, lead, and so on.

Precious stones - lands which contain minerals mainly used for ornamental purposes, such as diamond, ruby, emerald, sapphire, topaz, opal, jade, and so on.

Fuels - lands which contain combustible substances in solid, liquid, gaseous form such as peat, coal, natural gas, oil shales, asphalt, mineral oils, and so on.

Salines and mineral waters - lands which contain surface or subterranean soluble substances or waters such as salt, nitrates, sulfurated, carbonated, sodic, calcic and other waters.

Building stone, clays, fertilizers and other nonmetals - land which contain nonmetallic substances such as those used for building or construction purposes such as marble, granite, clay; asbestos, feldspar, lime, mica, guano, phosphate, potash, saltpeter and the like; and other substances used in the manufacture of paints, ceramics and fertilizers and for other industrial purposes.

Prospecting: Any person may prospect for himself or for other persons, associations, and corporations to locate mining claims and acquire leases. Prospecting may be carried out on public lands and on private lands with the permission of the land owner. No prospecting shall be allowed in: a mineral reserve closed to mining, and in reservations established for other purposes, in lands covered by patented mining claims, in lands in which minerals have been discovered prior to this Act, in lands which have been located for mining leases by other prospectors, and near or under buildings, cemeteries, bridges, highways, waterways, railroads, reservoirs, dams, or any other public or private works.

Discovery and Location of Mining Claims: The right to locate a mining claim shall in all cases be based upon the discovery of minerals there. A claim must be recorded within 30 days after completion of the location of such claim by the discoverer or locator. Maximum areas of claims differ according to the type of deposit and type of mineral (Section 35, Chapter V). Claims must be marked according to procedures outlined in this Act to be legal.

Claims may either be placer or lode claims. A lode mineral claim is a parcel of mineral land containing a vein, lode, ledge, lens or mass of ore in place. A placer claim is that which results from the finding of minerals in loose, fragmentary or broken rocks, boulders, or deposits other than those described for lode claims.

Any person making a valid location of a mining claim acquires the right of exploration and occupation from the date of registry of the claim. If such person then applies for a lease for the claim, he shall be issued a temporary permit for one year, pending the determination of the lease.

Survey and Lease: The Director of Mines may designate competent mineral or deputy mineral land surveyors to survey mining claims. All applications for official surveys of mining claims shall be filed before or upon filing of the lease application, and the expenses of the survey must be paid by the applicant. At the time of the official survey the corners of mining claims shall be marked with permanent markers. Leases can be granted for a period of up to 25 years, renewable for another 25 years. Every lease granted under this Act shall contain a clause whereby the lessee binds himself to comply with this Act and with such rules and regulations for the policing and sanitation of mines, easements, drainage, disposal of waste or tailings, water rights, rights-of-way, right of government survey and inspection, and other necessary means to their economic utilization.

Rights of Lessee: Holders of mining claims have the right to cut trees or timber within the mining claim for use in the development or operation of the claim only. Such persons also have water rights for the development and operation of the claim in accordance with existing law on waters. Holders of mining claims are entitled to rights-of-way through other lands and facilities in order to gain access to their land.

Prohibitions: According to Chapter VIII, it is prohibited for any person to:

- make a false application for a mining claim
- willfully and maliciously deface, alter, remove, or disturb any marker identifying the area of any claim
- extract minerals and dispose of them for commercial purposes without a permit or lease
- knowingly sell, transfer or convey any false mining claim
- knowlingly place or deposit any mineral in any land for the purpose of misleading other persons as to the value of such land for mineral deposits
- willfully and maliciously cause or permit sludge or tailings to accumulate in or flow from his mining claim so as to cause injury, danger, or obstruction to any

public road, river, or stream, or other public property.
- take waters from a mining mill, raise, dam, reservoir, or any other form of deposit, or prevent the water from entering said deposit
- destroy or injure any structure in or on mining claims
- set fire to any mineral, mine, or the workings, fittings, or appliances of a mine
- damage a mine, cause water to run into a mine, or obstruct any shaft or passage connected to a mine, or render useless any machine, rope, chain, or apparatus used in a mine.

Penalties for the above actions range from fines of from 100 pesos to 12,000 pesos to imprisonment up to five years.

3.3.1.2 Republic Act No. 387, 1949

Provisions: This Act, known as the Petroleum Act of 1949, is to promote the exploration, development, exploitation, and utilization of the petroleum resources of the country, to encourage the conservation of such resources, to authorize the Secretary of Natural Resources to create an administration unit and a technical board in the Bureau of Mines, and to appropriate funds for these provisions.

Definition: In this Act, petroleum resources means any mineral oil, hydrocarbon gas, bitumen, asphalt, mineral wax, and all other similar or naturally associated substances but excluding coal, peat, bituminous shale, and other stratified mineral fuel deposits. The Act states that all natural deposits or occurrences of petroleum or natural gas in public and private lands in the Philippines belong to the State. The ownership or right to the use of lands for any purpose other than petroleum exploration, development, or exploitation does not include the ownership of nor the right to explore for, exploit, or utilize the petroleum or natural gas deposits in, on, or under the surface of such land.

Petroleum Rights: The right to explore for, develop, exploit, or utilize the petroleum resources may only be granted to duly qualified persons by means of concessions. The government reserves the right to undertake such work either by itself or through independent contractors. Everything relating to the petroleum industry, including exploration and exploitation, manufacture, refining, storage and transportation, is herefy declared a public utility. Exploration and exploitation rights do not confer the ownership of petroleum lands and deposits, only the right to utilize them for the period and under the conditions determined by this Act.

Concessions: Concessions granted may be of the following kinds:

Non-exclusive exploration permit - non-exclusive right to conduct geological or geophysical exploration on specified areas.

Exploration concession - exclusive right to explore for petroleum in specified areas.

Exploitation concession - exclusive right to develop petroleum production within specified areas.

Refining concession - right to manufacture or refine petroleum, or to extract its derivatives.

Pipe line concession - right to provide and operate pipe line systems for transporting petroleum.

Petroleum Reservations: The Secretary of Natural Resources may divide the country into a number of prospective petroleum regions. Upon the Secretary's recommendation, the President of the Philippines may set apart petroleum reservations and declare their establishment and boundaries. The government may explore, develop, and exploit such reservations by itself or under contract to qualified persons. No petroleum reservation may be established over any areas covered by application for exploration or exploitation concessions already filed or granted. Areas within a reservation may be opened to exploration or exploitation upon proclamation by the President with the concurrence of the Congress.

All lands within the territorial limits of the Philippines including those beneath seas and other waters but which are not within National Reserve Areas, Petroleum Reservations, or covered by concessions or permits granted under this Act, are hereby declared as free areas open to application for exploration concessions by any qualified persons. All lands covered by concessions are also subject to public easements and must recognize existing mining rights.

Rights of Concessionaires: Exploration and exploitation concessionaires are granted the right to enter private lands for the purpose of conducting geological and geophysical studies. When easements over private or public land are needed by the concessionaire to conduct the work permitted under this Act, such easements shall be granted. Concessionaires also have the gratuitous right to utilize timber, water, and clay from any public lands within a concession.

Applications for concessions under this Act shall be filed with the Director of Mines who, if the application is in order, will forward it to the Secretary of of Natural Resources. If, after publication of the intent to grant such a concession, no one objects, the Secretary may execute the contract for the concession. Each type of concession and permit has different rules, rights, and obligations, including fees, taxes, and royalties.

Obligations of Concessionaires: Non-exclusive exploration permittees shall inform the Secretary of Natural of Resources of the general work to be done and the areas to be covered, and will submit reports every six months. These permits are for a period of two years, renewable for another two years. Exploration concessionaires are required to present a map and technical descriptions of the block desired to be explored, showing the location of the block with regard to municipalities and its natural boundaries. These concessions are for a period of four years, renewable for up to six years at three-year intervals. The total amount of exploration area a person may acquire is 500,000 hectares in any one petroleum region, and 1 million hectares in the whole territory of the Philippines. Holders of exploitation concessions may select one or more areas within an exploration block for exploitation, submitting a map showing those areas. The area of any exploitation parcel which may be acquired shall not be more than 50,000 hectares nor less than 1,000 hecatres. No person shall be allowed to hold more than 250,000 hectares of exploitation area in any one petroleum region, nor more than 500,000 hectares in the whole territory of the Philippines. Any roads and bridges constructed by the concessionaire shall be available for public use. This concession shall be for a period of 25 years, renewable for another 25 years. Holders of refining concessions have the right to provide facilities for the manufacture of petroleum products. and to carry out auxiliary works and operations that are essential to this conduct. These concessions are for a period of 25 years, renewable for another 25 years. The holder of a pipe line concession has the right to construct and operate pipe lines, pumping stations, storage tanks, power plants, storehouses, and other equipment or facilities as needed. Pipe line concessionaires have the right to give preference to carrying their own petroleum supplies, but must carry other suppliers' products with the remaining capacity. The term of a pipe line concession is for a period of 25 years, renewable for another 25 years.

