



STATE OF THE NATION REPORTS

SAVING THE PRESENT FOR THE FUTURE: The State of the Environment

Percy E. Sajise
Nenita E. Tapay
Enrique P. Pacardo
Nicomedes D. Briones
Rosario D. Jimenez
Edgardo E. Gomez
Prescillano M. Zamora
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Imelda Zosa-Feranil

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Center for Integrative and
Development Studies



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Percy E. Sajise

Professor in Ecology, UPLB

Nenita E. Tapay

Associate Professor in Sociology, UPLB

Enrique P. Pacardo

Professor in Plant Physiology, UPLB

Nicomedes D. Briones

Asst. Professor in Resource Economics, UPLB

Rosario D. Jimenez

Associate Professor in Urban Planning, UP Diliman

Edgardo E. Gomez

Professor in Marine Science, UP Diliman

Prescillano M. Zamora

Professor in Botany, UP Diliman

Miguel D. Fortes

Associate Professor in Marine Science, UP Diliman

Macrina T. Zafaralla

Associate Professor in Botany, UP Diliman

Imelda Zosa-Feranil

Associate Professor in Demography, UP Diliman

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Preface

The continuing degradation of the Philippine environment despite serious efforts on the part of government, nongovernment organizations and local communities to address the situation, positive reviews from readers and the demand for additional copies of the report impelled the University of the Philippines-Center for Integrative and Development Studies (UP-CIDS) to reprint the *State of the Nation Report No. 1*. This report is a popularized version of a 300-page research monograph which the Center is planning to launch in late 1994.

The research which this report summarizes was done by a multidisciplinary team of experts from UP Los Baños and UP Diliman under the leadership of Dr. Percy Sajise who was affiliated with the Institute of Environmental Science and Management. He is currently the Executive Director of the Southeast Asian Regional Center for Agriculture. The team was convened in 1989 as part of the UP Assessments on the State of the Nation Project. While the information may be dated, the Report can provide a good baseline analysis and recommendation against which current developments can be assessed.

The UP-CIDS acknowledges the contribution of the following institutions and people to the publication of this report: the Ford Foundation provided the grant for the State of the Nation Assessment Report Series; Dr. Emmanuel Lallana, then Director of the UP-CIDS initiated the publication of the original condensed report; Mr. Edgardo Maranan transformed the 300-page research report into a readable and popularized version; Bella Lucas, Joy Aparis, Stretch Payawal, Mike Arciga, and Ellen Cometa saw this reprint through minor editing and publication.

As in all the UP-CIDS publications, the analysis and recommendations are those of the author whose academic freedom is upheld by the University.

Maria Cynthia Rose Banzon-Bautista, PhD
Executive Director
UP Center for Integrative and Development Studies
September 1994

FOREWORD

The *State of the Nation Reports* are condensed and popular versions of the studies produced under the UP Assessments on the State of the Nation: A Multi-Disciplinary Research and Outreach Program. By making these scholarly studies accessible to the public, the University of the Philippines-Center for Integrative and Development Studies (UP-CIDS) hopes to contribute to the continuing debate on the nation's future and the alternatives for shaping it.

With the growing awareness and concern for our environment, it is but fitting that the first issue of *State of the Nation Reports* is on this vital matter. "Saving the Present for the Future" is not only an assessment of the current national environmental situation but also provides policy recommendations on how to improve our rapidly deteriorating environment. This study is produced by some of the country's leading experts on the field who are teaching and doing research in UP Los Baños and UP Diliman. Dr. Percy Sajise of the Institute of Environmental Science and Management, UP Los Baños is the team's study leader. His paper "Incorporation of Environmental Consideration in Regional and Local Resource Management" was published in the *UN Center for Regional Development Journal* in 1991.

The team produced a three hundred-page, single-spaced report which was condensed by Mr. Edgar B. Maranan of the UP Asian Center for publication.

A grant from the Ford Foundation to the University of the Philippines enabled the UP Center for Integrative and Development Studies to publish the *State of the Nation Reports*.

Finally, the assessments and recommendations published in this series are solely those of the authors whose academic freedom is held sacred in the University and guaranteed by the Constitution.

Emmanuel C. Lallana
General Editor
May 1992

SAVING THE PRESENT FOR THE FUTURE: THE STATE OF THE ENVIRONMENT

INTRODUCTION

The environmental scenario imaged twenty years ago has materialized.

We have been witness to the convergence of two major phenomena which threaten the well-being of this generation and those yet to come: one is unabated deforestation of watershed areas and pollution of water, land, air; the other is rapid population growth.

Recent floods in Eastern Visayas and Bicol, prolonged flooding around Laguna Lake, dried up rivers, streams and lakes, disappearance of animal and plant species, and decreased productivity of forest lands, croplands, lakes and marine ecosystems underscore the gravity of the situation.

The state of the Philippine environment has deep implications for policy and planning.

This study aims to make a general assessment of environment and resource development in the Philippines. Six primary interconnected ecosystems were analyzed: forest, marginal lands, croplands, urban, freshwater, and marine coastal.

The report presents (1) a general picture of these life-support systems; (2) an analysis of the relationships between utilization and development of natural resources in the country, and the impact of population pressure on the various ecosystems; and (3) management strategies as well as policy/research recommendations for sustainable environmental and resource development.



THE ENVIRONMENT AND SUSTAINABLE DEVELOPMENT: A CONCEPTUAL FRAMEWORK

ENVIRONMENT means "the circumstances, objects, and conditions by which one is surrounded," or "the complex of physical, chemical, and biotic factors that act upon an organism or an ecological community that ultimately determine its form and its survival."

Environment is our concern, and we need guidelines applicable to every possible existing ecological situation in the country.

The following guidelines must be taken into consideration in our environmental concerns:

1. Sustainability of life support system or ecosystems, taking into account ecological, social and technological factors
2. Problem focus: start with ecological problems faced by a community at a given situation
3. Development orientation
4. Site-specific and system-based programs
5. Interaction and interrelationship between various ecosystems
6. Long-term strategies and scenarios
7. Promotion of well-being of local communities, *e.g.* upland communities are directly dependent on forest resources
8. Equal opportunity and access to resources
9. Global factors, such as energy, trade, transport of hazardous chemicals, and others, impinging on local environmental problems

SUSTAINABLE DEVELOPMENT

It can be defined as "a dynamic process in which the development and utilization of resources, orientation of technological development, institutional change and direction of investments, are in harmony with and enhance current and future potentials to meet human needs and aspirations."

In brief, servicing human needs without jeopardizing the life support systems which are natural sources of human survival.

A conceptual framework is graphically provided by following two diagrams. (Figures 1.1 and 1.2)

Figure 1.1. CONCEPT OF SUSTAINABLE DEVELOPMENT (WCED,1987)

Sustainable development is a dynamic process in which the development and utilization of resources, orientation of technological development. Institutional change and direction of investments are all in harmony and enhance both current and future potentials to meet needs and aspirations.

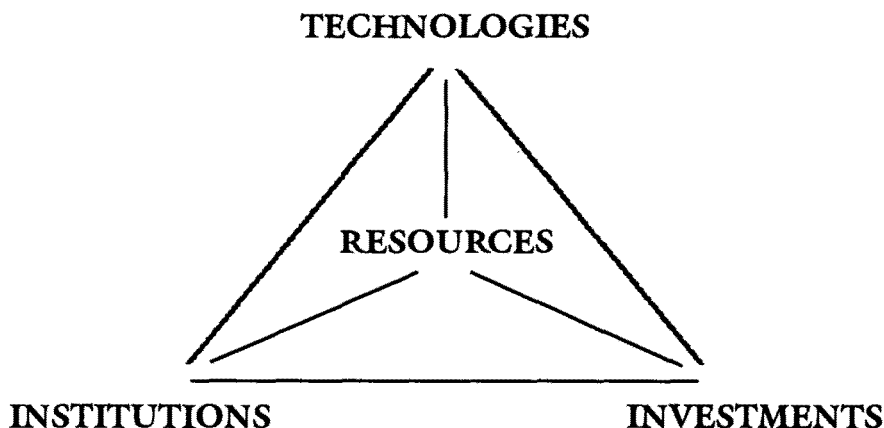
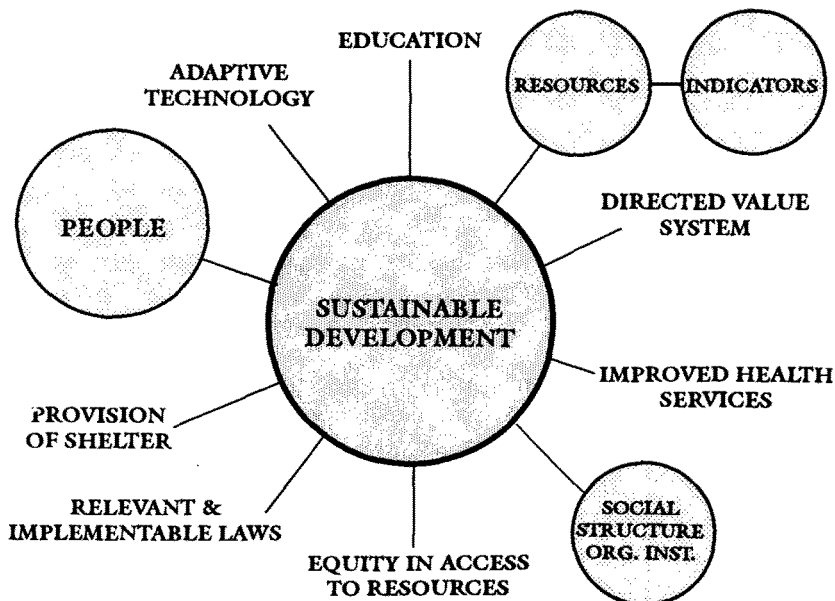


Figure 1.2. CONCEPTUAL FRAMEWORK FOR SUSTAINABLE DEVELOPMENT



OPERATIONALIZATION

The time frame in sustainable development should be long-term — at least one generation or sixty years.

It cannot be achieved without addressing the needs of the seventy percent of our population living below the poverty line. They are so needful that they resort to harmful technologies, such as dynamite and cyanide fishing, charcoal-making, and the like.

Strategies for operationalization embodied in the Philippine Strategy for Sustainable Development (PSSD) include:

- * inducing economic growth among the urban and rural poor
- * environment as constant factor in decision-making process
- * proper pricing and distribution of costs and benefits from natural resources
- * equitable access to resources; recognition of property rights (ancestral domain) of cultural communities
- * putting up integrated protected areas
- * rehabilitation of degraded ecosystems
- * strengthening of pollution and social welfare in planning
- * environmental education in all levels
- * citizen participation and building of an environmental constituency

SUSTAINABLE DEVELOPMENT AND THE ENVIRONMENT

We need to define the minimum quality of life or standard of living for the people, determine the limits of ecosystem and resources base, and device technologies for goods and services which are environmentally sound. Furthermore, we need to formulate a rational population policy and a system of environmental education.

Sustainable Development in the Agricultural and Rural Sector

The conceptual framework can be translated into five agricultural strategies, consisting of (a) agricultural production; (b) market development; (c) infrastructure; (d) education; and (e) support services.

Proceeding from this, we can draw up a Policy and Action Agenda for the agricultural and rural sector.

Policy Agenda:

- * preferential policies for resources-poor farmers
- * streamline the bureaucracy
- * promote equitable access to resources
- * patent locally developed technologies
- * adopt non-pollutive practices
- * discourage "it's cheaper to import" mentality

Action Agenda:

- * develop and test Integrated Pest Management package
- * promote agro-based rural industries
- * implement organic farming methods
- * develop appropriate, indigenous farming techniques/system
- * encourage agroforestry
- * emphasize human health factors in agricultural practice
- * establish integrated community-based development programs

Chapter

two

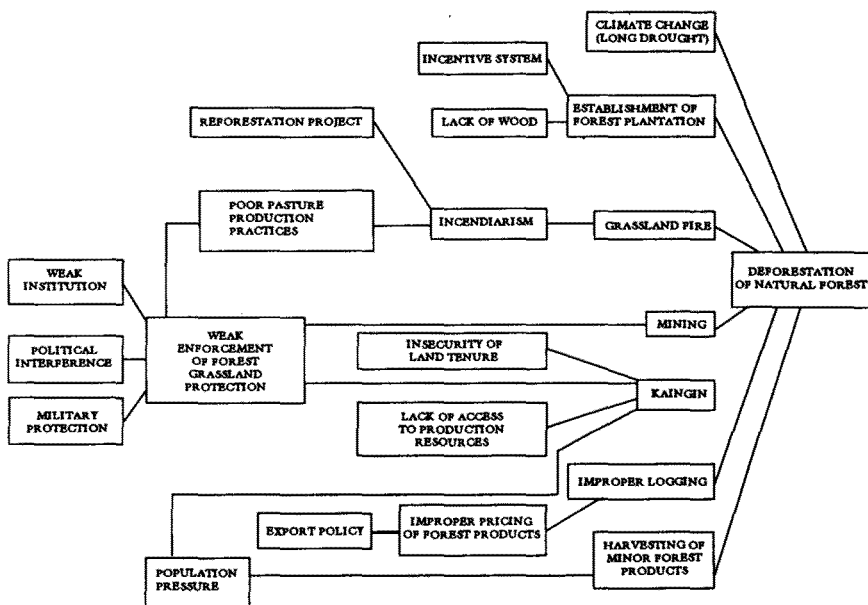


THE PHILIPPINE FOREST ECOSYSTEM

The forest is a whole complex system of closely interlinked biophysical, social, and economic components. The properties of this system are sustainability, equitability, diversity, and stability. Without man's interference, their interrelatedness is expected to continue existing in harmonious balance. Man's tinkering with nature has resulted in major, disastrous, and often irreversible consequences.

