

Land Use Planning Strategies on Watershed Management and Disaster Reduction in the Philippines

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1. Abstract

The Philippine watershed areas are already in critical condition. Deforestation contributes a lot in the degradation of almost 2.6 million hectares of identified critical watershed areas of the country. Northern Mindanao, with a total land area of 2.832 million hectares representing 9.4% of the total land area of the Philippines, is not spared from this crisis situation. Its geo-physical setting and improper land use of the uplands has resulted in severe soil erosion. The region has about 2.36 million hectares with slopes above 18%.

Improper management, insufficient technical know-how, among others, has resulted in the failed in implementation of already existing laws on watershed protection and preservation. However, recent government projects involving community participation and with proper funding have helped a lot in the rehabilitation of the degraded areas including watersheds.

On the other hand, as water-related disaster is a work of nature, this cannot be completely controlled. Its effects may, however, be mitigated through studies and strict implementation of hazard management plans and environmental laws. In any disaster management planning, the cost of repeatedly devoting public funds for relief and rehabilitation activities following disasters should be balanced against the cost of providing preparedness and mitigation measures before the event (Carter, W.N., 1991). Disaster reduction management is a cycle of activities that involves prevention, mitigation, preparedness, disaster impact, response, recovery, and development.

2. Overview of the Country

The Philippines is an archipelago or a chain of islands (Figure 1). It consists of more than 7,000 islands and islets. The 11 largest islands account for more than 90 % of the total land area. The two largest islands, Luzon and Mindanao, comprise more than 70% of the land area and more than 70 % of the population.

The total land area of the Philippines is 115,800 square miles (299,900 square kilometers). The distance from northern Luzon to southern Mindanao is about 1,000 miles (1,600 kilometers); the east-west width extends as much as 300 miles (480 kilometers). The islands are located on the

western margin of the Pacific "ring of fire" and are characterized by very rugged terrain to nearly flat morphology, with limited amount of land suitable for agriculture.

The country's forest areas comprise 5.590 million hectares or 18.6 percent of the total land area, of which 0.805 million hectares or 14.4 percent were old growth or virgin forests. Of the total forest areas, the residual forests summed up to 2.89 million hectares or 51.77 percent, while pine forests comprised 0.230 million hectares or 4.1 percent. The total volume of timber in the residual and pine forests was estimated at 426 million cubic meters.

In 1995, three (3) watershed forest reserves covering 3,179 hectares were proclaimed. These new proclamations brought to 117 the total number of watershed forest reserves with an aggregate area of 1,368 million hectares.