Prevention of Waste: All concessionaires drilling for or producing petroleum or petroleum products shall use every possible precaution to stop and prevent waste of petroleum or natural gas in drilling, production, storage, piping, or distribution, nor wastefully utilize petroleum or natural gas or allow them to leak or escape from natural reservoirs, wells, tanks, containers, or pipes.

Conservation: Rules and regulations may be issued to require concessionaires to utilize in their exploration and exploitation operations the latest and most improved methods and devices to prevent waste in petroleum as well as to

prevent oil, oil-field brine or other oil-field contamination from causing pollution or otherwise damaging streams, surface or ground water supply, and valuable mineral deposits.

Technical Board: The Secretary of Natural Resources is authorized to create an Administration Unit and a Technical Board under the Director of the Bureau of Mines. The Administration Unit is charged with the administration of petroleum lands, the preparation of forms and regulations, the settlement of disputes, and the enforcement of this Act. The Technical Board shall consist of at least one petroleum engineer and one petroleum geologist and will have the following functions:

- to advise and consult on technological matters relative to administration of petroleum lands under this Act and on petroleum operation and industry
- to assess the qualifications of applicants for concessions
- to recommend whether or not lands within National Reserve Areas should be offered for concession and study all applications for concessions within said areas to advise the Secretary of Natural Resources on their relative merits
- to determine relative merits of the conflicting applications for concessions in free areas
- to check on the performance of concessionaires
- to determine the maximum efficient rate of withdrawal from each well or oil field
- to supervise production operations to insure conservation of reservoir energy and optimum recovery from petroleum deposits in different oil fields
- to study ways and means to insure the efficient administration of petroleum lands and enforcement of this Act
- to keep and maintain a complete record on all phases of exploration, development and production of petroleum in the Philippines.

3.3.1.3 Act No. 2719, 1917 (Amended 1952)

Provisions: This Act, known as the Coal Land Act, was promulgated to provide for the leasing and development of coal lands in the Philippines. The Act states that the ownership or right to use land for agricultural, industrial, commercial, residential, or for any purpose other than mining does not include the right to extract or utilize the coal which may be found on or under the land surface. Any reserved and unappropriated coal-bearing lands may be leased by the Secretary of Natural Resources in blocks or tracks of not less than 50 nor more than 1200 hectares

each to allow the economic development and exploitation of the coal deposit. However, the total land area that can be leased to any one individual in the entire country for coal exploitation is limited to 1200 hectares. Leases are for a period of 25 years, renewable for another 25 years. Lease applications must be filed with the Bureau of Mines, and the land surveyed within one year from filing date. For the privilege of mining, the lessee shall pay royalties to the government as specified in the lease. Any lease reserves the right of the government to grant easements in, over, through or upon the land leased. The government reserves the right to work and exploit coal mines itself or organize and promote coal mining corporations.

3.3.1.4 Presidential Decree No. 1152, 1977

Provisions: The Department of Natural Resources will undertake a system of gainful exploitation and rational and efficient utilization of mineral resources and encourage citizen participation in this endeavor. Measures for the gainful exploitation and rational and efficient use of mineral resources include increasing research and development in mineral resources technology, training of technical manpower in geology, geophysics, mining engineering, and related fields, regulating the exploitation of identified mineral reserves, accelerating the exploration of undiscovered mineral deposits, and encouraging the establishment of processing plants for refined minerals.

3.3.2 Soil Resources

3.3.2.1 Presidential Decree No. 1152, 1977

Provisions: This Decree, the Philippine Environment Code, states that the Department of Natural Resources and the Department of Agriculture will undertake a soil conservation program including the identification and protection of critical watershed areas, encouragement of scientific farming techniques, physical and biological means of soil conservation, and short-term and long-term research and technology for effective soil conservation.

In addition to pertinent provisions of other laws relating to soil, the following will be included in a soil erosion, sediment and flood control program:

- the control of soil erosion on the banks of rivers, shores of lakes, and seashores
- the control of flow and flooding in and from rivers and lakes

- the conservation of water which means water bodies in their original form
- the needs of fisheries and wildlife and all other recreational uses of natural water
- measures to control the damming, diversion, taking and use of natural waters so as to affect the quality and availability of water for any other purposes
- measures to stimulate research in matters relating to natural water and soil conservation and the application of the knowledge thereby acquired.

3.4 Other legislation containing environmental provisions

3.4.1 Presidential Decree No. 1152, 1977

Provisions: This Decree, the Philippine Environment Code, contains, in addition to those provisions detailed in laws discussed above, provisions that deal with land use management, natural resources management and conservation, and waste management, as well as provisions on environmental education. These provisions are as follows.

Land Use Management: In Title III, Section 23, it is stated that the Human Settlements Commission, in coordination with the appropriate government agencies, will formulate and recommend to the National Environmental Protection Council a National Land Use Scheme. The National Land Use Scheme will include the following:

- a science-based and technology-oriented land inventory and classification system,
- a determination of present land uses, the extent to which they are utilized, underutilized, rendered idle or abandoned,
- a comprehensive and accurate determination of the adaptability of the land for community development, agriculture, industry, commerce or other activity,
- a method of identification of areas where uncontrolled development could result in irreparable damage to important historic, cultural, or esthetic values, or natural systems or processes of national significance,
- a method for exercising control by the appropriate government agencies over the use of land in areas of critical environmental concern and areas impacted by public facilities including but not limited to airports, highways, bridges, ports and wharves, buildings and other infrastructure projects,
- a method to ensure the consideration of regional development and land use in local regulations,
- a policy for influencing the location of new communities and methods for assuring appropriate controls over the use of land around new communities,

- a system of controls and regulations pertaining to areas and development activities designed to ensure that any source of pollution will not be located where it would result in a violation of any applicable environmental control regulations, and
- a recommended method for the periodic revisions and updating of the national land use scheme to meet changing conditions.

The location of industries, factories, plants, depots and similar industrial establishments will be subject to regulation and enforcement by the appropriate agencies taking into consideration the social, economic, geographic and significant environmental impact of such establishments.

Natural Resources Management and Conservation: The purposes of this title are to provide the basic policy on the management of the country's natural resources to obtain the optimum benefits from and preserve those resources for future generations, and provide general measures through which the policy may be carried out effectively. Chapters in this title include Natural Calamities, Energy Development, Conservation and Utilization of Surface and Ground Waters, and Pesticide and Fertilizer Use.

Natural Calamities: The Philippine Atmospheric, Geophysical and Astronomical Services Administration will promote intensified and concerted research efforts on weather modification, typhoon, earthquake, tsunami, storm surge and other tropical natural phenomena in order to bring about any significant effect to mitigate or prevent their destructive effects.

Energy Development: The Energy Development Board will undertake an energy development program encouraging the utilization of sources such as solar, wind and tidal energy. Measures for the energy development program include setting up pilot plants utilizing invariant sources of energy, training of technical personnel, and conducting research aimed at developing technology for energy development. Rules and regulations shall be established to prevent or mitigate the adverse effects of energy development on the environment. For this purpose, all nuclear powered plants exploring and utilizing geothermal energy will observe international standards of safety and provide safety devices to ensure the health and welfare of their personnel as well as the surrounding community.

Conservation and Utilization of Waters: The National Water Resources Council in coordination with other appropriate government agencies shall prescribe measures for the conservation and improvement of the quality of Philippine water resources and provide for the prevention, control and abatement of water pollution.

Pesticide and Fertilizer Use: The use of fertilizers and pesticides in agriculture shall be regulated, prescribing a tolerance level in their use. This use will be monitored by appropriate government agencies to provide empirical data for effective regulation.