The processes that human interference set into motion, leading to deforestation of natural forests, may be summed up in a diagram of Causes and Impacts in Forestry (Figure 2.1).

Figure 2.1. CAUSES AND IMPACTS IN FORESTRY



IMPACTS:

1. Displacements of cultural communities
2. Hydrologic Impairment
3. Siltation / Erosion
4. Reduction in biological diversity
5. Low income and poverty
6. Malnutrition

Population and weak enforcement of forest and grassland protection laws are two major causes of large-scale forest destruction. Population pressure is the single most significant factor. Increasing requirements for food, settlement, arable land, raw materials, and livelihood opportunities, intensify the exploitation of forest resources.

Weak enforcement of protection laws is traceable to weak institutional infrastructure, political interference, and military protection of big-time forest violators. Forest management efforts are crippled by nonresponsive bureaucratic procedures, and inadequate policy environment and incentive system. As a result, unregulated *kaingin* proliferates on fragile uplands, and other destructive activities continue, such as improper mining and intentional burning of reforestation sites, go on unabated.

Improper export and pricing policies as well as inefficient and harmful logging and extraction methods, conspire to further destroy the forests. In man's efforts to sustain his needs, he replaces natural forest stands with artificial forest plantation systems.

The resulting forest destruction causes major impacts: displacement of cultural communities, hydrologic impairment, erosion and siltation, low income and poverty, and malnutrition.

HISTORY OF FOREST UTILIZATION

In precolonial times, the country's population was small. Our forefathers had a harmonious relationship with forests and forest resources. When the Spaniards came, forest conversion was accelerated as Philippine logs were used to build ships for the galleon trade.

The Philippine forest cover in 1575 is estimated to have been around 27.5 million hectares, almost 92 percent of total land area. Total national population then was only 750,000. By 1800, with population up to 1.8 million, forest cover had shrank by 1.4 million hectares. Annual deforestation rate was only 4,444 hectares.

The Spanish government started the practice of forestry in the country. In June 1863, it organized the Forest Service. Forest laws and regulations enacted during the period were good but not fully implemented. From 1800 to 1900, annual forest reduction had gone up to 51,000 hectares due to increased demand for agricultural lands and settlement areas.

At the beginning of American colonial rule, Mindanao, Luzon, Samar, and Palawan were still covered with virgin dipterocarp forest. After about two decades, logging companies were expanding and more sawmills were being built. American logging firms with advanced machinery teamed up with Filipino businessman to organize logging firms. Filipino politicians frustrated regulation efforts by the Bureau of Forest Development (BFD). Logging throughout the American occupation was wantonly perpetrated without regard for future regeneration.

The rate of conversion to other land uses accelerated in 1935 under the Commonwealth government until the Japanese took over the management and control of the Forest Service during the Second World War. Although the BFD tried to minimize forest destruction, the people who retreated to the mountains resorted to rampant shifting cultivation to feed themselves.

From 1947 onward, the logging industry became fully mechanized, and "carabao logging" was phased out. This signalled a faster rate of denudation of the previously luxuriant virgin forest lands.

The government introduced the policy of selective logging and sustained yield only in 1955. However, loggers continued cutting faster than the forest could be renewed, and the sustained yield method was not used because it entailed a 25-year waiting period. Timber concessions had increased, whose practice was to cut and get out, with maximum revenues as the target.

A 1981 directive made the granting of timber concessions conditional on efforts of logging firms to carry out reforestation in their sites. Concessionaires were required to either apply to lease industrial tree plantations on denuded lands, or submit a seven-year plan for reforestation. Only one-third of them applied for leases, citing financial constraints.

The construction of logging roads opened the way for a second-wave exploitation by lowlanders, who migrated to the uplands due to shrinking employment opportunities.

Log production for export, which reached its peak in 1968-1971, declined since 1980, and attained its lowest level of 3.43 million cubic meters in 1986. This was the result of the log export ban and the decrease in number of timber licenses. Still, by the end of 1990, the remaining forest cover in the country would have further gone down to only 6.1 million hectares.

The major causes of deforestation are combinations of demographic pressure, logging, and developments in agriculture. Agriculture finally surpassed forestry as the dominant land use by the early eighties. So much forest lands had been cleared by loggers for roads, cables, and tractor ways, and for log storage areas, that an average of 30 percent — and as much as 70 percent — of forest lands has been cleared in the course of logging. Rapid deforestation also resulted from a decline in available land per capita, due to population increase. Forest lands were occupied by the landless, who complicated the problem by practicing the only agricultural technique they know: *kaingin* or slash-and-burn cultivation.

Government policies and the incentive system have also contributed to the loss of forest cover. This includes the Homestead Act, which provided land to the landless starting in the 1900s. Up to the late sixties, the government was opening up virgin forest lands and encouraging people to settle there, to broaden the country's agricultural base. The land-to-the-landless policy of the fifties likewise made possible large-scale conversion of forest lands to agricultural use. This was a politically motivated move that hardly changed the existing patterns of land ownership.

The government's policy of utilizing forest resources to increase export income for domestic capital formation was no less responsible for forest destruction. In the sixties and seventies, increased and unlimited export of logs took place.

THE PRESENT CONDITION OF PHILIPPINE NATURAL FORESTS

The Philippine dipterocarp forests support one of the world's richest plant and animal life. They contain the lifeblood of the nation, supplying its ecological and economic requirements. It has also supported and nurtured innumerable generations of tribal Filipinos whose lives are anchored upon the well-being of the forest.

We now stand to lose this vital natural resources. The ravage done to it has been swift and massive. A 1988 study showed a very low forest cover of only 23.92 percent. The ideal cover is 54 percent, based on slope consideration. The lowest forest cover occurs in Regions VII (3%), V and VI (14%), III (16%), and IV (19%) except for Palawan, which still has a relatively adequate cover of 54 percent.

Recent estimates based on LANDSAT photographs place adequately stocked forest lands at 3.8 million hectares, and open forest lands at 5.3 million hectares. In the early 1900s, there were approximately 10 million hectares of virgin and five million hectares of second-growth forests in the Philippines. Today, there are less than one million old-growth forest left. There is more residual forest than virgin forest, a complete reversal of the situation early this century.

The country maintains 59 national parks located in 441,331 hectares of forest lands. However, only seven of these parks now meet international standards due to squatting, illegal logging, kaingin, and subdividing. Seven forest areas covering a total of 939,886 hectares are designated as game refuge and bird sanctuaries, while 747,984 are presently kept as watershed reservations.

If forest destruction trends continue unabated, it is predicted that Philippine forests would have a life span of ten years at most. The forest situation in the Philippines is classified as critical: forest lands are mostly gone, hill forests are under attack or are dwindling, and maintenance of biological diversity is breaking down. In the first quarter of the next century, the natural forest will yield very little timber and instead, the logging industry will establish and maintain tree plantations.

Of the estimated eleven million hectares of critically denuded forest land, at least two million hectares are in critical watershed areas like those of the Agno River, Pampanga River, Cagayan River, the Magat and Pantabangan watersheds.

ENVIRONMENTAL PROBLEM ANALYSIS

Forestry issues are inextricably bound up with and rooted to the basic problems of population and poverty. The process of degradation and depletion of forest resources is closely linked to the interwoven problems of unequal access to resources, population growth, poverty level, military intervention, political interference, and inadequate or inappropriate policy and incentive systems. These factors are responsible for the varied problems besetting the country's forests, among which are the following:

1. Forest Fires

Forest fires refer to any incendiary occurrence in the forest which often result in extensive destruction of forest areas. These may be accidental or intentional. In the early eighties, fires accounted for 49.55 percent of total forest destruction, compared to 21.7 percent by *kaingin*, 27.28 percent by logging, and 1.46 percent by pests and diseases. There are cases when intentional burning is done on a reforestation area by disgruntled workers so that there will be a continuous source of paid labor for the project.

2. *Kaingin* Practices

Kaingin or slash-and-burn agriculture is a farming technique in which cut vegetation is burned to make a clearing. Fields, rather than crops, are rotated. This is an extensive and subsistence-dominated farming technique using minimal labor and cash, and widely resorted to in the uplands.

The bulk of forest destruction is usually blamed on this cropping practice. However, not all shifting cultivations degrade the environment. Some systems are in harmonious balance with the environment by virtue of land size being farmed, crops, management, and other traditional cultural systems. They are self-perpetuating and stable. A good example is the Hanunuo Mangyan shifting cultivation.

The *Kaingineros* are not shifting cultivators by choice. Majority of them are rural landless and laborers driven into the forest lands because they cannot gain access to land and employment opportunities in the lowlands. There are about seventeen to eighteen million people living in the uplands today, of which six to eight million are located within the forest zones. Shifting cultivation is their means of livelihood.

Even the traditional *kaingin* practices of the cultural communities or tribal groups have been affected by changes brought about by the increase in population and logging activities in their ancestral land. They are displaced from their ancestral land by lowlanders, and logging concessionaires. Increasing family size and cash needs induces shortened fallow period of their *kaingin* land. The tribes are forced to abandon traditional ways of protecting the forest cycle. Worst, they sell their lands to lowlanders, whose pattern of exploitation destroys the forest ecosystem.

Many environmentalists dispute the claim that *Kaingineros* are to blame: it is precisely because of big logging concessions that most farmers are able to enter the forests.

3. Land Tenure

There are two basic doctrines that provide the legal framework of the land tenure system in the uplands. One is the **Regalian Doctrine** which assumes that all lands are owned by the crown or the state, unless otherwise declared alienable and disposable. Land of this type is commonly known as public domain. The other is the **doctrine of private ownership** whereby public lands that have been classified by the state as alienable and disposable are subjected to private ownership.

The conflict between the legal conception and the actual realities of upland tenure system is one major source of tenurial problems in the uplands. While public lands are legally owned by the government, the upland settlers especially cultural communities perceive themselves as the actual owners.

Kaingineros were first dealt with harshly by the government, and prosecuted for violating clear-cut laws on forest cutting and forest land. Later, the BFD issued the "Kaingin Management and Land Settlement Regulations," giving one-year forest occupancy permit to upland settlers. Another program is the Family Approach to Reforestation, involving the payment of settlers/participants for taking care of 3-5 hectares forest plantation. This was followed by the Integrated Social Forestry Program, which adopted social forestry as a guiding principle in forest management and development.

There are problems regarding lease agreements. Short-term leases encourage concessionaires to maximize present gains. They thus exploit the forest without concern for future sustainability. Because the stewardship contract is short of the farmers' goal of owning the land, most of them are not satisfied since this will not assure them of their children inheriting it. The short maturity of the agreement entices the farmers to increase the area for short-lived cash crops, and so they use erosive farming practices to gain as much profit at the shortest possible time. Some prefer a tax declaration to the stewardship contract, because they can mortgage or even sell the land with it. Because they lack title over their lands, farmers have scant access to any form of credit to finance improvements.

4. Logging

Commercial logging in itself is not considered by the government to be a form of forest destruction. It may in fact be done in a scientific and ecological mindful way. But commercial logging has been a primary agent of forest destruction and a proliferator of social inequity because of political, socioeconomic, and technological factors.

The remaining timber forests used to be controlled by only 103 concessionaires with annual allowable cuts of 6.98 million cubic meters. Together, they controlled 4,886,877 hectares of our forests. These concessionaires have realized about 52 billion dollars in profits in the last 16 years.

Timber concessions are major culprits of forest denudation. The forest covers in present concession areas are below the standard of 54 percent.

Operators with timber license agreements (TLAs) are located mainly in Southern Mindanao, Cagayan Valley, and Northern Mindanao. These regions have relatively more forests than the rest of the country, but are expected to suffer the same fate as the denuded areas if restrictive and regulatory actions are not enforced. The prevailing mechanized logging methods inflict heavy damage on the residuals, which are then finished off by swiddeners, charcoal-makers, carabao-loggers, and other upland settlers.

Logging indirectly leads to permanent loss of forests. Wherever loggers build roads and settlements, other people follow. The widening of clearings and shifting cultivation sites are normal sights around new roads in logging concession areas.

Another major problem faced by Philippine forests is unabated illegal logging. There are two types of illegal production from the forest: overcutting by legally authorized corporations, and poaching. In 1988, illegal logging comprised 34 percent of total log production in one province. This figure can be assumed as representative of the national average.

Illegally cut logs are mainly exported to Japan and Taiwan, either through smuggling or underreporting.

5. Harvesting of Minor Forest Products

The degradation of second-growth forests is partly associated with firewood-gathering and charcoal-making. Majority of rural households are dependent on these traditional fuel sources for their cooking and energy needs. Fuel wood may account for 70 percent of all wood used, about one-third of all commercial or noncommercial energy consumed. An additional 12 million cubic meters per annum may be required by the year 2000. Future shortages of fuelwood are expected with dwindling area of natural forests.