Waste Management: The Department of Local Government and Community Development will promulgate guidelines for the formulation and establishment of waste management programs to be undertaken in all provinces, cities, and municipalities. Every waste management program shall include:

- an orderly system of operation consistent with the needs of the area concerned,
- a provision that the operation will not create pollution of any kind or will constitute a public nuisance,
- a system for a safe and sanitary disposal of waste,
- a provision that existing plans affecting the development, use, and protection of air, water or other natural resources be considered,
- schedules and methods of implementing the development, construction and operation of the plan together with the estimated costs, and
- a provision for the periodic revision of the program to ensure its effective implementation.

Each province, city or municipality shall provide measures to facilitate the collection, transportation, processing and disposal of waste within its jurisdiction and may receive funds to do so upon request made through the National Environmental Protection Council.

Solid Waste Disposal: Solid waste disposal will be by sanitary landfill, incineration, composting, and other methods as may be approved. In no case shall landfills be located along any shore or coastline, or along the banks of rivers, streams, or lakes throughout their length. The dumping or disposal of solid wastes into the sea and any body of water in the Philippines, including shorelines and river banks, where these wastes are likely to be washed into the water is prohibited.

However, dumping of solid wastes or other materials into the sea or any navigable waters shall be permitted in case of imminent or immediate danger to life and property, subject to the rules and regulations of the Philippine Coast Guard and the National Pollution Control Commission.

Liquid Waste Disposal: Wastewater from manufacturing plants, industries, community or domestic sources will be treated either physically, biologically, or chemically prior to disposal in accordance with the rules and regulations promulgated by proper government authority. Dumping of liquid wastes into the sea or any other body of water is prohibited as for the disposal of solid wastes.

Environmental Education: The Department of Education and Culture shall integrate subjects on environmental education in its school curricula at all levels and endeavor to conduct special community education emphasizing the relationship of man and nature as well as environmental sanitation and practices.

Miscellaneous Provisions: Other provisions included in this Decree deal with environmental research, monitoring and dissemination of environmental information of foreign origin, incentives, financial assistance, participation of local government units and private individuals, preservation of historic and cultural resources and heritage, public hearings, government offices performing environmental protection functions, and definition of terms used in the Decree.

4.0 RESOURCES

4.1 Climate

The Philippine archipelago of over 7,100 islands extends north to south along the southeastern rim of Asia. It is bordered on the east by the Pacific Ocean, on the west by the South China Sea, and is separated by straights a few kilometers wide from the Republic of China (Taiwan) to the north and Malaysia and Indonesia to the South. The climate of the Philippines is uniformly tropical with small variations in temperature and rainfall due to altitude and location of mountain ranges. Eleven islands comprise over 95% of the total land area of the Philippines. Most of the islands are mountainous in the interior, with lowland plains along the coasts. Climate is generally moderated by the maritime conditions affecting the country.

4.1.1 Topography, geography and climate

Geographically the Philippines can be divided into the principal regions of Luzon, the Visayan Islands, and Mindanao, and the islands of Mindoro, Palawan, and the Sulu Archipelago.

Luzon - The island of Luzon comprises 35% of the total land area of the country by itself and contains the country's most important agricultural area, the Central Luzon Plain. Luzon has seven major topographic features: the North Luzon Highlands or Cordillera Central, Sierra Madre and Eastern Cordillera, Cagayan Valley, Zambales Mountains, the southwestern volcanic area, and the Bicol peninsula.

Visayan Islands - Grouped around the Visayan Sea, the seven Visayan Islands include Masbate, Samar, Bohol, Cebu, Leyte, Panay, and Negros. With other small islands, these seven make up 21% of the total land area of the Philippines. Most of these islands have mountainous interiors, with the only large lowland areas being the Leyte Valley, Iloilo Plain on Panay, and the plains of western and northern Negros.

Mindanao - The island of Mindanao makes up 34% of the country's total land area and is composed of six major topographic regions: the Eastern or Pacific Cordillera, Davao-Agusan Trough, Central Mindanao Highlands or Central Cordillera, Bukidnon-Lanao Plateau, Cotabato Basin-Tiruray Highlands, and Zamboanga Peninsula.

Mindoro - Mindoro Island, located southeast of Luzon, is largely mountainous and forested containing an eastern and northeastern coastal plain.

Palawan - Palawan, a long narrow island surrounded by 1,000 smaller islands has rugged mountains on the interior and a narrow coastal strip.

Sulu Archipelago - Southwest of Zamboanga Peninsula on Mindanao, the Sulu Archipelago consists of over 800 small islands reaching in a chain to the Malaysian State of Sabah on Borneo.

4.1.2 Rainfall patterns

Rainfall in the Philippines is seasonal and associated with mass air movements originating in the Indian Ocean (southwest monsoon), the Asian landmass (northeast monsoon), and the North and South Pacific Ocean. Local variations are caused by mountain barriers and geographic location of the islands. Most of the country, except along the east coast, has a hot, dry summer season during April, May, and June, while the wet season of heavy rains occurs from late June through October. Much of the Philippines is subject to typhoons, which are most common during the month of August. The months of November through March are cooler with little rain in most parts of the country.

About 60% of the country receives between 1778 and 3048 millimeters (mm) of rain yearly, which is sufficient to permit rice cultivation without irrigation. Ten percent of the country receives less than 1778 mm annually including the Cagayan Valley, the Central Plain of Luzon, much of the central Visayan islands of Cebu, eastern Negros, western Leyte, northern Mindanao and sheltered coastal and intermontane areas of southern and southeastern Mindanao and Cotabato Valley. Another 30% receives more than 3048 mm yearly, primarily the mountainous western coasts (even though there is often drought in these areas during the dry season), the mountainous eastern coasts, and parts of Mindanao. The eastern coasts of Luzon, the Visayan Islands, and Mindanao are characterized by heavy winter rains with a short dry period during summer and autumn. These areas do not have a period of drought such as that experienced by the rest of the country in the summer months, since they receive rainfall throughout the year.

In the Philippines the highest rainfall is recorded in the town of Hinatuan, Surigao del Sur (4360 mm) while the lowest is recorded in General Santos, South Cotabato (544 mm), both in Mindanao.

Table 5. Monthly and Annual Average Rainfall, 1951-1970 (mm)

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ilocos	5	6	18	57	187	420	472	657	459	135	75	17
Cagayan Val.	134	91	68	59	98	210	221	291	320	202	354	235
Central Luzon	4	4	11	38	205	431	495	717	526	157	103	34
So. Tagalog	100	63	66	75	163	239	280	309	283	283	278	199
Bicol	267	145	139	120	153	173	207	242	231	350	454	416
W. Visayas	75	36	44	41	152	243	280	291	239	239	211	136
Cen. Visayas	91	61	60	49	99	156	183	150	145	177	169	130
E. Visayas	365	244	192	162	208	173	200	195	190	306	408	443
W. Mindanao	96	64	76	104	189	222	193	176	190	233	215	175
NE Mindanao	388	300	239	175	208	232	231	219	233	239	264	368
SE Mindanao	96	90	65	97	166	133	149	118	126	127	119	93

Source: Ministry of Natural Resources. 1976. Inventory of Natural Resources, Technical Report Vol. VIII, Climate. Republic of the Philippines.

4.1.3 Temperature and humidity

The Philippines has an annual temperature of 27.2°C, which varies little on the three major islands: Luzon, 27.2°C, Visayas, 27.3°C, and Mindanao,

27.0°C. Throughout the country the month of May is the hottest, while January is the coolest. The highest normal temperature is usually recorded at Tuguegarao, Luzon, in May (37.1°C). Seasonal variations are very small, varying only 5°C on average throughout the year, while daily fluctuations are around 7°C. The greatest variations in temperature occur with altitude, The city of Baguio, located 209 kilometers north of Manila at an altitude of 1,463 meters (m) has mean monthly temperatures of 19.2°C while Manila has mean monthly temperatures of 27.7°C. The summer months of April, May and June are hot and dry, but with the beginning of the rainy season in late June, temperatures are lower but humidity increases. Average monthly relative humidity in Manila varies between a low of 70.7% in March to a high of 85.1% in September. This is typical for much of the Philippines.

Table 6. Monthly and Annual Normal Mean Temperature, °C, 1951-1970

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Baguio	17.8	18.3	19.5	20.2	20.4	19.8	19.4	19.0	19.1	19.3	18.9	18.4	19.2
Dagupan	26.1	26.6	28.3	2915	29.7	28.7	28.2	27.8	27.9	28.2	27.3	26.6	27.9
Aparri	23.3	24.0	25.8	27.5	29.1	29.2	28.8	25.5	27.8	26.8	25.5	24.2	26.7
Calapan	25.4	25.6	26.8	28.1	28.3	27.9	27.4	27.3	27.2	27.0	26.5	25.8	26.9
Manila	25.9	26.3	27.7	29.0	29.5	28.6	27.9	27.4	27.4	27.7	27.1	26.3	27.6
Legaspi	25.5	25.7	26.4	27.3	28.1	28.2	27.8	27.7	27.5	27.1	26.6	26.0	27.0
Iloilo	25.7	25.8	26.7	28.0	28.5	27.8	27.3	27.1	27.2	27.2	26.8	26.2	27.0
Cebu	26.4	26.5	27.3	28.4	28.8	28.1	27.5	27.6	27.6	27.5	27.3	26.7	27.5
Tacloban	25.9	25.9	26.7	27.5	27.9	27.9	27.8	28.0	28.1	27.7	27.1	26.4	27.2
Zamboanga	26.5	26.7	27.1	27.4	27.5	27.1	26.7	26.9	26.7	26.9	26.9	26.7	26.9
Davao	26.3	26.5	27.3	27.9	27.8	27.2	26.9	27.0	27.2	27.3	27.2	26.8	27.4

Source: Ministry of Natural Resources. 1976. Inventory of Natural Resources, Vol. VIII, Climate.

Table 7. Annual Normal Relative Humidity, %, 1951-1970

Station	Average %
Baguio	83
Dagupan	76
Aparri	80
Calapan	81
Manila	73
Legaspi	83
Iloilo	81
Cebu	77
Zamboanga	81
Davao	80

Source: Ministry of Natural Resources. 1976. Inventory of Natural Resources, Vol VIII, Climate.

4.2 Water Resources

4.2.1 Surface water resources

The water resources of the Philippines include 412 principal rivers of which seven are major river basins, 58 lakes of which 6 are major, covering an area of 199,571 hectares, and swamplands covering a total surface area of 527,143 hectares. Most rivers in the Philippines are short, seasonal in flow, and subject to flooding in the monsoon and typhoon seasons. Even the larger rivers are navigable only for short distances. The largest river in Luzon is the Cagayan River, a 320 km long river which drains the Cagayan Valley, flowing northward to empty into the sea at Aparri. The low-lying Central Luzon Plain is drained by the Pampanga River which empties into Manila Bay and by the Agno River which flows northward into Lingayen Gulf. The Pasig River flows between Manila Bay and the country's largest freshwater lake, Laguna de Bay, and is very important as a commercial thoroughfare. In Mindanao, the Agusan River flows northward through the Agusan Valley into the Mindanao Sea, while the Mindanao River drains the Cotabato Lowland, emptying into the Moro Gulf northwest of the city of Cotabato. Both the Agusan and the Mindanao Rivers are over 320 km in length.

Table 8. Principal Rivers by Province

Province	River	Navigability
Agusan	Agusan River	ships 32.9 km, small craft 257.4 km
Camarines Sur	Bicol River	ships 40.2 km, small craft 48.3 km
Cagayan	Cagayan River	small seagoing vessels 20.9 km, small boats 241.4 km, rafts 321.8 km
Cotabato	Mindanao River	small steamers 64.4 km, small boats 112.6 km
Leyte	Ilog River	small boats 12.9 km
Pampanga	Pampanga River	launches 40.2 km, small boats 72.4 km
Pangasinan	Agno River	small craft 96.5 km
Rizal	Pasig River	small ships 1.6 km, small boats 29 km

Source: Evaluation Technologies, Inc. 1979. The Philippines: A Country Profile.

The six major lakes of the Philippines are Laguna de Bay (91,130 hectares), Lanao Lake (34,304 hectares), Taal Lake (26,368 ha.), Mainit Lake (14,848 ha.), Naujan Lake (6,912 ha.), and Buluan Lake (5,880 ha.). Of swamplands, 126,253 ha. are freshwater, while mangrove or brackishwater covers an additional 400,890 hectares (1973 figures).

4.2.2 Groundwater resources

There are four major groundwater reservoirs in the Philippines: Central Luzon (9,200 km^2), Cagayan River Basin (10,200 km^2), Agusan River Basin (8,500 km^2), and the Cotabato River Basin (6,000 km^2). Other reservoirs known to exist total 22,000 km^2 on the islands of Negros, Panay, Mindoro, Mindanao, and other parts of Luzon and Bohol. Luzon has a total potential

groundwater area of 26,800 km^2 of which 15,900 km^2 is a potential shallow water table area. This includes Central Luzon, Cagayan, and other areas. In Mindanao, the Cotabato River Basin shallow water table is estimated to be about 4,900 km^2 of the total groundwater area, of which the Agusan River Basin accounts for 2,500 km^2. The groundwater reservoirs of the country underlie an area of 56,000 km^2. In 1975, there were 25,836 artesian wells operating in the country serving a population of 6,660,000. Developed springs totalling 2,088 served an estimated population of 1,317,757. The area from which artesian wells can be drawn covers more than 10,000 km^2. There is little data, however, on groundwater resources of the Philippines outside of Central Luzon, Cagayan, Cotabato, and Agusan River Basins.

Water resources in the Philippines are not yet generally polluted, except in certain urban areas with rapidly increasing populations. Studies are underway to monitor and evaulate water pollution by several agencies including the National Pollution Control Commission, the Bureau of Mines, the Ministry of Health, the Development Academy of the Philippines, the Laguna Lake Development Authority, and the Metropolitan Water and Sewerage System in the Manila area. Studies include classification of rivers, chemical quality of groundwater, bacteriological quality of wells in Metro Manila, and total solids from industrial wastes discharged into the rivers and lakes within a 30 km radius of Manila.

4.3 Forest Resources

The Philippines has lush tropical vegetation with more than 10,000 different species of flowering plants and ferns identified to date. There are 3,800 identified tree species, of which 3,500 are indigenous to the Philippines. Only a few areas of the country contain homogeneous forests, including the Mountain Province of Luzon with Benguet pine, certain portions of Mindoro with Mindoro pine and Palawan with a predominantly apitong forest. There are eight types of dipterocarp tree species that provide most of the forest production of the Philippines, and their commercial value is based upon color, weight, hardness, and use. These include the Philippine mahoganies - red lauan, tanguile, tiaong, almon, mayapis, bagtikan, and white lauan; apitong, guijo, yakal, manggasinoro, palosapis, manggachapui, and narig. Most of these trees are used in log, veneer, and plywood production. Other minor forest products of the Philippines include resins, rattan, buri, firewood, charcoal, nipa, abaca, and nuts.

Vegetation throughout the islands is fairly uniform, varying more with altitude and rainfall patterns than with temperature. Two kinds of forests grow at the lower altitudes - the evergreen rain forest and the molave forest. The evergreen rain forest is found in areas of consistently heavy rainfall in the lowlands and on the lower slopes of mountains and is dominated by the Philippine mahoganies, including the most abundant species, lauan. The molave forest, named after the molave tree, a teak species, is found at lower altitudes as well, but in areas which have distinct wet and dry seasons. Molave trees are usually deciduous. In higher elevations are forests consisting of a variety of species which have no general commercial value, and at the highest elevations are the pine forests of Luzon and Mindoro. Mangrove swamps line many coastal regions and cover about 1% of the total land area.

According to the Philippine government, 56.77% or 17,029,716 hectares (ha.) of the total land area are considered public forests, while 43.23% or 12,970,284 ha. are classified as alienable and disposable lands. There are 13,690,128 ha. of actual forests, of which 11,931,037 ha. are productive forest lands. There has been a continuous decline in the amount of forest land in the Philippines due to commercial logging operations and slash and burn agriculture. Analysts predict that, at current rates of extraction, all virgin forests of commercial value will have been cut by the early 1990's. The current rate of deforestation is about 80,000 ha. per year, of which one-half is illegal. This is down from a high of 200,000 ha. during the 1960's. At present the government requires replanting when clear-cutting has been carried out to build access roads and log assembly roads, and a Presidential Decree in 1979 required loggers to replant with the same tree species being taken. In 1979, the Ministry of Natural Resources announced that the country's annual rate of reforestation was 7,252 ha. from 1966 through 1971, and 28,446 ha. from 1972 through 1978, for an average annual rate of approximately 18,000 ha. The government has as a goal the reforestation of 50,000 ha. annually.