Export of minor forest products (resins, gums, seed oils, essential oils, wild food plants, and natural dyes) contribute to the country's foreign earnings. Export earnings from almaciga, elemi, bamboo, and unsplit rattan totalled \$735 thousand in 1987. The production of these forest resources has declined through the years, due to overexploitation and reduced forests.

6. Mining

Mining seriously disturbs the existing balance in the environment. Mining operations entail extensive use of land and water resources. Activities such as open pit mining and quarrying inevitably result in large-scale disruption of environmental processes by altering land forms and physiography, disrupting the hydrologic regime, discharging waste into the river, polluting water bodies with toxic wastes, and destroying prime agricultural lands.

7. Population Pressure

Rapid population growth and the resulting pressure on land provide the driving forces for high rates of deforestation by converting forest lands to agricultural and other uses. The tendency of population to build up around timber concession areas is a common occurrence. If trends in the upland population continue, more forest lands will be converted into agricultural use to meet food needs. Based on the total area of grasslands, intensive and extensive agricultural lands, the population density in the uplands is 174.7 persons per square kilometer. The sustainable level of population in a shifting cultivation land-use is estimated to be 25 persons per square kilometer. This means the carrying capacity of the uplands has already been reached.

Under the current population growth trend, the country will find it hard feeding its growing population starting in 1995. A serious land-use conflict between agriculture and forestry will likely arise, resulting in the further deterioration in living conditions of the people, and in the environment.

8. Weak Enforcement of Forest Protection

The major causes of forest protection are weak institutional infrastructure, persistent political interference, and military protection of violators of forestry laws.

The former Bureau of Forest Development (BFD) was not able to check the massive forest destruction in the country. It was pointed out in a World Bank report that the BFD had organizational problems. The top management was not committed to enforcing regulations. Its efforts at reforestation were inadequate, in terms of quality and quantity.

The BFD was replaced by the Ministry of Natural Resources in 1986. This in turn was replaced by the reorganized Department of Environment and Natural Resources (DENR) in 1987.

The DENR has its share of institutional weaknesses with regard to natural resources management, as reported in the 1989 World Bank Document on Philippine Forestry. These are: limited mandate; resource limitations, potential for corruption of the line agencies charged with managing natural resources, and ineffectiveness of local government and user groups that need to be empowered.

The DENR is also beset with weak policies and programs. There is a large gap in the enforcement and implementation of environmental policies. The agencies under it have insufficient clout to influence the course of actual decision-making. They are under-funded and inadequately staffed, and have little influence in formulating important development projects.

An evaluation of forestry policies indicates that their present weaknesses can be attributed to the following:

- * Overregulation. When a provision of a regulation is violated, another regulation is handed to curb further violation of said provision, instead of strengthening the implementation system.
- * Inadequacy of certain forestry policies and their implementation systems or programs. Participants in the tree planting and social forestry programs discover that their wood harvests are confiscated by the authorities who encouraged them to join the programs.

- * Ineffective, unsound policies that cannot be implemented in real situations.

The DENR has adopted the mission of promoting the well-being of the Filipino people through sustainable development of forest resources, optimal utilization of lands and minerals, social equity and efficiency in resource use, and effective environment management.

The programs and projects in the sustainable development concept include: national forestation, establishment of an integrated protected area system, forest resource inventory, development of rainfed resources, and watershed rehabilitation and management.

Optimal utilization is supposed to cover land classification and evaluation, cadastral survey, final lot survey, the Palawan Integrated Area Development Project (PIADP), research development on mineral resource utilization, and mineral industry resources survey.

Programs under social equity and efficiency include integrated social forestry, community-based reforestation and forest management lease, "*Handog Titulo*," promotion and operationalization of small-scale mining, agrarian reform under the Comprehensive Agrarian Reform Program (CARP), wood industry rationalization and residual forest management under the Community Forest Program (CFP).

Environmental management, the linchpin in all DENR efforts, involves programs such as the Philippine Strategy for Sustainable Development (PSSD), strengthening of the Environmental Impact Assessment (EIA), a new regulatory regime for pollution control, revival of rivers, and ecosystems research.

The three other major programs are: natural resources management and development project, remote sensing and mapping, and inventory of forest occupants.

Political influence has had a stranglehold on the logging business in the Philippines. Logging has always been linked with political favoritism and corruption. Timber licenses were granted for short terms, from one year to ten years. Companies had to have an influential politician, usually a Congressman, on its board of directors for its license to be renewed. The political cronies during the Martial Law period were able to consolidate their

control over forestry resources. Licenses and concessions were gobbled up by the cronies of President Ferdinand E. Marcos. Some favored logging firms owned by Marcos friends were allowed to cut timber from lands legally held by other concessionaires. Large hectarages of concessions were obtained by favored political officials and most favored cronies in defiance of the constitutional provision that nobody could control more than 100,000 hectares of land. One crony of Marcos received a total of nearly 200,000 hectares in timber concessions in three provinces in Northern Luzon, including tribal lands of the Tinggians.

The collusion and complicity of BFD personnel, and of municipal and military officials facilitated the proliferation of illegal logging in the country. The BFD was for so long regarded the most corrupt of all Philippine government agencies, because of its readiness to protect the loggers.

Accusations of corruption plague the present DENR. Anomaly is alleged in the \$240 million foreign-assisted reforestation program. Some projects are alleged to be nonexistent, because some DENR officials corner the contracts and award reforestation contracts to fictitious persons.

The military has had a role in illegal logging, through military officials' collusion with and protection of the loggers, in return for payoffs. Some officers have been reported to have part ownership in concessions, and are believed to have participated in illegal logging and log smuggling.

Despite the log ban imposed on February 10, 1989, extensive logging went on in Samar, made possible through the help of the loggers' private armies and enterprising soldiers. Forest guards are helpless against these people, who escort truckloads of logs from the forests.

ENVIRONMENTAL IMPACTS

1. Erosion and Sedimentation

Deforestation-induced erosion, estimated at 100,000 hectares at one meter depth of one billion cubic meters every year, has caused massive and irreparable loss of fertile top soil, deterioration of productive arable lands, and low crop yield. It has also contributed to increased occurrence of floods, siltation and sedimentation of rivers, lakes, and waterways. These lead to the shortening of the life span of hydroelectric dams and irrigation canals, water shortage, and destruction of standing crops in the lowlands.

Siltation problems occur in major rivers and dams in the country as a consequence of the destruction of their watersheds. A well-known example is the Agno River, where heavy siltation caused some areas of the river to become higher than the surrounding fields. It has also shortened considerably the useful life span of expensive infrastructures such as the Binga and Ambuklao Hydroelectric Projects.

2. Loss of Biodiversity

Deforestation is the main cause for the progressive decline of Philippine wildlife.

Continued encroachment on the forests destroys and alters the natural habitats of wildlife population. Out of the 1,657 existing wildlife species in the Philippines, no less than 46 are possibly threatened with extinction. Eighteen are on the endangered list, which includes the tamaraw, tarsier, dugong, crocodile, monitor lizard, and the famous monkey-eating eagle. Forest plant species are also in the endangered species list, including seven ornamental plants. The gigantic molave trees are now practically extinct. Other endangered plant species are kalantas, gubas, batikuling, batsan, and sanglo, all used for carving and other wood handicrafts.

3. Disturbances in the Hydrological Regime

Loss of forest cover has resulted in droughts, floods, and saltwater intrusion, disrupting the social and economic life of the people.

Salt water intrusion is movement of saline water into fresh aquifer or surface water, caused by the reversal or reduction of natural barriers preventing the movement of saltwater, and lowering of groundwater level due to reduced infiltration of water in denuded areas.

Deforestation reduces rainfall, as was found in a study in Northern Luzon in the mid-seventies. It induces drought by lowering the amount of water retained in forest soil, and quickly depleting them during the dry season.

Much of our floods are traceable to forest denudation. Flooding catastrophies which washed away entire villages in the Cagayan Valley had never been experienced by the people before logging activities came to the mountains. The Mindanao areas has also been hard hit by flooding caused by denudation. The very denuded Negros experienced destructive floods which brought down huge logs from the mountains and eroded thousands of hectares of productive farm land.

4. Displacement of Cultural Communities

There are about 7.1 million tribal Filipinos in the uplands. Unlike upland migrants, these groups have long occupied and cultivated these lands inherited from their ancestors. Their time-immemorial occupancy resulted in an inherent knowledge of upland environs and tested agricultural traditions handed down from generation to generation. Their farming practices are generally protective of forest resources.

But they now face problems of displacement from their ancestral lands. Migration into the uplands by outsiders is exerting pressure on them, because of the failure of society to recognize property rights associated with ancestral lands. Thousands of tribal land cases have been filed. The minorities usually lose their cases because their opponents produce Torrens titles which are the legally recognized proof of ownership in this country. Other than usurpation of land rights by outsiders, there are other ways by which the cultural minorities have been displaced:

- * putting up of parks, by which the indigenous inhabitants are declared squatters;
- * logging concessions, like those in Palawan where the Bataks are being deprived of the source of resin, the almaciga tree, supposedly a protected tree but is being hauled out by the loggers;
- * illegal logging, which has denuded ancestral lands;
- * agribusiness, such as what happened to the Manobos in Bukidnon, whose ancestral lands were converted by cattle ranchers into pasture lands, then sold to a sugarcane company; and
- * hydroelectric development projects, as shown by the experience of the Ibalois who were displaced by the construction of Ambuklao and Binga Dams, the threat of dislocation posed by the Chico River Valley dam project against 100,000 Kalingas, and the actual displacement of 304 Ifugao families by the Magat Dam.

The displacement of both tribal people and rural poor from their homes and farming grounds has enticed many of them to turn to the communist insurgents and the New People's Army for protection against unpopular logging concessionaires and illegal logging in their areas.

5. Low Income and Poverty of Upland People

The upland dwellers have an annual income of P10,000 to P15,000, compared to around P34,933 for the entire country in 1988. Their income is way below the poverty line which is placed at P36,000 a year. Upland poverty is evident in their poor housing conditions, lack of toilet facilities, limited education for children who do not go beyond primary level, and low levels of nutrient intake. They have no health and social services and information sources. One reason for the children being out of school is the demand for household labor in the farm during the peak periods of farm preparation, planting, harvesting, and weeding. Upland income is low due to (a) low farm productivity and limited products from the forest; (b) high cost of inputs; and (c) low prices for their products.

6. Malnutrition of Upland People

In Palawan, second and third degree malnutrition among upland children is from 40.7 percent to 46.9 percent. This could be representative of the upland community in the whole country. Infant mortality is high due to improper health practices. Poor nutrition, over-fatigue, and lack of proper clothing in the cold upland communities weaken the resistance of both children and adults.

RECOMMENDATIONS

1. Priority should be given to the following areas of research:

- * strategies to protect the remaining original dipterocarp forest
- * speedy generation of basic information on the utilization of logged over areas to safeguard remaining forests
- * establishment of a community-based participatory forest development and conservation effort
- * tie up forest development and protection to lowland, coastal, and town development integrated planning

2. The following courses of action should be taken:

- * legislate an Integrated Protected Areas Network; provide the necessary institutional support system for the preservation of remaining original dipterocarp forests

- * Forestry Development Programs must include integrated social forestry, community forestry, mangrove rehabilitation, and reforestation
- * evaluate the formulation and implementation of forestry policy
- * provide adequate forestry research development related to logged over forestry utilization, forest ecology and conservation
- * regional strengthening strategies in environment and natural resources management and training for DENR and local government
- * establish a network composed of DENR, nongovernment organizations (NGOs) and the academe, for forest management and conservation, at all levels

3. Specific recommendations

*** Equity**

Stop implementation of Presidential Decree (PD) Nos. 1515, 2282, 1998 and other decrees resulting in arbitrary allocation of resources, confusion over jurisdiction, and inconsistency of enforcement; give local communities priority access to and control over the use of resources they need, with pertinent rights and responsibilities; recognize right to use land and resources seized without due process, or provide just compensation; establish community resource reserves, such as communal forests, for the rural poor.

*** Resource management through:**

Reforestation program approach where areas are identified for specific purposes (environmental rehabilitation or community-based livelihood); reforestation strategy based on cost-benefit analysis; national data base on species and habitat distribution, to intensify research on ecology of species; preservation of remaining dipterocarp forests, based on a strategy of selective logging combined with regeneration using original species; selection of critically remaining areas of relatively undisturbed habitats (flora and fauna native to tropical forests, mangrove swamps, coral reefs); alteration of development patterns to be made compatible with preservation of biological

diversity; review of criteria and conditions under which present national parks and marine reserves were established; determination of realistic number and size which is environmentally viable and manageable.

*** National cultural communities**

Determine the actual extent of ancestral lands of tribal communities and broaden the current modes of land tenure to include tribal ownership; reconcile customary and civil laws.

*** Upland migrants**

Examine the tenurial options available to migrant upland communities; develop and implement effective social forestry and community extension programs for basic necessities; guarantee equal access to development services; develop more nonland-based enterprises/livelihood opportunities for lowland and upland communities to help relieve pressure on limited and fragile uplands.

*** Industrial forestry**

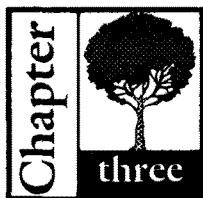
Pursue vigorous timber production of natural dipterocarp forests and develop forest plantations in suitable areas; monitor and check annual timber drain; improve and protect residual forest; develop and implement the program of phasing out or retooling processing machineries; utilize lesser-used species to delay depletion of forests; intensify research on production and use of forest plantation species.

*** Community participation**

Encourage independent multisectoral, grassroots-based People's Council on Natural Resources as network of NGOs, private volunteer organizations (PVOs), research institutions, government agencies and individuals; support formation of independent organizations in the uplands; strengthen participation by granting secure tenurial status to persons or groups capable of managing resources; encourage NGOs to participate in planning and implementing development programs.

*** Organizational strengthening**

Provide flexibility for local DENR offices to develop site-specific programs; develop strong linkage and coordinative mechanism with other concerned agencies.



THE PHILIPPINE MARGINAL LANDS ECOSYSTEM

INTRODUCTION

Population increase continues to put a stress on our natural resources.

The need for settlement, food, and raw materials has intensified the exploitation of forests, croplands, coastal and fishery resources.

The fast rate of exploitation and the slower rate of natural regeneration could result in environmental catastrophes. Droughts, floods, soil erosion, sedimentation of dams and reservoirs, attest to this. Forty one percent of our total land area is now considered marginal: unproductive, highly eroded, barren.

Marginal lands are an important ecosystem type. Reforestation efforts depend on the type, diversity, and succession of species in marginal habitats. Grasslands, a marginal land type, has a rich and diversified network of food chains. They offer cheap forage for livestock, but are excellent fuel for forest fires.

DEFINITION

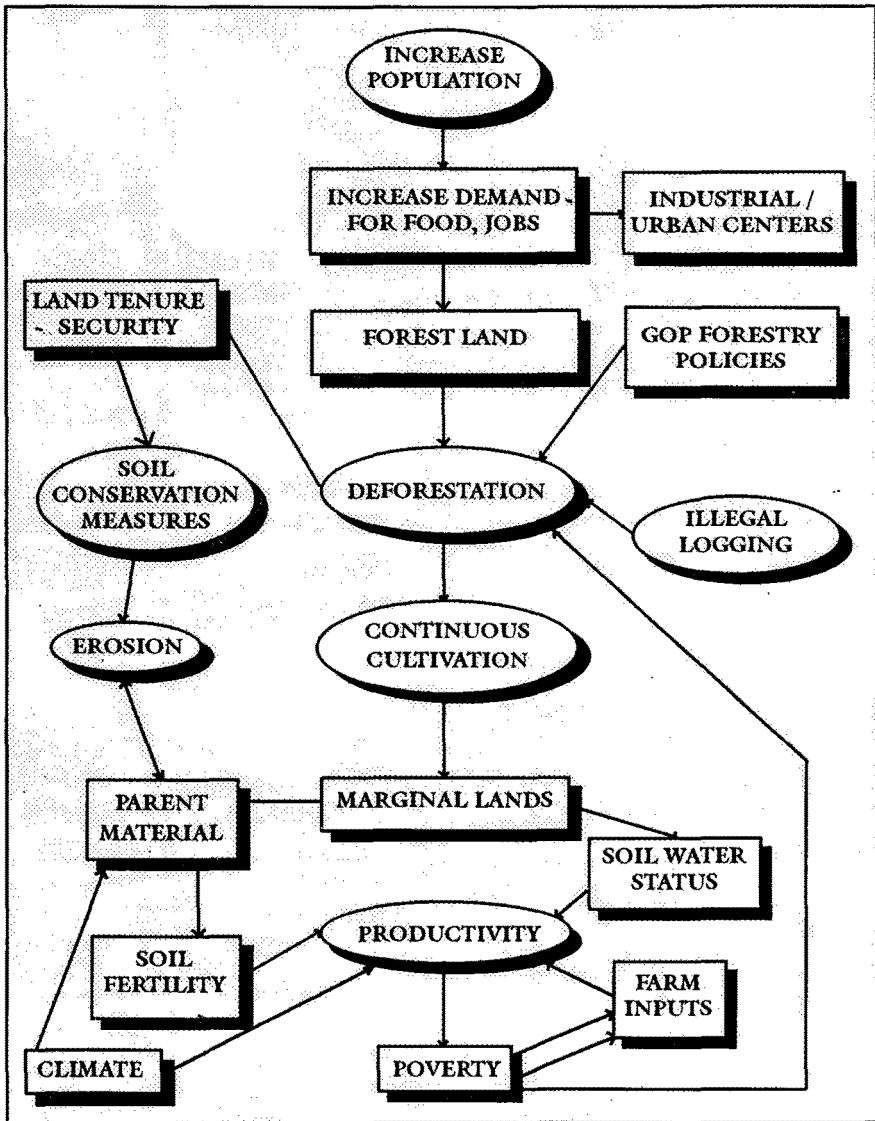
Marginal lands are areas once covered with tropical moist forest, converted to plantation forests, fire-climax Imperata grasslands, and reproductive brushlands. They have low productivity, are unable to support extensive lowland agriculture, and have high outmigration rates.

Open lands, grasslands, grazing lands, problem soil areas and poorly-managed pasture lands fall under "marginal lands."

ANALYTICAL FRAMEWORK

Population pressure, environmental degradation, rapid deforestation, lack of tenurial security, poverty, and inequitable access to resources, and inadequate soil and resource management are the main issues concerning marginal lands. (See Figure 3.1.) Excess lowland rural population goes either to the industrial and urban centers, or uphill in the remaining forests. The migrants convert the forests into agricultural lands for their own needs. Deforestation is accelerated by inappropriate government forestry and land-use policies, and illegal logging.

Figure 3.1.
ANALYTICAL FRAMEWORK FOR MARGINAL LANDS



THE PRESENT ENVIRONMENT SITUATION

Marginal lands in our country today are made up of converted forests, grasslands, brushlands, and barren areas. They comprise a total of 11,968,600 hectares. Extensive grasslands have been opened up as a result of practices such as shifting cultivation.

About 7.5 million people live on marginal lands, about 50 percent of whom are cultural communities.

The main problems and concerns with respect to marginal lands are the following:

1. **Soil Erosion** — the process of detachment, transportation, and deposition of soil materials by wind or water, away from the original site.

At least 22 provinces are known to have more than half of their areas eroded. Thirty-six out of 81 provinces are severely eroded. The uplands are even more vulnerable to erosion.

Climate, soil topography, and improper land-use are the major factors affecting soil erosion, while shifting cultivation and indiscriminate logging are the major cause.

Soil erosion has negative effects on the environment and the economy: lower crop productivity, siltation of dams and rivers, reduction of capacity of water conveyance structures, destruction of wildlife habitat, degradation of water quality, and destruction of standing crops.

2. **Low Productivity** — caused by the general lack of proper vegetation cover and great vulnerability to soil erosion due to slopes and erodable soil characteristics.

Loss in soil fertility is brought about by the loss of nutrient-rich topsoil due to soil erosion, and by the carrying away of nutrients by runoff water or its leaching down the soil layers, below the reach of crop roots.

Low productivity of marginal uplands can also be traced to excess water during the wet season and low or no water during the dry season. Cogonal vegetation in these areas have poor water-holding capacity.

3. Acid and Saline Soils — acidity occurs naturally through the centuries, during which soil development takes place as hydrogen ions carried by downward percolating waters slowly replace calcium and magnesium ions. Salt-affected soils is increasing as induced by use of brackish water for irrigation. Abnormally high salt concentration can retard plant growth by restricting the rate at which the crops can absorb water.

4. Other Soil Pollution Problems — the major culprits in soil pollution are improper pesticide and inorganic fertilizer use, excessive deposition of solid materials such as mine tailings and other solid wastes, and intrusion of saltwater into farm lands.

5. Loss of Biodiversity — indiscriminate clearing of forests threatens what remains of our biodiversity. We have depleted our forests at the rate of 190,000 hectares a year. Aside from deforestation, the reduction of biological communities has been caused by extensive use of artificially created varieties, monocultures, and uniform strains. While the objective of increasing yield is laudable, there are negative repercussions. In agriculture, these can cause outbreaks of pests and diseases. The extinction of wild strains from which crops are developed diminishes the potential to improve disease and pest resistance of the improved varieties. In forestry, tree plantation types usually involving few, exotic, fast-growing species, increase the probability of failure of reforestation for the same reasons.

6. Uncontrolled Fires / Burning of Grasslands — a common practice for various reasons: to manage the pasture areas for grass regrowth, to control pests and diseases, to facilitate cleaning of *kaingin* sites, and other motives. But the improper use of fire leads to soil degradation and perpetuation of marginal conditions. Soil erosion, volatilization of nitrogen during combustion, and reduction of plant litters for soil organisms are some of the negative effects of burning. Repeated burnings scorch and kill tree seedlings and abort the regrowth of trees.

7. Poverty and Low Access to Production Resources — majority of upland people realize only an annual income of between P800 and P3,000. They have no basic services such as health, education, and livelihood. As a result, they appear to be the least educated, lowest paid, least healthy, and most neglected in agricultural development. The sociocultural restraints in the upland areas are (a) lack of production inputs; (b) lack of effective marketing systems; (c) weak or insufficient institutional linkages especially in social services; and (d) insecure land tenure system. In addition, the worsening peace and order situation in the uplands serves as deterrent to productivity.

FACTORS AFFECTING DEGRADATION OF MARGINAL LANDS

1. Rapid Population Increase

The country has a population of 60.5 million and is projected to grow to 71 million by the year 2000. The increasing total number of people to be supported by finite resources seems to be one of the factors in the degradation of the environment and the rise of poverty. It is expected that greater population pressure on land will result in the conversion of more forests to agriculture and other uses. By the year 2000, the upland population is projected to increase to 24 to 26 million, which means an additional five to six million people opening up more lands for cultivation. On the assumption that two hectares are used for cultivation by a family of six, another eight million hectares of forest lands will be converted to agriculture to feed this increased population. This scenario does not even include the clearing of forests due to logging, urban encroachment and other activities more destructive than agricultural expansion. Movement into the uplands continues unabated. Economic displacement due to lack of employment, spiralling costs of living, stiff competition for access to lowland resources, social injustice, and other factors continue to push the poor lowland population into the uplands. Millions of rural inhabitants do not have the opportunity to eke out a living on a piece of land while a few rich people own vast tracts of arable and often under-utilized lands. The fate of the tribal forest inhabitants in the light of present population trends, and increasing spillover of lowland population into their ancestral lands, is another big social issue.

2. Insecurity of Land Tenure

We cannot address the environmental problems without considering the tenurial security of upland inhabitants. Due to lack of security, settlers are encouraged to exploit indiscriminately the upland resources without concern for sustainability. In 1987, of the country's 57 million people, only 1.5 million owned the land they were tilling. Two million were share and leasehold tenants, and 1.5 million were farmers in public lands and had no titles. The current land reform program of the government has failed to solve the issue of inequitable distribution of land. Jurisdictional dispute between the Department of Agrarian Reform (DAR) and the Department of Environment and Natural Resources (DENR) in the case of farmers occupying public lands in areas with 18 percent slope has been part of the problem.

Land rights conflicts also arise because of the current government policy of vesting private rights based on the Regalian Doctrine. There are two natural consequences of adherence to this doctrine:

- * Native titles and customary laws are not acceptable to or recognized by the state
- * Displacement of both cultural minorities and long-settled upland farmers occurs very frequently due to landgrabbing and encroachment by various development and industrial projects.

Because the government has not taken a definite stand on officially recognizing vested rights of people traditionally occupying ancestral lands, this has led to their displacement in the name of national interest. Foreign transnational corporations and other local agribusinesses supported by infrastructure such as dams and processing zones have benefitted from this inaction.

3. Slow Rate of Reforestation

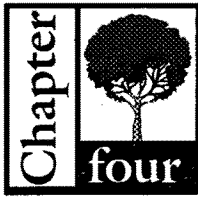
Although considerable improvements have been made by DENR, reforestation efforts are still contrained by several problems:

- * the high state of denudation in many parts of the country, vis-a-vis the high cost of reforestation
- * slow growth process and low survival rate of tree seedlings
- * inadequate skilled manpower
- * lack of effective technology
- * inadequate information on existing natural forests
- * complex nature of forest protection
- * general public apathy towards forest conservation and renewal
- * late budgetary releases which result in failure to plant during normal planting season
- * potential for graft and corruption in the reforestation program, such as in the parcelling of contracts to persons who are fictitious or dummies.

While reforestation is critical to the management and rehabilitation of denuded marginal lands, a key factor is the protection of these resources from fire and from illegal settling in steep slopes.

RECOMMENDATIONS

1. Reexamine policies regarding land tenure of upland communities within public lands. Provide mechanisms which involve the local people in land and resources use planning, and in the allocation of benefits. Institute a system of compensation for displaced traditional resource users.
2. Expand the development of plantation to provide an alternative source of forest produce. Reduce the rate of conversion of the tropical forest.
3. Introduce land-use management which provides the variety of habitats necessary for the maintenance of species diversity.
4. Develop professional, technically trained and socially sensitive personnel who shall introduce ecologically sound land-use management practices to the inhabitants of marginal lands.
5. Develop well-supported programs to promote proper management of "problem soils." Convert reclaimable open grasslands into productive agro-forestry farms. Preserve and protect the remaining old growth dipterocarp forest.