4.3.1 Deforestation and soil erosion

An associated problem with the cutting of forests in the Philippines is soil erosion. An estimated 5 million ha. of forest lands have been clear-cut in the country, of which 1.4 million ha. were in critical watershed areas. A 1967 survey of the life span of the Ambuklao Dam in the Agno River watershed areasconcluded that 2,500,000 cubic meters of silt had already been deposited in the reservoir. It was estimated that by 1985, if no significant changes were made in land use, management, and reforestation in the watershed, a total of ₱ 196.42* Million would be lost as a result of the reduced life span of the dam. This is just one example of the massive problems soil erosion can be when the protective cover of forests on watershed areas is cut and not replanted. Other regions of the country have similar erosion problems, due both to deforestation for commercial use and for agriculture.

4.3.2 Forest utilization

Forest products are a major export item for the Philippines, although there has been a decline in timber export from a high of 8.6 million square meters in 1968 to a low of 2.3 million square meters in 1973. Almost all commercially-valuable forests have been cut with the exception of virgin forests in relatively inaccessible areas of the interiors of Mindanao and Palawan. Commercially-important trees such as the teaks and mahoganies have not been replanted to any great extent, and timber exports will probably decline as the last remaining virgin forest stands are cut.

During the last twenty years there was an increase in timber exportation from the Philippines until 1968. In the 1970's log production has continually decreased. Plywood production for export decreased from 0.76 billion board feet in 1973-74 to 0.24 billion board feet in 1974-75. Veneer production decreased from 580 million square feet in 1973-74 to 364 million square feet

*Philippine pesos ₱ 7.38 = US $1.00 (April 1979)

in 1974-75. However, production and export of minor forest products including forest-based manufactured articles have shown increasing trends during the 1970's. The Philippine government is promoting the exploitation of minor forest products with the understanding that log exportation will eventually cease.

At present the wood industry is confronted with problems including the lack of large-scale plywood plants that are competitive with other countries (primarily Malaysia and Indonesia), high freight costs, high production costs, limited number of markets, and an increased rate of timber depletion.

Table 9. Production of Minor Forest Products, 1974-75

Product	Unit of measure	Total, 1974-75
Firewood	cubic meters	9,250
Charcoal	cubic meters	1,860
Split rattan	kilo	182,950
Bamboo	piece	261,700
Nipa sap	liter	229,200
Nipa shingles	kilo	695,408
Buri mats	kilo	79,150 (1973-73)
Wild abaca	kilo	31,892
Orchids	piece	192
Beeswax	kilo	600
Honey	kilo	200
Lumbang nuts	kilo	158,773

Source: Bureau of Forest Development, Philippines.

4.3.3 Forests as wildlife habitat

Philippine forests provide habitat for many species of wild animals and birds, including 760 species of birds of which 100 are migratory species. There are numerous rodents, including more than 50 known species of bats. Larger animals are few in number and variety, consisting of monkeys, wild pigs, small deer and a few cats. Although crocodiles were once abundant, now they are found only in Mindanao. A species of buffalo, the tamaraw, is found in Mindoro. There are three poisonous snakes in the Philippines - the coral snake, the pit viper, and a kind of small cobra. In general wildlife is not very abundant in the country, due to habitat destruction and the attitude of Filipinos to wildlife. Prior to martial law, many Filipinos would go to the forest and shoot birds for sport. After all guns were turned into the government, there was a noticeable increase in bird sightings in the rural areas of the country. Wildlife are protected in parks and wildlife refuges, but even there laws are not always enforced.

4.4 Soil Resources

Soil resources in the Philippines cover a wide range and are relatively more fertile than soils found in many other tropical areas due to the extensive occurrence of coralline limestone and materials of volcanic origin. The most fertile soils are alluvial in nature, covering about 15%

of the land surface in the principal lowland areas on major islands. Alluvial soils in the Central Luzon Plain, the Iloilo Basin on Panay, and the Leyte Valley are fine-textured and suited for wet rice cultivation. Coarser alluvial soils with better drainage are used for sugarcane production, and are especially important for growing corn in the Visayas.

Some soils are directly derived from underlying limestone and these cover about 13% of the country. Such soils are found in the Visayan Islands, particularly on Negros, Bohol, Cebu, and Samar, and occur from Luzon to Mindanao. These soils are porous, making them unsuitable for rice production, but they are well-adapted to production of corn, coconuts, bananas, and citrus fruits.

Shale and sandstone are parent materials for soils covering 15% of the Philippines, and soils developed from them are generally clayey, difficult to manage, and have poor agricultural potential. Soils developed from calcareous shales are better and used to cultivate sugarcane, corn, and other crops on Cebu and Bohol.

Andesites, basalts, and agglomerates are the parent materials for soils covering about 21% of the country. These soils occur in upland areas and are usually deep. Some of the most common of these soils are suited to growing sugarcane, upland rice, and coconuts, but their fertility varies. Another soil type is derived from tuff, formed by recent volcanic eruption. Tuff-derived soils are found chiefly in southwestern Luzon where they are used for growing upland rice, sugarcane, vegetables, and fruit. Alluvial soils derived from tuff have a higher clay content and hold water, and are used for wet rice cultivation.

Surveys done by the Bureau of Soils, Ministry of Natural Resources, have identified and classified the soils of each region as to their ability for use in agriculture as follows:

<u>Ilocos</u> - soils suited to forest and pasture 74%, soils suited to crops 20%. Soil series found include Alaminos, Bauang, Cervantes, Quimaong, and San Manuel. Soil types range from loamy to sandy.

<u>Cagayan</u> - soils suited to forest 74%, soils suited to crops, 25%. Soil series found include Alaminos, Bolinao, Carig, Longa, Ilagan, and Guimbalaon.

<u>Central Luzon</u> - soils suited to agriculture 40%. Soil series found include Angeles, Annam, Antipolo, Novaliches, Quingua, Sibul, and Tarlac.

<u>Southern Tagalog</u> - soils suited to forest 37%, crops 35%. Soils very rich. Include series of Antipolo, Calumpang, Faraon, Guadalupe, Luisiana, and Maranlig.

<u>Bicol</u> - soils suited to forest purposes 76%, crops 23%. Includes Antipolo-Alimodian-Luisiana, Sevilla, Luisiana, and Ubay.

<u>Western Visayas</u> - soils suited to forest 75%. Soil series found include Alimodian, Bantog, Faraon, Silay and Santa Rita.

Central Visayas - soils suited to agriculture 16%, forest 80%. Soils range from clay loam to sandy loam and include Faraon, La Castellana, Lugo and Ubay.

Eastern Visayas - soils suited for agriculture 84%. Soil series Catbalogan unique to this area.

Western Mindanao - soils suited for forest use 72%. Predominant soil series are Adtuyon and Bolinao.