THE PHILIPPINE CROPLANDS ECOSYSTEM

INTRODUCTION

Our croplands are under environmental stress. Agricultural lowlands and alluvial plains are rapidly shrinking, soil erosion is severe in 36 provinces, urban encroachment into agricultural lands had reduced the country's productive capacity, and decreasing person-to-land ratio has led to the occupation and cultivation of ecologically unstable croplands.

EXTENT OF CROPLANDS

Out of 30 million hectares total land area, about 9.9 million hectares or one-third are classified as croplands. These are further classed into the following, ranked according to hectarage:

- * coconut plantations
- * other plantations
- * arable land, cereals, sugar
- * crops mixed with coconuts
- * crops mixed with other plantations
- * fishponds from mangroves
- * other fishponds

Corn and rice occupy the largest percentage of croplands planted to annual crops. High yielding varieties of rice occupy about 82 percent of total rice-cropped areas and 21percent of total croplands. Coconuts are the most dominant perennial crop, occupying 26 percent of the total cropland area.

ENVIRONMENTAL ISSUES

1. Degradation of the Production Base

Soil erosion is pronounced in the Philippines due to geographical and climatic conditions. It also results from improper land use, poor soil and harmful practices. Loss of fertile topsoil result in the deterioration of crop productivity.

Land pollution occurs through the use of fertilizers and pesticides. These production outputs may offer advantages in terms of increased production and protection, but they decrease the soil's humus content, adversely affecting infiltration and water-holding capacities. Excessive chemical fertilizer use causes acidification of soil, and poses health problems. Contamination of drinking water with nitrate concentration greater than 45 parts per million (ppm) can cause methoglobinemia disease which affects livestock and human infants.

The use of pesticides is claimed as having increased marketable surplus by minimizing crop losses due to pests. But they have negative effects, such as health hazards faced by farmers. Studies show an increasing trend in pesticide poisoning, leading to deaths. Mortality patterns on the farms peak during the months of greatest pesticide use. Hospital facilities are generally inaccessible to the majority of poor rural farmers, and so the figures reported may even be an underestimation. Several pesticides are known to consist of toxic compounds that persist in the environment for long periods of time. Another problem with continued reliance on chemical pesticides is the build-up of pests, when they develop resistance to insecticides. Pesticide hazards are compounded by widespread ignorance of their effects, poor labeling, inadequate supervision, lack and difficulty of wearing protective clothing.

The mining industry continues to be a main source of land pollution. Mine tailings, large coarse rocks, mine wastes can affect land physically and chemically. Residues from washings accumulate in river bodies as silt. A recent survey found that sedimentation of ricelands and rivers in Region I caused yearly losses of P208 million in palay production. Mining firms in the Benguet region have discharged some 117 million metric tons of tailings into the lowlands. Mine tailings may also carry other pollutants such as excessive salts used in mineral extraction, cyanides, acids, alkalis and heavy metals such as silver, copper, aluminum, lead, zinc, chromium, iron, calcium and arsenic.

Pollution of croplands also comes from industries, such as alcohol fermentation firms.

2. Land Constraint

Scarcity of land is indicated by the person-to-land ratio. The present ratio is 0.54 hectare per person, the lowest in Southeast Asia except Singapore, and this ratio will further decrease to 0.36 hectare by the year 2000. As rural lands evolve into urban, the need for prime agricultural land competes with the need for urban growth. Diminution of agricultural lands also results from infrastructure development projects.

If present population trends continue (2.6 percent in the uplands, 3.5 percent in logging concession areas, and 2.3 percent national average), more forest lands will be converted to agriculture to meet food needs. The pressure on land can be eased up if enough employment can be generated for the population.

3. Loss of Genetic Diversity

The agricultural orientation of more extensive use of monocultures and uniform strains erodes the genetic potential of crops. Uniform strains and high-yielding varieties (HYVs) replaced local varieties that were grown before them. These HYVs are more productive in terms of output, but are also more disease-prone. The use of HYVs has not improved the living conditions of our small farmers. Poor farmers are further submerged into poverty because of the high cost of farm inputs.

4. Land Tenure

Insecurity of land tenure is a major constraint to more productive management of croplands. The absentee landlords often fail to implement conservation measures while the tenant farmers has little incentive to invest in long-term sustainability of the land. The problem of land ownership and distribution is being addressed by the government through the Comprehensive Agrarian Reform Program, but budgetary constraints cripple its implementation. Dissatisfied by the government's failure, many militant farmers have began implementing their own version of the program, which involves forcible occupation of agricultural and abandoned public lands.

5. Low Income and Poverty

Around 5.3 million families, or 56 percent of the total number, depend on agriculture. A great number of families in the bottom 30 percent of national income distribution are in agriculture. Cultivation in this country is dominated by small-scale farmers. Marginal upland farmers earn from P800 to P3,000 a year, and are among the poorest of the poor. Low income is due to low agricultural productivity, low prices for their produce, and high cost of inputs.

6. Climatic Factors

Adverse climatic conditions have caused losses of 85 percent of total annual production of rice and corn. These include droughts, floods and typhoons.

RECOMMENDATIONS

1. Establish a national agricultural land use policy which will resolve the conflict between agriculture and industry in terms of positioning for space.
2. Institute appropriate measures to protect prime agricultural lands from being converted to other permanent nonagricultural uses.
3. Launch a well-coordinated and well-funded national soil conservation program covering both lowlands and uplands.
4. Enable the agricultural planners of the Department of Agriculture to acquire the necessary skills in agro-environmental planning and program implementation, and the extension workers of the Department of Agriculture (DA) and the Department of Environment and Natural Resources (DENR) to acquire the knowledge and technology in upland soil conservation.
5. Establish a coherent program for sustainable agro-environment development through a collaborative effort by DA, DENR and Department of Agrarian Reform (DAR).
6. Provide security of tenure to uplanders, or to those occupying areas classified as forest lands.
7. Institute a program to monitor and control pesticide and fertilizer pollution.
8. Vigorously pursue an integrated population and environmental resources development programs.



THE PHILIPPINE URBAN ENVIRONMENT

BACKGROUND

By the year 2000, the present urban population of the country is expected to increase to 46 percent of the total population due to natural increase, rural-to-urban migration, and the inevitable reclassification of rural land for urban use. As more areas become built-up, it becomes important to determine how to ensure the health, safety, and well-being of urban residents. At present, a large proportion of the urban population suffers from deteriorating living conditions.

PRESENT SITUATION

1. Urban Population Growth Trends

On a national scale, urban growth has been mainly due to natural increase. But in Metro Manila, the share of net migration has been larger than that of natural increase. The National Capital Region had the highest population growth rate in 1970-1980. The stream of migration has resulted in a population of eight million people occupying a total land area of 636 square kilometers. By the end of this century, Metro Manila's population will reach 11.1 million.

2. Housing in Urban Areas

The demand for land has resulted in the cost of urban land rising to prohibitive levels. In rapidly urbanizing capital towns and cities, people are forced to reside in the urban fringes where land is comparatively cheaper. The poor are forced to settle in public or private lands, river banks, and flood-prone areas. Slums and squatter settlements have become a permanent part of the urban landscape. Population growth in these areas is estimated to be 12 percent per annum.

In 1985, there were four million dwellers in slums and squatter colonies in the country. With 44 percent of Metro Manila residents living below the poverty line (3,292 pesos being the threshold income), the lack of access to credit and the high cost of land, squatters will continue to proliferate in Metro Manila and in most urban areas.

Government pronouncements and attempts to enforce laws have had little impact on squatter settlements. With the incidence of poverty rising, the continued high and escalating costs of land and houses construction, and lack of credit, the housing backlog in urban areas its expected to remain unsolved.

3. Availability of Basic Services

*** Water supply**

In 1975, only 55 percent of the total urban households in the country had piped water. In 1977, only 68 percent of Metro Manila residents were served by the Metropolitan Waterworks and Sewerage System (MWSS). Residents of slums and squatter communities obtain their water mostly from sources outside the home. A survey conducted in Metro Manila, Cebu and Davao showed only 16.7 percent of households having a direct water connection. A large number depended on artesian wells, public faucets, and open wells. Water fetchers took from one to three hours, and up to four hours during summer months. Those who used artesian wells and open wells had to contend with gastrointestinal diseases, including parasites.

*** Sewerage and drainage**

There are only six major cities in the Philippines with any kind of organized public sewerage. These are Baguio, Bacolod, Cebu, Davao, Zamboanga, and Manila. Only 14 percent of Metro Manila is served by a sanitary system with a major portion of the area served by individual septic tanks directly discharging to rivers and other waterways. These contribute 70 percent of all the biodegradable pollutants flowing into the different river systems.

4. Pollution

*** Solid waste**

Municipal solid wastes or garbage are generated by domestic, commercial, industrial and institutional sources. One of the more serious environmental problems confronting Metro Manila residents daily is pollution brought about by an inadequate solid waste management program. Daily, 3,400 tons of solid wastes are generated in Metro Manila. Only about 1,500 tons end up in existing dump sites, while the rest are either left on the streets.

creating health and aesthetic problems; dumped in storm drains, *esteras*, canals, creeks or rivers; burned, creating air pollution; or collected and recycled by scavengers. The practice of dumping solid waste into storm drains or natural drainage channels compound annual flooding problems. Open dumping is epitomized by Smokey Mountain located at the juncture of Estero de Vitas and the Navotas River in Balut, Metro Manila.

* Water pollution

The two main sources of water pollution in urban areas are domestic and industrial wastes. Only 14 percent of Metro Manila's population is served with sewers. Thus, sewage finds its way to the rivers and waterways. Untreated or partially treated industrial wastes are also discharged into these rivers. Organic pollutants contain toxic substances from hospitals and factories. Sewage, industrial wastes and garbage, and other solid wastes washed into water bodies greatly lower their level of dissolved oxygen to the point where marine life is damaged or killed. The water becomes anaerobic, turbid, and foul smelling. Metro Manila river systems have been declared biologically dead.

A consequence of uncontrolled dumping of wastes is the "red tide" phenomenon. Since September 1988, bays in the country have been suffering from a condition brought about by the abnormal and uncontrolled growth of phytoplankton, caused by the high organic load in water bodies. There have been cases of poisoning, and death, from eating contaminated fish and shellfish.

* Air pollution

The proliferation of motor transport in an area like Metro Manila causes traffic congestion through the day. Air pollution in the urban center has been traced mainly to exhausts from motor vehicles. Jeepney, bus, and taxi commuters are exposed to excessive concentrations of Respirable Suspended Particles (RSP), as much as 1,000 milligrams per cubic meter. Millions of Metro Manila residents are exposed to ambient concentrations of RSP, as much as 100 milligrams per cubic meter.

5. Flooding

About 2,304 cubic meters of garbage are thrown daily into Metro Manila's waterways. The resulting clogging contributes to floods during the rainy season. Three major causes of flooding in the city are: the overflowing

of Manila's heavily silted rivers during intense rainfall; insufficient capacity of inland drainage facilities; and the disappearance of 35 out of 95 *esteros* or canals used as transportation arteries before World War II. Illegal construction of dikes and the conversion of traditional fishponds along shores into residential areas have likewise aggravated the problem of flooding.

GOVERNMENTAL RESPONSE

Metro Manila, like other cities in the world, has been unable to manage urban growth and to provide urban residents and businesses adequate infrastructure and services. The poverty of so many of its inhabitants limits the scale of possible cost recovery in any major investment program. Metro Manila for the past three years has had difficulty coping with its numerous environmental problems.

1. Water Pollution

The Department of Environment and Natural Resources (DENR) has linked up with other government agencies, the private sector and nongovernmental organizations (NGOs) in a river revival program, specifically with regard to the Navotas-Malabon-Tenejeros-Tullahan river system. The MWSS has committed itself to a basin-wide septic tank cleaning program to lower the sewage load from the projected 1992 load of 26,608 kg. BOD (Biochemical Oxygen Demand) to about 9,978 kg. BOD per day. The National Housing Authority has committed itself to removing all the squatter shanties lined along the 26-kilometer waterway. The Department of Public Works and Highways has committed itself to dredge the waterway and to build two parallel roads alongside it. The Manila Bay Clean Up Project is a comprehensive approach to cleaning the individual sink systems of six major river networks which empty their wastes into Manila Bay.

2. Solid Waste Management

The Smokey Mountain dumpsite and the Payatas dumpsite have been scheduled for closure for more than a year now, dependent on approval of new sanitary landfill area at Carmona, Cavite, whose residents have resisted the plan. Smokey Mountain and Payatas are envisioned to be converted into an industrial-residential complex. Cost of conversion will reach two billion pesos per site. Immediate use, however, cannot be assured because of the danger posed by the pile of organic material decomposing all these years and producing methane gas.

3. Air Pollution

Efforts have been limited to campaign by DENR, other agencies, and the private sector to enforcing the anti-smoke belching law.

4. Metro Manila Authority

The Metro Manila Authority was created in January 1990 to have jurisdiction over the delivery of basic urban services in Metro Manila, which include: land use planning and zoning, traffic management and control of operations during calamities and emergencies affecting public welfare and safety, and sanitation management. The authority has made no visible impact after six months of existence.

SOME PRESSING POLICY ISSUES

The urban environment faces serious problems and the responses have mainly been piecemeal and short-term. A long-term strategy must take into account the interrelationship between human activities and the environment. Two issues are relevant here.

1. The Need for Energy Planning

There is a need for sustainable development based on a reduced primary energy use while still allowing economic growth, and for energy planning that addresses the threat of the "greenhouse effect."

It was always assumed that energy is readily available and inexhaustible, and that the natural environment can absorb energy use without harm. This has been proven wrong. Planners and policy makers must now determine the feasibility of greater use of renewable sources of energy such as biomass, mini-hydro, windmills, *etc.*, of increasing and encouraging the use of public transport with new and more efficient forms of propulsion, and to look for more efficient urban land use patterns that shall minimize travel time, take advantage of topography, and the application of energy conserving measures.

2. Rethinking the CALABAR

Converting agricultural lands to urban use in Cavite, Laguna, Batangas, and Rizal (CALABAR) provinces may have possible negative impacts. Metro Manila is part of a variety of ecosystems that include the Manila Bay Coastal Ecosystem, Laguna Lake Watershed, Novaliches-Montalban Watershed, and the Pasig River Fresh Water Ecosystem, for which an environmentally-sound management plan is necessary.



COASTAL AND MARINE ECOSYSTEMS

INTRODUCTION

About two-thirds of the country's population live in the coastal zone directly influenced by the marine environment. The environmental impact on coastal and marine resources cannot but have dramatic proportions.

The three most important coastal ecosystems dealt with in this report are the coral reefs, the mangrove swamps, and the seagrass beds.

Discussed in the section on marine ecosystems are the two components of marine fisheries, capture and culture. Capture fisheries are of two kinds, demersal or bottom fishing and pelagic or surface fishing. Culture fisheries include brackishwater and marine culture activities.

PHILIPPINE CORAL REEFS: ECOSYSTEMS UNDER STRESS

A coral reef is basically a geological structure of calcium carbonate created by living organisms, principally the scleractinian corals forming the framework or matrix and the calcareous remains of algae, molluscs, and echinoderms providing the mortar or cement. There are coral communities that may simulate the diverse life of a coral reef whatever the substrate, but by definition, there are no artificial coral reefs.

From a layman's fish-eye view, a coral reef presents a kaleidoscope of rainbow colors from the most diverse assemblage of life, with reef fish coming in all sizes, shapes, colors, and speed, the invertebrates even more diverse, motile or anchored to the bottom.

Coral reefs are important because they support fisheries productivity, provide coastal protection, and have aesthetic and recreational value. They also have much scientific and educational value. Reef organisms may be providing us with chemical substances that have pharmacological significance in addition to other nonfood products such as construction materials.

The Present Situation

Our coral reefs have been destroyed or degraded by as much as 70 percent.

Research work conducted by the University of the Philippines - Marine Science Institute in 1977 arrived at the above figure. Two other survey projects were launched since then, investigating the state of some five dozen coral stations in Pangasinan, Batangas, Oriental Mindoro and Palawan.

Environmental Issues

Coral destruction is due to several causes. Natural causes include water movement, whether it be rhythmical like tides or catastrophic storms, geological dynamics which require long periods, and biological interactions, principally predation. Corals can cope with these. More problematic are human activities leading to coral degradation, such as siltation and sedimentation, fisheries-related destruction like the use of explosives and poisons, collection of coral and sand for construction, collection of coral and other invertebrates for the ornamental trade, tourism-related degradation, and others.

Siltation and sedimentation over and above the natural levels arise from forest destruction. The pressure of human activities in the mountainous areas far inland has its effects downstream on the coastal zone.

Blast fishing and the use of poisons arise from a combination of greed and need, and compounded by laziness and outright disregard for the environment. These are also the reasons for the excessive collection of corals.

Mining of corals and coral sand for construction is done out of convenience rather than necessity, since there are alternative sources of materials.

Tourism-related degradation can be minimized with adequate education and enforcement of regulations where the tourists are concerned. If developers and resort operators are involved, the problem becomes more basic.

PHILIPPINE MANGROVES: THEIR DEPLETION, CONVERSION, AND DECREASING PRODUCTIVITY

Mangroves are a unique plant formation, consisting of species belonging to various unrelated groups. They vary considerably in their dependence on littoral habitats. They may form very extensive and productive forests. Given suitable conditions for growth and development, mangroves colonize brackishwater habitats. With the passage of time, communities of plant and animal species are assembled which interact among themselves and with coastal soil and waters form an ecosystem. Mangroves occupy a highly strategic position in the ecology and the economy of coastal areas.

As of December 1988, the mangrove resources of the Philippines totalled 139,725 hectares.

Ecologic and Economic Value of Mangroves

- * Source of forest products

Poles for house construction, fish coral post substitutes; firewood for cooking; charcoal; tanbark for coloring *tuba* (fermented nipa juice); nipa sap for various uses (*tuba*, vinegar, alcohol, sugar); nipa shingles for roofing and walling for domestic use and source of income.

- * Source of fishery products (mangrove-dependent)

Adult forms of finfish, shellfish, prawns, mangrove crabs for household consumption and as source of income; fries, for food and for stocking fishponds as source of income.

- * Sites for other human activities

Industrial waste disposal; human occupancy; commercial and industrial establishments; and as fishponds

Mangrove swamps can be converted into brackishwater swamps for breeding marine species for food, such as milkfish, prawn, and crabs. They are also indirectly beneficial to coastal dwellers. There are indications that mangrove swamps:

- * export detritus and nutrients which form the food base of marine organisms
- * serve as feeding, nursery, or spawning grounds for finfish, shellfish, and crustaceans
- * protect valuable property by dampening storm surges and high winds during tropical typhoons
- * perform a flood-reduction function
- * help prevent erosion of banks of rivers

Controversial Issues: Depletion, Conversion, Decreasing Productivity

In 1920, Philippine mangrove swamp forests totalled between 400,000 and 500,000 hectares. The most recent survey, done in 1988, placed them at 139,725 hectares. Nearly 70 percent of the total mangrove forest has thus been denuded. A large proportion of the denuded areas is now devoted to brackishwater fishponds. This conversion of mangrove swamps into capital-intensive fishponds has given rise to controversy. Ecologists are concerned that further conversion may have significant ecological and economic impact on the nearshore ecosystem of the country.

There have been studies and cases to show that conversion into fishponds has contributed to the decline in the yield of other mangrove products. This has been happening in the United States, in Indonesia, in peninsular Malaysia, in Latin America, and in the Philippines.

For aquaculture to function, the developer must change the mangrove from a natural to an artificial state. Once converted into a fishpond, the mangrove can no longer function as a natural system. It can no longer contribute to the productivity of the nearshore ecosystem. Continued reduction of the mangrove area is harmful because it decreases the nutrient export, which affects the entire food chain including human beings; it decreases the area available for protection and nursery grounds for seed fish; and it decreases the catch of other fishery sectors.

The proliferation of fishponds along littoral areas means clearing of more vegetated areas, and maximum disturbance of the mangrove ecosystem, since (a) all standing biomass is completely removed; (b) soil profile is totally

disrupted or covered up; and (c) subsequent natural regeneration cannot take place.

Remedial Measures

The government should now act by formulating and implementing measures directed towards the protection and conservation of the remaining mangrove forest areas, and the rehabilitation of the critically denuded mangrove swamps. It must also act to diligently implement rules and regulations designed to protect and properly manage existing mangrove areas in the country.

PHILIPPINE SEAGRASS ECOSYSTEMS AND THEIR RESOURCES: A SITUATIONER

In every developing maritime nation, the coastal zone, with its enormous potential to produce food, will inevitably be used and exploited to feed its growing population. A major ecosystem threatened by growing demands upon the coastal habitat in the tropical region is the seagrass ecosystem. In island societies, population centers tend to develop around sheltered bays and estuaries, places colonized by seagrass. These plants thrive in shallow waters, and are therefore subject to increasing stresses caused by society and its needs. Seagrass beds are being filled, dredged and diked for conversion to other coastal uses.

Definition, Systematics, and Importance

Seagrasses are hydrophytic monocotyledonous plants that are completely adapted to the marine environment. They resemble true terrestrial grasses in certain features, such as their rhizomes, which are buried in soft sandy or muddy bottom, and erect leafy shoots in the water. They comprise only about 50 species falling into two families and 13 genera.

Due to their enormous quantities, forming dense beds which cover large areas in the coastal waters, seagrasses perform a wide spectrum of biological and physical functions in the marine environment. These include substrate stabilization, sediment production, habitat and nursery for fish and many invertebrates, primary food source for fish, turtles, dugongs, and invertebrates such as echinoderms, and as an alternative feeding site for commercial and foraging organisms. As a discreet ecosystem, seagrass beds interact physically with coral reefs and mangroves in the reduction of water energy, sediment relationships, and flow regulation.

The distribution of seagrasses within coastal areas dictates the kind of grazers associated with them. Among these are parrotfish, surgeon fish, green turtles and sirenia. Seagrass beds form a community frame that controls the structure of communities. The role of seagrass at the ecosystem level is matched by their importance at the component level. In many parts of the world, seagrasses have varied uses: as materials for woven baskets, as source of salt, soda, and warmth; stuffing for mattresses, substitute for animal straw, roof thatch, and upholstery material; component for fertilizer, insulation for sound and temperature, and others.

The contemporary direct use of seagrasses is related to their ability to trap and bind sediments and organic material.

The Need to Study the Seagrass Ecosystems in the Philippines

A greater portion of the Philippine population is living adjacent to coastal waters, or to the shores of estuaries. It is almost certain that this percentage will increase in the coming years. There will be more demands upon the marine environment as producer of food, avenues of transportation, receptacles of wastes, living space and sources of recreational and aesthetic pleasure. It is no wonder that seagrass beds are being diked, filled, dredged, and converted to other coastal uses.

Seagrass Components and Uses

Many plants and animals live in Philippine seagrass beds. This is due to the rich nutrient pool and diversity of physical structures protecting young marine life from predation. Fish and shrimp are probably the most important, though coastal villages derive their sustenance from other components of the grass beds. The major ones are seaweeds, invertebrates (shrimps, sea cucumbers, sea urchins, crabs, scallops, mussels, and snails), fish, reptiles and mammals.

Seaweeds grow in great abundance, and are harvested either for food, or as rich source of chemicals for industries.

Coastal inhabitants gather sea urchins, sea cucumbers and other echinoderms mainly as supplement to daily nutrition and as income sources. Gonads from the urchins are usually eaten raw with vinegar, serving as the "caviar" of the coastal Third World.

Coral reefs with their associated seagrasses could supply more than 20 percent of the fish catch. A total of 1,384 individual kinds and 55 species from 25 fish families have been identified from five seagrass sites in the Philippines.

Some endangered species of reptiles and mammals have been reported in Philippine seagrass areas. These include the green sea turtle, the olive ridley, the loggerhead, the flatback, and the wart snake.

Seagrass beds have the potential to filter sewage, thus reducing the threat from pollution which would otherwise affect the components of both coral reefs and mangroves. Seagrasses are biotic heavy metal reservoirs or sinks in the marine environment. The habitat is also known to stabilize the coast mainly due to its ability to trap sediments via the extensive mats of roots and rhizomes.

Susceptibility and Vulnerability of the Seagrass Ecosystem

Seagrass beds are in shallow waters, thus they are susceptible and vulnerable to natural stresses as well as to acute and sometimes chronic disturbance from man and his needs. In coastal Southeast Asia, cyclones, typhoons, tidal waves, volcanic activity, pests and diseases, and human activities constitute the natural sources of stress on this ecosystem. It has been the object of relentless pressure from man's basic needs for food production, transportation, waste disposal, living space, recreation, and aesthetic pleasure.

There have been changes observed in seagrass areas, particularly in species composition, stunting of growth, phenological alterations in relation to seasons, and movement of ecosystem boundaries. Impairment of feeding, growth, recruitment, development, and energetics resulting from disruptive activities of coastal inhabitants may result in alteration both in reproductive and developmental success and changes in community structure and dynamics.

There have been recorded degenerations in the seagrass population. One of these was the "wasting" disease that almost completely decimated the eelgrass beds of the North Atlantic in the 1900s, attributed to a major and abrupt change in the climate, or to the amount of increasing pollution from silt, toxic materials such as heavy metals, pesticides, PCB, and detergents.

Perspective and Advancement in Seagrass Ecosystem Management

Resource management, for a developing country like the Philippines, should address problems at the gut level.

From the point of view of an environmental scientist, management is a dynamic process whereby the resource base is initially subjected to a thorough study so that its potentials, frailties and strengths are well understood before the information is finally disseminated and the resource utilized on a sustainable basis.

This is the basis for MANAGEMENT OF THE RESOURCE, where the ecological information is now tested and applied to optimize production with adequate provision for environmental protection. The manager considers the marine environment as his business realm and profit is an excess of the common currency (energy) produced by myriads of biotic components, interacting with one another, and with the biotic environment. The results of the testing application of marine ecological principles are packaged for dissemination to end-users, and here begins MANAGEMENT OF THE USE of the resource.