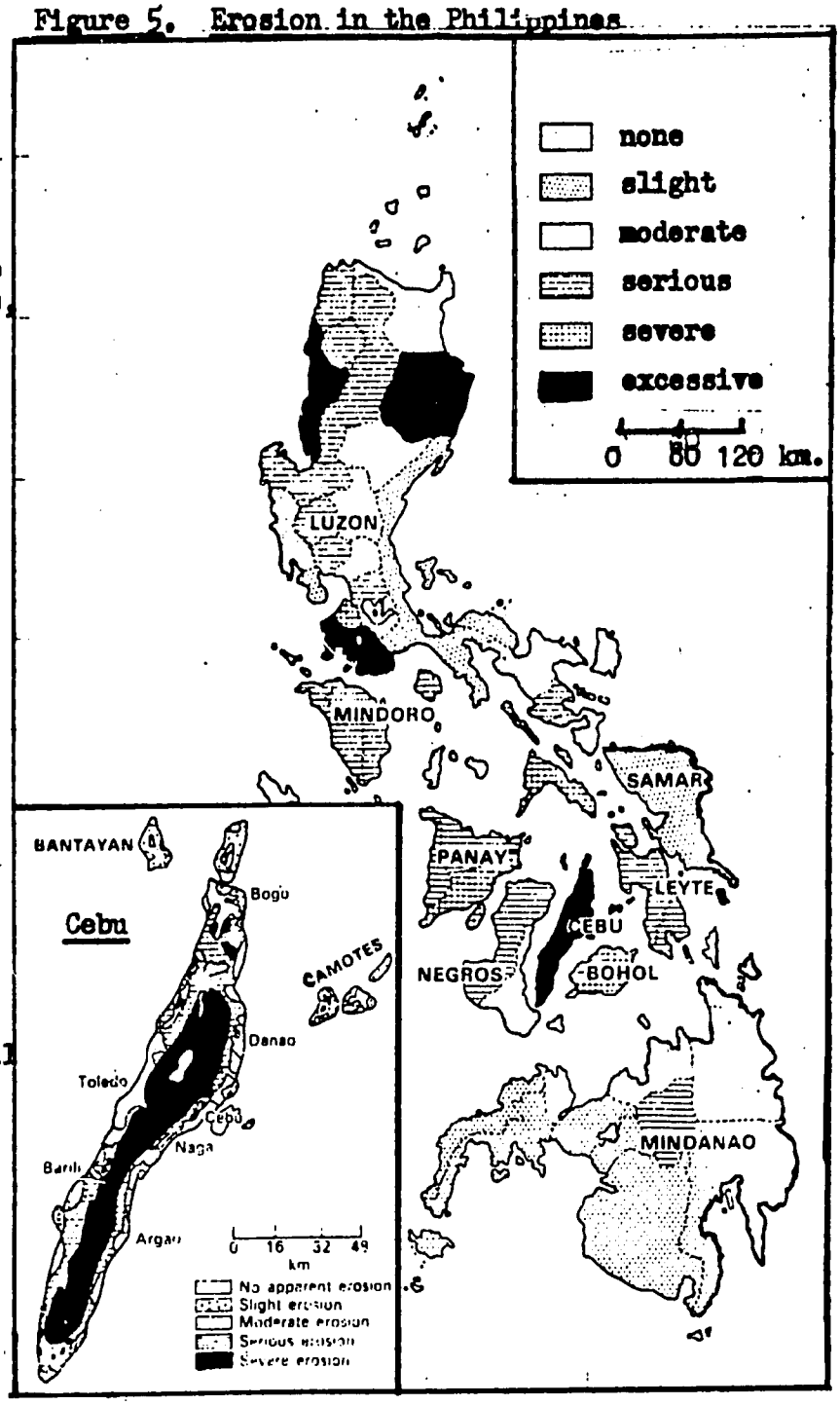
Northern Mindanao - soils suited to forest 68%, crops 27%. Soil series are diverse and include Adtuyon, Antipolo, Butuan, and Kidapawan.

Southern Mindanao - soils suited to agriculture 22%, forest 76%. Soil is rich, belonging to Banga, Camansa, Faraon and San Manuel series.

4.4.1 Soil erosion

Although the Philippines is well endowed with good soils, erosion and the resultant depletion of soils have become a problem of national importance. Farmland yields in many regions have declined significantly in recent years despite the use of high-yield varities. Land use and soil management practices have not changed appropriately from traditional ones, and soil-exhausting crops are planted year after year with little regard to the benefits of crop rotation or the use of fertilizers. Erosion is severe and excessive in parts of Luzon, Panay, Masbate, Bohol, and Cebu, and most islands are experiencing some amount of erosion.

Figure 5. Erosion in the Philippines



Source: Burley, T.M. 1973. The Philippines - An Economic and Social Geography. G. Bell and Sons, Ltd. London.

4.5 Wildlife Resources

The Philippines has many species of animals and birds, with birds more common than most other types of wildlife. There are at least 760 species of birds in the country, including such endangered species as the Monkey-eating eagle, the Palawan peacock pheasant, the Cebu black thrush, and the Mindoro zone-tailed pigeon. There are relatively few larger mammals, only consisting of monkeys, small deer, wild pigs, and a few members of the civet and cat families. There are over 50 known species of bats, and rodents are numerous. The tamaraw, a species of wild water buffalo, is found only in Mindoro. Crododiles, once widespread, occur now mainly in Mindanao. Several varieties of snakes exist, including the coral snake, the pit viper, a small cobra, and large pythons. There are also some large lizards and serpents in the more isolated areas. Several species of wildlife in the Philippines are considered to be endangered or threatened with extinction, among which are the following*:

Philippine deer	Axis (Hyelaphus) calamianensis
Tamaraw	Bubalus (Anoa) mindorensis
Philippine tarsier	Tarsius syrichta
Mindanao gymmure	Podogymnura truei
Dugong	Dugong dugon
Asiatic buffalo	Bubalus bubalis
Monkey-eating eagle	Pithecophaga jefferyi
Palawan peacock pheasant	Polyplectron emphanum
Mindoro zone-tailed pigeon	Ducula mindorensis
Koch's pitta	Pitta kochi
Cebu black thrush	Copsychus niger cebuensis
Philippine crocodile	Crocodylus novaeguineae mindorensis

4.5.1 Fish and fisheries

The Philippines is rich in aquatic life, with many species of fresh and marine fish and shellfish in lakes and rivers and along the shoreline. There are over 750 species of saltwater fish that are used for food, and edible mollusks occur in large numbers, including crabs, shrimp, prawns, clams, and oysters. Pearl oysters are also found in Philippine waters. The reef areas offshore abound in colorful tropical fishes, and shell collection is becoming an important economic factor. Important fishing areas are found along the south shore of Palawan, in the Visayan Sea, in the Samar Sea, in Manila and Tayabas Bays, in the Davao Gulf, and in Sibuguey Gulf in Mindanao. Most sea fishing is done in commercial vessels, while municipal and sustenance fishing is done in vessels of less than 3 tons.

Freshwater fishing is done for family use first and market second. Most small freshwater fishermen use small dugout canoes called bancas to go out into the lakes where they use nets or fish traps to collect fish. In recent years fishermen have begun building fish pens in rivers and lakes where they hold fingerling fish until they reach marketable size, then harvest them. This has become very profitable since fish are easily accessible and do not have to be fed. Many small farmers also maintain fish ponds on their land for family use. The government is promoting the use of

*U.S. Fish and Wildlife Service List of Endangered and Threatened Wildlife and Plants, and International Union for the Conservation of Nature and Natural Areas (IUCN) Red Data Book.

backyard fishponds in order to provide better protein to all Filipinos regardless of their location. Fish grown in ponds and pens include the common carp, catfish, other introduced Chinese carps, and the milkfish. Milkfish fry are caught during spawning season along the shoreline, then transferred to brackishwater ponds or acclimated to freshwater ponds for rearing. Milkfish (Chanos chanos) are the preferred food fish for most Filipinos.

Table 10. Fisheries Production, 1972-1976

	1972	1973	1974	1975	1976
	(in 1,000 metric tons)				
Commercial fishing	425	465	471	499	509
Fish ponds	99	100	113	107	113
Municipal and sustenance fisheries	599	640	684	732	773
Total	1,122	1,205	1,268	1,338	1,395

Source: Bureau of Fisheries and Aquatic Resources, Philippines.

4.5.2 Wildlife Protection

There are three types of protected areas in the Philippines*, ranging from national parks to national recreation areas. Although the government lists 12 national parks, 11 national recreation areas, 7 wildlife sanctuaries, and 2 strict nature reserves, the International Union for the Conservation of Nature and Natural Areas (IUCN) lists 23 national parks as providing the necessary amount of wildlife protection. The protected areas proposed by the Philippine government are in these three categories:

National Park - an area reserved for the interpretation of natural features and ecological processes. Parks may contain facilities to support hiking, nature observation, and photography.

National Recreation Areas - an area which possesses a substantial natural environment capable of providing and supporting outdoor recreation activities based upon the utilization of the physical resources found in the area such as swimming, camping, fishing, and mountain-climbing.

Equivalent Reserves - an area that meets the requirements of a national park but restricts or eliminates tourism to permit the free interaction of natural ecological factors. Reserves may be 1) wildlife sanctuaries - to protect wildlife species no longer capable of surviving or multiplying in an unprotected environment, and 2) strict nature reserve to provide scientific control of an area in which natural processes may take place without human interference.

*These area classifications were proposed as part of a Philippine National Park System detailed by the Development Academy of the Philippines in 1975. No data available on result of proposal.