Much has been done to understand coral reefs, mangroves, and to a lesser degree, seagrass beds, but information regarding interactions among these marine ecosystems still remains fragmentary and inadequate. The prevailing sectoral approach to marine resource management and conservation is based upon a single exclusive purpose, disregarding the fundamental concept of biological continuum which is the key to the integrity of the marine environment as an integrated macroecosystem. It is increasingly being realized by scientific circles that one of the causes of the failures in marine resources management has been the failure of leaders and investigators to view the marine habitats as one interacting macroecosystem.

An integrated study is the most practical approach towards sustainable development and conservation of these ecosystems. It treats the resource base as a dynamic system where biophysical, sociocultural, and economic factors continuously change and interact.

Mitigation and Restoration

We must bear two things in mind. First, if any biologically productive habitat is destroyed, it is improbable that its original productivity can be

restored. The biological and psycho-chemical interactions which took hundreds of years to evolve and develop among its components are permanently disrupted. Second, mitigation (destruction with specified recondition) rarely creates new and similar habitat where the original components would normally thrive. What it achieves is transitory enhancement. Only the creation of an entirely new, previously desolate aquatic habitat can be considered and allowed as true mitigation.

Transplantation

Seagrass transplantation is a viable means of recovery or restoration of degraded coastal habitats. Restoration with seeds, seedlings, and vegetative materials offer great potential for investigating basic biological problems. Techniques could be developed to recognize areas which have lost their plant cover, or to create new areas.

Artificial Seagrass Systems

A new approach in coastal restoration ecology uses artificial seagrass systems (ASS). The effect is achieved with the creation of more ecological niches for juveniles of fish and invertebrate fauna. The epibiota growing on the system are direct food sources, while the system itself serves as refuge and spawning ground, especially for fauna of economic value. The physical components can also stabilize the sediments.

Management Goals and Needs

Our goals are (a) to preserve the natural interconnections of the ecosystem; (b) to protect valuable fisheries; (c) to protect the coastlines from erosion, siltation, and pollution; (d) to establish seagrass, mangrove, coral reef reserves for research; and (e) to preserve the aesthetic and recreational qualities of the natural shorelines.

On the basis of the dictum "Sound ecology is good economics," these are our perceived needs:

1. Technical Needs — We need adequate field data for each specific ecosystem to identify interconnections, dynamic qualities, and populations which require protection. We need to identify and initiate studies in representative natural seagrass, mangrove and coral reef ecosystems in regional and local areas, in order to have baseline data from which we can measure human impact on these systems.

2. **Sociopolitical Needs** — The environment crisis is rooted in our sociocultural values. Our policy-makers deal with problems with curative rather than preventive measures. To guard against this, we must (a) ensure that local decisions and actions are based on local perspectives; (b) make the public aware of the intrinsic value of the ecosystem; (c) formulate sound legislation against disruptive activities; (d) encourage and facilitate coordination of coastal projects information; (e) use a holistic approach in planning; (f) encourage cooperation among institutions and social groups on ecosystem issues; (g) choose strategies of management, not control; and (h) introduce environmentalism and environmental ethics in all educational levels.

THE PHILIPPINE MARINE ECOSYSTEM

Capture Fisheries

1. **Demersal Fisheries** — Marine demersal fisheries can be categorized into commercial and municipal fisheries, on the basis of gross tonnage. Commercial fisheries include fishing operations using vessels of over three gross tons. Municipal fisheries include fishing activities using vessels three tons or less. Based on this, the commercial sector is equivalent to large-scale or industrial fisheries, while the municipal sector is equivalent to small-scale or artisanal fisheries.

"Demersal resources" refers to fish and invertebrates living on or near the sea bottom. Demersal fishing includes all fishing activities, municipal or commercial, directly or indirectly exploiting demersal resources. Commercial demersal fishery mainly employs the trawl in soft-bottom areas, the *muro-ami* and hook-and-line in hard coral grounds, and the new Daseine in both soft and hard bottom grounds. Municipal demersal fishery uses baby trawls, bottom gill nets, beach seines and push nets.

Philippine demersal stocks in many fishing grounds are fully exploited or overexploited, with the exception of Palawan waters. Adding to this problem is the use of explosives and other methods of illegal fishing. Also, small-meshed nets do not maximize the yield for trawl-caught species. The denudation of mangrove and swamp areas, the destruction of coral reefs and uncontrolled runoffs from watershed areas have caused severe damage to the marine ecosystems.

2. **Pelagic Fisheries** — Pelagic fisheries means catching of fish on the surface or near-surface of the sea. The two classes of fish caught are small

pelagics and tuna or tuna-like species. Small pelagic fishes comprise a great percentage of total pelagic landings; though there has been an increasing shift towards tuna fishing. There are signs of tuna stocks being at an initial over-exploitation stage. A great portion of Philippine landings of yellowfin and skipjack tunas is made up of immature members of the species. We may be witnessing the beginning of a levelling-off of pelagic fisheries as a whole, and our pelagic resources may begin to decline in the near future.

Brackishwater Aquaculture

This technique started a long time ago, when some Filipinos discovered some milkfish in their salt beds, using the small impoundments and with seawater as the source of the brine solution. They started stocking their salt beds with young milkfish during the rainy season, and used the beds for salt production in summer. Then more ponds were constructed and stocked with fingerlings. Culture techniques were developed, like pond fertilization, feeds and feedings, culture of one species or combination of two or more species of fish.

Some environmental issues concerning brackishwater aquaculture have surfaced.

1. Fishpond Construction — Mangrove swamps, ricefields, and sugarlands, including residential and commercial areas, increasingly face conversion into fishponds. The removal of green vegetation which consumes atmospheric carbon dioxide and converts it into living matter, is particularly dangerous. Land tenure system is drastically affected, especially those areas with ricefields and sugarlands. Pond conversion also displaces local inhabitants from residential and commercial areas.

2. Chemical Use — Highly toxic chemicals are being unloaded into ponds and estuarine areas when operators drain prepare them. Mass mortality of fish has been reported in such cases. Time will come when the levels of toxicity would be beyond tolerable limits, with direct effects on the environment and human beings.

3. Feed Dumping — Operators usually dump so much feed in the ponds which cannot be consumed by the fish. The leftover food undergoes microbiological decomposition, resulting in the increased chemical and biological oxygen demands of the pond. Life support systems, like aerators and paddle wheels, are usually used to compensate for the loss of dissolved oxygen in the water.

4. Freshwater Supply — The constant pumping of freshwater from the deep wells to supply the fishponds has caused the intrusion of saltwater into drinking water wells, as has been reported in Negros Occidental.

Mariculture

Mariculture is the culture of organisms (finfish, crustaceans, molluscs, and seaweeds) in the marine environment. This came later than pond culture or aquaculture. In the 1970s, people began utilizing tidal and subtidal areas along the shoreline. They constructed enclosures such as cages or pens and stocked them with fish like groupers and seabass. They put up wooden bamboo structures for the attachment of spats of mussels and oysters. Others used the broadcast method of stocking tidal flats with young oysters. In seaweed culture, floating or sinking nets and lines are used as culture media.

Environmental problems have come up. In some cases, mariculture competes with catch fisheries in space and obstructs water transportation. Pen and cage culture obstructs or slows down the free flow of currents. This promotes rapid rate of siltation, resulting in the formation of sand pits and beach pools hazardous to transportation. The culture medium for seaweeds usually tangles up the nets of trawlers and long line fishing gears. Wooden and bamboo poles and rafts block sea transportation, and impede the recreational purpose of beaches. Also, feeds in the cages and pens may cause the environment to change in terms of species composition. Unconsumed feeds pollute the surroundings, or attract other organisms like crabs and other free swimming fishes and crustaceans, which would compete with resident species.

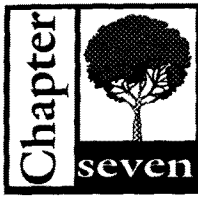
The problem of obstruction can be minimized if municipal permits are secured before constructing pens and cages, wooden or bamboo poles and rafts. There should be proper zoning of municipal waters for allocation of areas for waterway transport and mariculture sites.

CONCLUSION

The environmental concerns in our coastal and marine ecosystems are clear. In order to rehabilitate and protect them, we need to:

1. Regulate fishing by focusing on underexploited fishing grounds and reduce pressure on depleted areas

2. Increase nondestructive aquaculture development
3. Stop destructive fishing methods and exploitation of rare species
4. Ban further conversion of mangrove areas
5. Properly manage coastal zone development to include sound tourism policies
6. Reduce siltation and pollution in coastal zones by regulating watershed activities
7. Provide alternative livelihood to fishing communities, to reduce pressure on marine resources.



THE PHILIPPINE FRESHWATER ECOSYSTEM

INTRODUCTION

The Philippines has 421 principal rivers and 384 river systems. It also has 69 lakes, the biggest of which is Laguna de Bay. The other five major lakes are Lanao Lake, Taal Lake, Mainit Lake, Naujan Lake, and Bulusan Lake. There are a total of 52 dams, all of multiple uses, though their main purpose is to provide income and food for rural families. We have seven reservoirs ranging in size from 150 hectares in Binga to 8,900 hectares in Pantabangan, built primarily for power generation and irrigation water supply, but also serve as fishing grounds. Ninety seven smaller water impoundments exist. There are four major groundwater reservoirs underlying the major basins: Cagayan River, Central Luzon, Agusan River, and Cotabato River.

Water has been a most important part in the daily life of Filipinos, who are dependent on both freshwater and seawater. Water use in an urban setting differs in many ways from that in rural areas due to different modes of production. In rural areas, concern over the effects engendered by polluting agricultural chemicals like fertilizers and pesticides add to the concern over the biological safety of water from water-borne diseases. In urban-industrial areas, pollutants complicate the biosafety of water.

IMPORTANCE OF RIVERS AND LAKES

Rivers, streams and lakes are a vital part of nature's pathway for the circulation of water on the planet. Rain clouds release their water over land, river, lake and sea. On land, water goes deep into the soil, finally ending up in underground aquifers which supply artesian wells, lakes and rivers. Rivers meander through forests, and end up in the sea or lake. Water is absorbed by root systems of vegetation, and enters plants through the transpiration stream. The water is then evaporated back into the air through the stomata of plants. The combination of transpiration and evaporation ensures the return of water to the rain clouds in the atmosphere.

Man now controls how much, when and where water will flow. He rechannels the normal water course to the sea. He builds dams that prolong the normal residence time of water. Before man began cutting down forests, water on the forest floor meandered quietly into rivers in small quantities, keeping the rivers tame until they joined the sea or lake. No catastrophic flooding occurred due to overflowing rivers.

Rivers draining mountains are an effective vehicle for the transport of mineral nutrients and materials like silt, pebbles, stones, rocks, and live organisms. If left undisturbed, the forest floor will have a more or less constant contribution of nutrients into rivers. When uncovered through deforestation, normal amounts and proportions of nutrients are changed considerably. Living organisms that are carried away by a flowing river represent a pool of nutrients that can potentially enrich another receiving body of water, and a gene pool from which new traits can be sourced.

OUR FRESHWATER RESOURCES

Vast coastal waters seem to reduce to a seeming insignificance our freshwaters. Yet, freshwaters may be the only natural source of fish for many landlocked communities. Thus, they are usually important in our daily sustenance and livelihood, specially among the marginalized. The Filipino has a high demand for fish in his diet, with 55 percent of his protein intake coming from fish.

Because the greater part of our population depends on agriculture, the portion supported by the fishing sector is small. By the year 2000, we will see escalating needs for domestic water supply, industry and agriculture.

PRESENT STATE OF RIVERS AND LAKES

At present, there are several flood control, irrigation, and water impoundment projects being maintained. These are the following:

1. **Mangahan Floodway** — a channelization project partially operational in 1988. It crosses the Marikina River north of Laguna de Bay, and traverses Barangays Rosario and Mangahan in Rizal. Operation of the floodway resulted in the worst flood ever witnessed by lakeshore towns.

2. **Napindan Hydraulic Control Structure (HCS)** — the most famous and the most maligned of all local dams. Recommended by a group of foreign consultants, it became operational in 1982. The HCS is a pollution cum flood control infrastructure built to prepare the lake for tapping as a source of domestic water supply by the year 2000. It was designed to be closed during the summer months to prevent the entry of polluted Pasig River water, and to be opened during the rainy season to flush it out. But one effect was the reduction of lake salinity, which caused the proliferation of water hyacinth, a navigation hazard, and the alteration of the lake's chemistry, which in turn adversely affected aquatic life and fish catch.

3. Laguna de Bay Development Project - Irrigation Component — designed to tap the lake as a source of irrigation water by 1989 to boost agricultural production, increase farm income, and provide employment in Laguna, Rizal, and Cavite. The proposed development has potential benefits since the focus is to boost vegetable and rice production. There is the risk, however, of overextending the lake's capacity to supply irrigation water, and indiscreetly opening up more channels for the pollution of the lake with agricultural chemicals and domestic waste.

4. Pantabangan Dam — the country's largest reservoir, constructed in 1969, and forced the resettlement of 5,000 families in ten barangays. Today it serves primarily for power generation and irrigation.

5. Magat Dam — half the area of Pantabangan but twice as deep, the only reservoir with a fish yield exceeding a thousand tons. High siltation has set in, caused by severe erosion in the denuded uplands, reducing the dam's operations life by 40 years.