Parks listed by the IUCN in 1971 include the following:

Luzon:	Bataan National Park
	Banahaw and San Cristobal Mountains National Park
	Mount Isarog National Park
	Tirad Pass National Park
	Bicol National Park
	Aurora Memorial Park
	Biak-na-Bato National Park
	Hundred Islands National Park
	Quezon National Park
	Fuyot Spring National Park
	Bessang Pass National Park
	Caramoan National Park
	Callao Cave National Park
	Pagsanjan Gorge National Park
	Mayon Volcano National Park
Mindanao:	Mount Apo National Park
	Mainit Hot Springs National Park
Mindoro:	Naujan Lake National Park
Negros:	Canloan National Park
Cebu:	Sudlon National Park
Leyte:	Mahagnao Volcano National Park
	Kuapnit-Balinsasayao National Park
Samar:	Sohoton Natural Bridge National Park

Other parks not included in the IUCN list because of uncertain status or too small a size are: Central Cebu National Park, Basilon National Park, Mount Data National Park, Makiling National Park, Mount Arayat National Park, Bulusan Volcano National Park, Roosevelt National Park, Tongonan Hot Spring National Park, Mount Dajo National Park, Manleluag Spring National Park, Mado Hot Spring National Park, Tiwi Hot Spring National Park, Libmanan National Park, Taal Volcano National Park, and Liguasan Game Refuge and Bird Sanctuary, a marsh where only the fauna is protected.

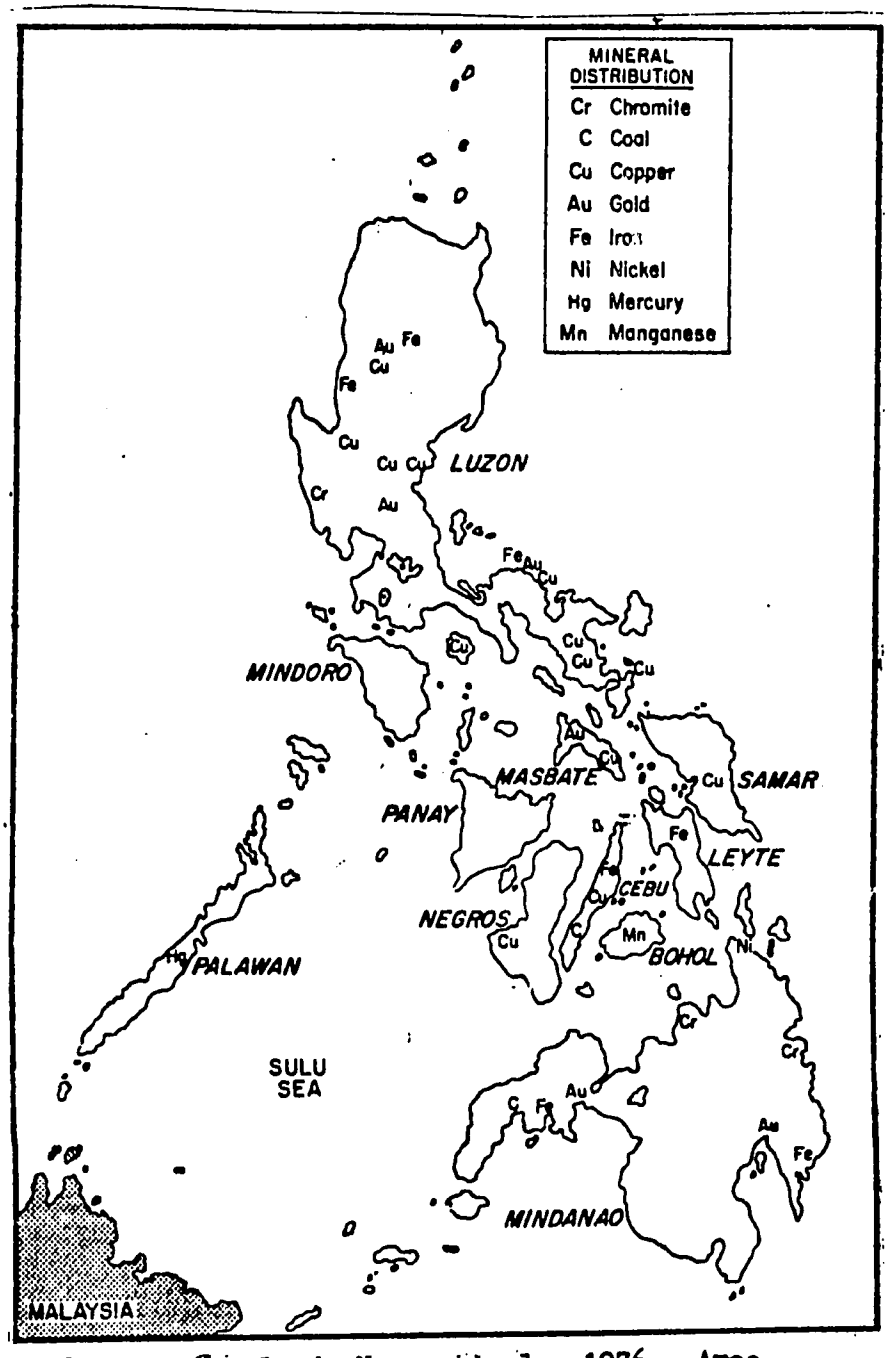
4.6 Mineral Resources

The Philippines derives 3% of its gross national product from the mining sector, with copper the leading mineral export. Copper deposits are found in Negros Occidental, Cebu, Benguet Province in Luzon, and on Marinduque. Copper production in the Philippines is the largest in the Far East. Other metallic minerals found in the country include gold, chromite, iron, mercury, silver, manganese, lead, and zinc. Gold has been mined since Spanish times and is found in scattered locations from Luzon to Mindanao. The chief deposits of chromite, in Zambales Province in Luzon, have reserves estimated at over 10 million tons of refractory grade ore and over 3 million tons of metallurgical ore. Iron ore deposits are concentrated on Luzon and Mindanao, with some deposits in the Visayans. Nickel occurs in Surigao del Norte in Mindanao and ore reserves are estimated at over 100 million tons.

Nonmetallic minerals found in the Philippines include asbestos, diatomite, feldspar, gypsum, limestone, dolomite, marble, perlite, quartz, and talc.

Clays are found everywhere, and sulfur deposits are found on Luzon. A large sulfur deposit of volcanic origin is located on Negros, estimated at 30 million tons of ore. Coal deposits are found from Mindoro to Mindanao, but in the 1970's only Cebu supported significant coal mining. There has been extensive exploration for petroleum resources in the Philippines, and in 1978 significant deposits of petroleum were confirmed off the island of Palawan. Production of crude oil is expected to reach 12,000 barrels per day.

Figure 6. Mineral Resources



Source: Vreeland, Nena. et.al. 1976. Area Handbook for the Philippines.

Table 11. Mineral Production, 1977

Mineral	Quantity
Manganese	8,000 metric tons (MT)
Copper	273,000 MT
Chrome	531,000 MT
Coal	285,000 MT
Salt	213,000 MT
Gold	1,621,100 fine ounces
Silver	558,300 fine ounces

Source: Bureau of Mines, Philippines.

4.7 Coasts and beaches

The coastline of the Philippines extends over a total of 16,000 km, twice as long as that of the continental United States. It has 61 natural harbors, including one of the finest harbors in the world, Manila Bay, and 20 land-locked straits. Many coastal areas have fine sandy beaches, while others are covered with mangrove swamps. Mangrove forests once covered 400,000 hectares of coastline, but at present there are only 200,000 ha. left, and these are being destroyed at a rate of 24,000 ha. per year. Mangrove swamps are dredged for fishponds and other types of development.

Along the coastline are nearly 27,000 km^2 of coral reef surface, mostly fringing reefs. These reefs are very important as habitat for important food fishes as well as serving as buffers for the coastal areas nearby. Many reef areas are already included in national parks, such as the Hundred Islands National Park off the coast of Luzon. But coral reefs are in danger of destruction from several quarters. Fishermen use dynamite and other explosives near reefs to stun fish and break up coral, which is collected and used for jewelry and in the construction trade. Reefs are also damaged by siltation from rivers carrying eroded materials away from deforested slopes on the mainland. The University of the Philippines' Marine Center estimates that 50% of the Philippine coral reefs are already dead or dying. However, some corrective measures are being taken, including reforestation and training of fishermen in less destructive fishing techniques.

4.8 Volcanos and seismic activity

The Philippine archipelago was formed primarily by volcanic activity and has several active volcanos, including Mt. Taal on Luzon which last erupted in 1971 and Mt. Mayon, also on Luzon, which erupted in 1968. There are about 100 eruption areas on the islands of the Philippines. The Philippines lies astride the Philippine Fault Zone or Rift, which passes from the Caraballo Mountains on Luzon, through Polillo Strait, Ragay Gulf, north-eastern Masbate, the Central Cordillera of Leyte, to the upper Agusan Valley in Mindanao. The fault line is paralled offshore by the Philippine Trough. Northern Luzon receives an average of 13 perceptible shocks annually, while the number is 9 for the Manila-Taal area, 4 for the Mayon area, and 6 for the Sulu-Visayan area.

4.9 Energy resources

With a growing demand for energy, the Philippines is making an effort to develop indigenous energy resources such as hydroelectric, geothermal, solar, and biogas energy. Geothermal development began several years ago at Tiwi Hot Springs in Luzon, and in 1979 the Tiwi Geothermal Power Plant began operation. The Plant will generate 560 megawatts and is being developed in 55 megawatt stages. The Philippine Commission on Volcanology announced that another geothermal site had been found in Manito, Albay Province. The Ministry of Energy predicts that by 1987 geothermal energy will account for 8% of the total power needs.

The Philippine Government contracted with the Westinghouse Corporation to build a nuclear power plant of 620 megawatt capacity in Morong, Bataan. Construction on the plant has been suspended until Westinghouseccan assure the government that the plant will be safe. This is in reaction to the accident at Three Mile Island in the United States. The government says that, due to adverse political reactions and cost overruns, this will be the only nuclear plant built in the country.

The country's first commercial oil well began production in 1979. The government is promoting the development of solar and biogas power for rural use, and in 1978 344 biogas plants had been built, of which two-thirds were privately-owned. Experiments in the use of solar cells for ice plants are also underway.

The Manila Electric Company and the National Power Corporation are the two main suppliers of energy in the country, and together they supply 90% of the power needs. Total generating capacity of the Philippines in 1977 was 4,186,000 kilowatts.

5.0 ECONOMY

5.1 General Economic Picture

GNP: US $17.9 billion (1976 estimate)

Per capita GNP: US $450 (1979 estimate)

Real growth rate: 3.9% (1970-1976)

Monetary conversion ratio: Philippine pesos ₱7.38 = US $1,00 (April 1979)

Average annual inflation rate: 7% (1978 estimate)

The Philippine economy is based both upon agriculture, the traditional economic base, and increasingly upon private enterprise and the industrial sector. Agriculture accounts for about 27% of the GNP and employs more than 50% of the total labor force, while the industrial sector, including manufacturing, mining, and construction, contributes 35% of the GNP and 14% of total employment. During the 1970's, economic policies brought some improvement to the total economic picture of the country. Tax reform measures have increased public revenues, allowing public investment to rise from 2% in early 1970's to 5% in 1976-1978. Agricultural performance has improved, and employment increased by about 4.6% annually during 1973-1977, keeping up with labor growth. However, income distribution remains highly unequal; the top 20% of households receive 53% of private income, while the lowest 40% receive only 15%.

5.2 Agriculture

Agriculture, including forestry and fisheries, is characterized by labor-intensity and low production levels. Because most farm units are small, less than 5 hectares, rural farm families usually depend upon more than one occupation for income. A large percentage of farmers are tenant farmers, although land reform programs are changing that situation. In 1975, 10,750,900 hectares of land were under cultivation, of which 70.9% were in food crops and 29.1% in commercial crops. Of major crops, rice accounts for 40% of cultivated land and corn for 33%. Other important crops are fruits, nuts, and sugarcane. Minor crops include abaca, tobacco, coffee, vegetables, rubber, cacao, ramie, magney, kapok, cotton, coconuts, bananas, and pineapples.

In 1973 the Philippine government launched the "Masagana 99" program which was aimed at achieving self-sufficiency in rice production by increasing rice yields through the use of improved seeds, fertilizers, and pesticides. The 1977 rice harvest was for the first time sufficient for domestic consumption, and in 1978 the Philippines had a small exportable surplus. Through a similar program for corn, "Maisan 77", the Philippines is self-sufficient in white corn for human consumption, although it imports yellow corn for animal feeds.

Table 12. Principal Crops

(In 1,000 metric tons)

Crop	1974/75	1975/76	1976/77
Rice	5,661	6,159	6,456
Corn	2,568	2,767	2,843
Coffee	91	80	82
Tobacco	62	60	52
Cocoa	4	3	3
Sugar Cane	24,600	33,010	32,400
Copra	1,719	1,865	2,110
Abaca (Manila hemp)	134	137	151

Source: Bureau of Agricultural Economics, Sugar Quota Administration, Philippines.

5.2.1 Fertilizers and pesticides

In line with the government's programs to produce more rice and corn, the use of fertilizer has been promoted in the Philippines. Fertilizer consumption in the country has grown from 101.2 million metric tons in 1956 to 563.0 million metric tons in 1972. Fertilizers are produced locally, although some types such as ammonium sulphate and other nitrogenous fertilizers continue to be imported. Local production of fertilizers reached 348.2 million kilograms in 1973. There are four major fertilizer companies in the country.

Pesticides used in the Philippines include fungicides, insecticides, rodenticides, herbicides, and fumigants. In 1972, fungicides and agricultural insecticides accounted for 84% of the country's total importation of pesticides. Until 1966, all pesticides used in the country were imported, but by 1971 over 50% of the pesticides used were produced locally.

Table 13. Pesticides used in control of insects on agricultural crops

Crop	Pesticide	Brand name
Cereal grains	Diazinon	Basudin
	Gamma BHC	Lindano
	Carbaryl	Sevin
	Methyl parathion	Meptox
	DDT	DDT
	Malathion	
	Aldrin	
	Dieldrin	
Coconut trees	Aldrin	
	Methyl parathion	Meptox
	DDT	DDT
	Dieldrin	
Fruit trees	Malathion	E.C.
	Carbaryl	Sevin
	DDT	DDT
	Methyl parathion	Folidol

Table 13. (cont.)

Vegetable crops	Carbaryl	Sevin
	Malathion	
	DDT	DDT
Tobacco, cotton, abaca	Carbaryl	Sevin
	DDT	DDT
	Malathion	
	Dieldrin	
	Methyl parathion	Folidol

Source: National Economic and Development Authority

5.3 Animal Husbandry

Most small farmers in the Philippines maintain a few pigs, chickens, and a carabao or water buffalo for plowing. Ducks, goats, turkeys, and geese are also raised by farm families. Dairy cattle are raised near Manila and other cities, while beef cattle are raised in Mindanao, Central Luzon, and Masbate. Dairy production does not yet meet the demand for milk and milk products. There is some sheep production as well. Most livestock are produced for home consumption and few farmers are able to maintain more than one carabao and a few pigs. The traditional Filipino diet consists of rice and fish, and farmers are beginning to supplement their protein needs with fish grown in backyard fish ponds.

Table 14. Livestock Numbers

Animal	1976	1977
Cattle	1,737,000	1,885,000
Pigs	6,489,000	5,735,000
Carabao	2,725,000	2,921,000
Chickens	45,671,000	47,784,000
Ducks	4,104,000	4,195,000

Source: Bureau of Agricultural Economics

5.4 Industry

Industrial production accounted for 35% of the GNP in 1977 and is composed of manufacturing, mining, construction, and production of agricultural crops for export. The major industries are food processing, chemicals, rubber products, beverages, tobacco, textiles, construction, and mining. Sugar is the leading export crop, accounting for 16% of export earnings in 1977, with copra and coconut oil second and third. Between 1974 and 1976, the construction industry grew rapidly, reaching 7.5% of the GNP in 1977. Since 1970 there has been a dramatic growth in non-traditional manufacturing such as garments, textiles, electronic parts, and wood products, and accompanying employment gains. Mining contributes significantly to foreign exchange earnings, although only 4.8% of Philippine mineral deposits have been tapped. Other major exports of the Philippines are copper, logs, lumber, bananas, and gold.

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Also helpful in the legislation section were all available copies of the Philippine Offical Gazette.

APPENDIX

Member Agencies of the National Committee on Man and the Biosphere/UNESCO, Philippines:

University of the Philippines
Bureau of Public Works
Philippine Institute of Environmental Planners
Metropolitan Waterworks Environmental Planners
Philippine Atmospheric, Geophysical and Astronomical Services Administration
Philippine Coconut Authority
National Pollution Control Commissio
Philippine Council for Agricultural Research
Bureau of Soils
Bureau of Medical Services, Department of Health
Bureau of Fisheries and Aquatic Resources
Forest Products Research and Industries Development Commission
Bureau of Forest Development
UNESCO National Commission of the Philippines

Chairperson of Philippine National Commission on MAB:
Dra. Estela L. Zamora