6. Chico Dam — one of the three components of a proposed super project along the Chico River in the Cordillera to supply electricity and irrigation water. It would have displaced 100,000 tribal people and inundated 341,000 hectares of ancestral lands, including ricefields, villages, and burial grounds.

7. Lake Buhi Water Development Project — part of the Bicol Integrated Area Development funded by the United States Agency for International Development (USAID), intended for irrigation and hydropower generation, to service the needs of 10,000 hectares of ricelands. Discontinued in 1985 due to economic and sociological issues, involving potential harm to fishcages in the lake and the limited arable land around the lake.

POLLUTION BY URBAN AND INDUSTRIAL WASTES

Pasig River is the receptacle of Manila *esteros* and septic channels, which unloaded into it domestic sewage and refuse. As much as 70 percent of undecomposed organic waste comes from domestic sources, while the rest comes from other sources, including the 138 industrial firms lining its banks, discharging eleven million gallons of industrial wastewater a year. Some 300 gasoline stations and depots, and numerous industrial vessels, ferry boats, barges, tankers and boats contribute to the river's pollution every day.

The worst state for any river is that of the Malabon-Tullahan river system. It receives all kinds of solid and liquid wastes from at least 209 industrial firms along its banks. No form of life survives in its polluted waters.

The main sources of pollution in our rivers are domestic sewage and garbage, and wastes from industry, agriculture, mining and other metal-based industries. Domestic wastes are either solid (garbage, refuse, human excrement) or liquid (sewage, housewashings) coming not only from homes but also from food service and lodging establishments, schools, hospitals, theaters and public toilets. Sewage water flows through pipes and culverts that empty into *esteros*, which lead to major rivers.

POLLUTION BY AGRICULTURAL CHEMICALS

Agricultural chemicals include both fertilizers and pesticides used to control, prevent, destroy, repel or minimize pests. After twenty years of being promoted in the market, these agricultural chemicals have had devastating effect on people's health and on the environment. Effects have included occupational poisoning, accidental ingestion, skin irritation, and even cough.

The residual life of these chemicals in the environment has spawned resistance in the target organism, thereby creating an imbalance in the food and energy relationships in the environment.

SILTATION

Siltation follows from disturbances of the uplands and forests. It is an exported problem, caused by hastened erosion in the highlands, as a result of widespread tree cutting by loggers and burning by *Kaingineros*. When heavy deposits of suspended sediments or silt flow into lakes and coastal areas, the rate of shallowing is hastened. Sunlight fails to reach into great depths, to the detriment of photosynthesizing aquatic plants. Fishery productivity is lowered.

High siltation rates have occurred because of decimation of forest cover in many areas of Luzon. Deforestation has increased the proneness to erosion of many watersheds.

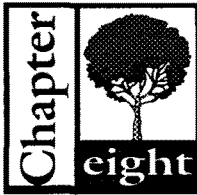
PROBLEMS AND ISSUES

In the light of what has been happening to the freshwater ecosystem, we can now have a general picture of the environmental problems that have cropped up.

- * Our water supply has deteriorated in quality.
- * The life span of our water resources and structures has been shortened.
- * The productivity of our aquatic resources has deteriorated.

RECOMMENDATIONS

1. We must clearly define the objectives for the management of freshwater resources in terms of production target, beneficiary population, and strategy for achieving production target.
2. The academe must develop a greater responsibility for propagating the results of their environmental investigations.
3. We must develop livelihood activities for shoreline communities to lessen pressure on lakes, and uplift the community's socioeconomic status.
4. There is a need to review the functions of existing bureaus in order to make management more effective, and planning more realistic.
5. There is a need to reeducate and retool teachers in the primary and secondary levels, and to integrate environmental science into all tertiary curricula.
6. Religious groups must be encouraged in their efforts to propagate a creation-centered type of spirituality.
7. Laguna de Bay and the national rivers that have dropped in quality must be made the focal point of our efforts at rehabilitation, protection, and conservation.
8. We must develop a comprehensive land-use management plan in areas near freshwater sources. It may be necessary that a total logging ban be implemented on remaining forests of denuded and critical watersheds.



THE POPULATION DIMENSION IN VARIOUS ENVIRONMENTAL SYSTEMS IN THE PHILIPPINES

POLICY AND VALUE FRAMEWORK

Population, resources, and the environment are necessarily interrelated. Increased resources use and environmental degradation have been the result of population pressure, among other factors. The Philippine Strategy for Sustainable Development of the Department of Environment and Natural Resources (DENR) has pointed out that two-thirds of the Philippine population live in the rural areas and are directly dependent on agriculture, fishery, and forestry. The document emphasizes various areas of immediate concern: equity of access to natural resources, poverty being a cause and consequence of environmental degradation; the carrying capacity of ecosystems; and the need to avoid exceeding this capacity in order to meet present and future needs.

CONCEPTUAL FRAMEWORK

The United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP) framework emphasizes the welfare of the population and improved **quality** of life as the ultimate goal of development. Population size and distribution play a significant role in determining resource allocation, access, and utilization.

Increased overall demand and expansion of rural population extends cultivation into marginal lands, with negative effects: short fallow period, erosion, reduced soil fertility. Forest areas are reduced by agricultural activities, fuel and housing requirements. Flooding, water shortage in the dry season, and siltation of rivers and coastal waters take place as a result of deforestation.

The quality of physical environment affects the quality of life. Polluted and contaminated water can cause disease, and lead to higher mortalities. Landless individuals are pushed to remote areas without social services, intensifying their poverty.

A deteriorating environment with either low agricultural productivity or industry-related pollution may lead to out-migration. Lack of basic services and opportunities in rural areas may push more poor people to the cities, adding to the already large population of urban slums suffering from squalid and unsanitary conditions.

PHILIPPINE POPULATION CHANGE

From 7.6 million at the start of the twentieth century, the population of the Philippines has reached 60 million by 1990. Although the population has increased substantially in terms of numbers, the growth rate has actually decelerated.

Long-term population projections for the Philippines indicate that depending on fertility trends, total population by the year 2030 may vary from a low of 97 million to a high of 117 million. This means increasing population pressure in the years to come and has macro-implications on resources and the environment because of increased requirements for feeding, clothing, and housing, as well as meeting the demands for employment and economic growth. This also implies changes in land use patterns and increasing utilization of the country's local resource base.

THE POPULATION IN DIFFERENT ENVIRONMENTAL SYSTEMS

The issue of population encroachment into marginal land may entail different forms. Those who are very poor and without land actually settle on lands with steeper slopes, with marginal agricultural productivity, at coastal fringes, or into slums and squatter communities in already densely settled urban areas.

There is a need to look into population classification to find out the different stresses being exerted upon various ecosystems.

The usual way of classifying populations is whether they are urban or rural. Another way would be by distinguishing them according to the environmental systems they reside in: (a) upland, including forests and rangelands; (b) lowland croplands; (c) coastal-inland; (d) coastal-marine; and (e) urban. "Urban" is based on demographics and socioeconomic characteristics, while the other categories are land-resource-based. A city like Baguio poses a conceptual problem. It is considered urban, due to population density, but it is located in a mountain zone, and its peripheral inhabitants engage in some form of farming or forest occupations. The coastal environment is another "overlap" with the "urban" classification. There are other cases of overlap, such as coastal populations of less urbanized areas, people who live on hillsides located along the coast, and those who inhabit land for agricultural purposes extending from the lowlands and coastal sites to meadows, pastures, hillsides, forest zones.

ESTIMATES OF POPULATION IN UPLANDS, FORESTS, AND OTHER ENVIRONMENT SYSTEMS

"Upland" is defined as comprising (a) marginal land with slopes 18 percent or higher; (b) lands within identified mountain zone, including tablelands and plateaus lying in high elevation; and (c) land within terrain classified as hilly to mountainous. There are 14.9 million hectares of uplands in the Philippines. There are 302 municipalities in 60 provinces belonging to the upland category. Upland dwellers occupy about 40 percent of total forest and woodlands, with a density of about 100 persons per square kilometer.

Of the total population in 1980, 14.4 million were upland dwellers, many of them in forest zones. The largest number of upland dwellers can be found in Southern Mindanao and Central Visayas.

One estimate mentions the figure of 26 million coastal inhabitants living in 10,000 coastal barangays.

The largest urban population in numbers and percentage is in Metro Manila, recorded in 1980 at 5.9 million or 12 percent of the country's total population.

POPULATION DENSITY AND POPULATION GROWTH

Upland density levels in 1980 were lowest in the Cagayan Valley and Southern Tagalog, and highest in Central Visayas. Among urban areas, Metro Manila is the most densely settled, with 42,571 inhabitants per square kilometer.

The country's upland population growth rate in 1980 was only slightly lower than the rate of the country, but the uplands of the Cagayan Valley and Eastern Visayas appeared to have grown even faster than the regions themselves. Urban areas grew the fastest, even when the measure used is tempo of urbanization (tempo equals urban minus rural growth).

Implications of Projected Populations

1. Regardless of the trend in fertility, the population will continue to grow and density level will rise.
2. The upland population of 17.8 million in 1988 could conceivably occupy all of public domain land classified as alienable and disposable;

if these lands were subjected to land reform and subdivided, each upland family would get 1.02 hectares.

3. By the year 2000, assuming one household per hectare, an additional 1.52 million hectares of forest lands would have to be cleared for agriculture. That would mean only 5.8 million hectares forest cover left. By year 2025, forest cover would be down to less than one million hectares.

SUMMARY

We need to verify the population estimates of the different environmental systems; study the environmental impact of population changes, particularly those that measure stress in welfare terms; and study the effects of environmental degradation on population processes. In matters of policy, we must pursue an integrated statistical system of gathering information on various environmental systems, strongly support the Population Program, rationalize our environmental policies, and strictly implement our zoning laws.



THE STATE OF THE PHILIPPINE ENVIRONMENT: GENERAL CONCLUSIONS

Our environment is in a critical situation.

The country's forest cover is down to 23 percent. It was 60 percent 90 years ago. However, the remaining primary or "virgin" forest stand is only 900,000 hectares.

Agricultural productivity has diminished due to degradation of the soil, pest incidence, chemical pollution, and conversion permanent of arable space into nonagricultural use.

Freshwater resources have deteriorated. Forty rivers out of 384 are biologically dead. Saltwater has intruded into 480,802 hectares of croplands.

Seventy percent of our coral reefs and most seagrass communities have been destroyed, mangrove to only 30 percent, fisheries production have declined and may even have exceeded sustainable yield limits.

Population growth and improper land use have led to environmental deterioration in urban and settlement areas.

The state of our environment has caused a broad range of problems: poverty, displacement of cultural communities, conflict and instability, reduced productivity, poor health and nutrition, and hydrologic instability and siltation.

Environmental problems will be exacerbated in the next two decades, due to our foreign debt burden, poverty, rapid population growth, inequity, weak institutional capacity, lethargy of local communities, a stagnant economy and a nonresponsive political system.

A development agenda is clearly needed. Its components will be:

- * rational land use plan at all levels
- * protection of remaining primary forest areas, and endangered flora and fauna
- * support for population-related programs

- * implementation of community-based, participatory and integrated resource management
- * research and development (R & D) support for priority projects on agricultural sustainability and management of critical resource areas
- * environmental education and extension programs
- * networking among government organizations (GOs), nongovernment organizations (NGOs) and academe for natural resource management
- * comprehensive national policy of environmental ethics and management
- * focus on urbanization process and assessment of deterioration
- * integrated plan for coastal zone and fishery resources management
- * low-waste, environmentally sound recycling, rehabilitation, renewability
- * organic agriculture, integrated farming and pest management
- * incentive schemes for resource regulation and pollution controls
- * a master plan for major urban centers and Community Environment and Natural Resources Officers (CENROs) all over the country
- * effective mechanisms such as Environmental Impact System and monitoring at all levels.

I have enjoyed reading the booklet "Saving the Present for the Future: The State of the Environment" by UP-CIDS publications... I feel such landmark publications need to be presented in widely-based seminars, TV talk shows, newspapers, etc.

SHEHZAD SADIQ

*Director,
Energy and Industry Department
Asian Development Bank
(13 January 1993)*

A deeper understanding of the principal causes of deforestation and the implementation of a comprehensive sustainable forestry program provide a viable realistic and scientific basis for a strategic or long-term forest policy than a sweeping total log ban.

This was revealed by a study conducted by a team of environmental and forest scientists led by Dr. Percy E. Sajise for the Center for Integrative and Development Studies of the University of the Philippines.

"UP study says total log ban won't save forests,"

*Philippine Star
7 March 1994, page 1*

The study entitled "Saving the Present for the Future: The State of the Environment" revealed that to maintain its forests and meet the wood requirement of its people and wood dependent industries, the government must draw up and implement a comprehensive program for sustainable development lasting at least 60 years.

The study said poverty has a lot to do with forest destruction and that a comprehensive 60-year sustainable development policy to maintain and develop the forest ecosystems is a better and viable alternative than a total log ban.

"UP study nixes total log ban:

RP needs 60-year forestry program,"

Bulletin Today

7 March 1994, page 6



STATE OF THE NATION REPORTS

Handog sa BAYAN ng UNIBERSIDAD ng PILIPINAS