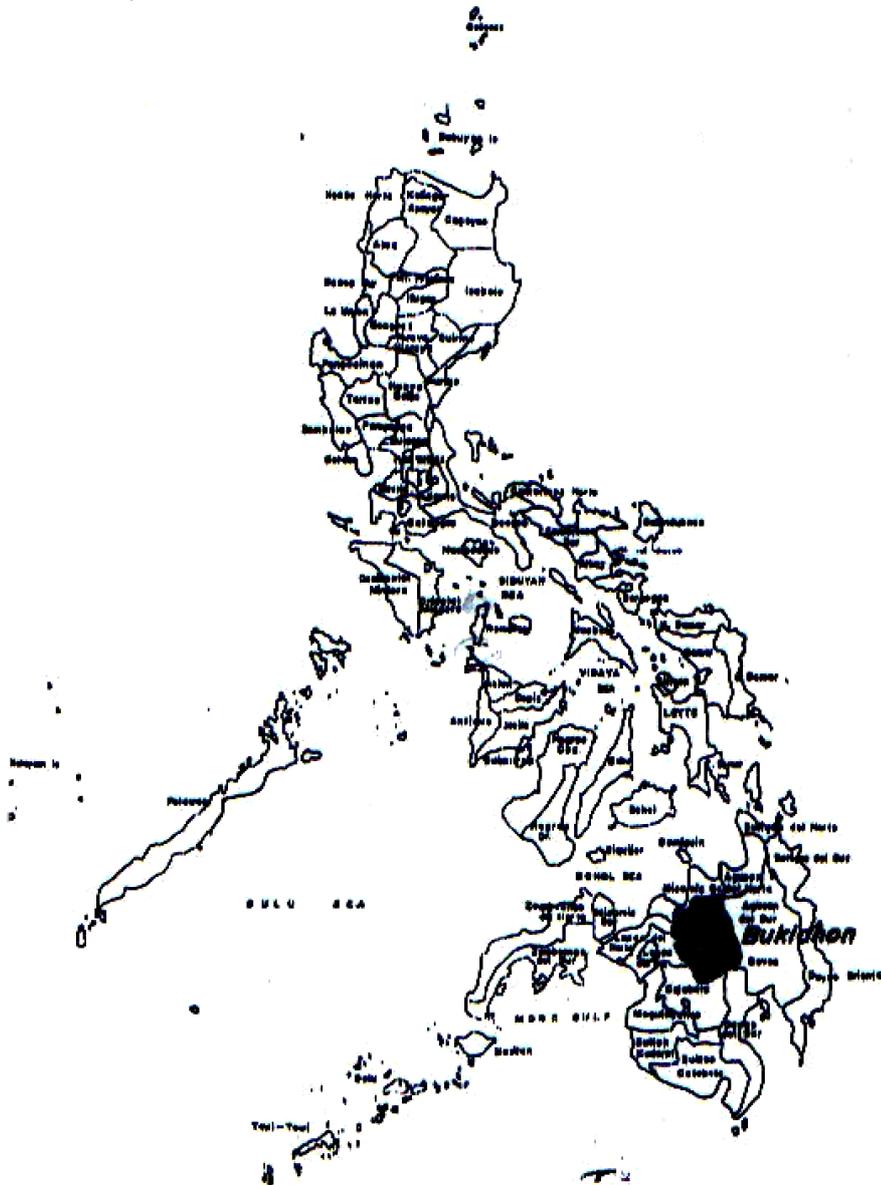


Figure 1. Map of the Philippines.

3. Watershed situation in the country

A watershed is simply defined as "all land area which drains into a stream system, upstream from its mouth and is surrounded with a divide." A watershed, if properly managed, will supply water for agricultural and industrial use, including water for domestic consumption.

The destruction of the forests and uplands endangers the watersheds and results in massive soil erosion, declining soil productivity, sedimentation of river channels and siltation of dams, catastrophic floods and acute water shortages during the dry season.

The denudation of our watersheds has been partly blamed for the recent rice crisis experienced by the country. The irrigation systems of the National Irrigation Administration (NIA) have a total service area of 650,000 hectares throughout the country. However, the actual area that can be irrigated by these systems is only 469,000 hectares during the rainy season and 441,000 hectares during the dry season. There is thus a foregone production of 525,000 tons of palay per year, enough to feed 2.86 million Filipinos for a year (Marcelo, 1996).

The Department of Environment and Natural Resources (DENR) has identified 18 of the 85 critical watersheds listed by the NIA as needing immediate rehabilitation. Among these are the Magat, Abulog-Apayao, Angat, Pantabangan, Jalauar, Maasin, Salug, Muleta-Manupali, Andanan, Allah, and the Buluan-Alip watersheds.

In addition, the links between watersheds, power and development cannot be denied. There are currently 20 hydro-electric plants in the country, which can generate 1,836 megawatts of power. Siltation of these structures, however, has impaired their capacity. In Mindanao growth areas, hydropower is the best option for energy generation, so their watersheds are keys to their development.

The Environment and Natural Resources Accounting Project (ENRAP, 1996) estimates foregone power benefits at 2.4 billion per year. There is also the on-site cost of soil erosion measured in terms of the value of lost soil nutrients. The on-site and off-site damages of soil erosion and sedimentation have been estimated at U.S.\$300 million per year. Metropolitan areas like Cebu City, Davao City and Cagayan de Oro City are experiencing water supply problems as well. The watersheds servicing these cities need immediate rehabilitation. The DENR is boldly going forward and targeting the rehabilitation of about 500,000 hectares of major watersheds by year 2000.

3.1 Deforestation

Environmentalists throughout Southeast Asia, home to the world's most beautiful rain forests, are racing against time to salvage the region's natural heritage. There are grim projections that unless the destruction of these rain forests which form a tight belt on the world's equatorial areas, is halted, most will have gone or been severely damaged in just 21 years.

In Southeast Asia which includes the Philippines, the rate of destruction has been faster than elsewhere. For instance, official statistics show that there were 2.49 million square kilometers of virgin forest in the region outside Papua New Guinea in 1900. By 1989, only 602,222 square kilometers remained. Just as the rate of degradation of the world's rain forests has reached record levels (about 2,000 square kilometers is destroyed or degraded every year), evidence is accumulating that they are assets which the world needs.

Already, Thailand has gone from an exporter to an importer of timber, and the Philippines timber trade is down to a trickle. If the current rates of deforestation continue, WRI predicts that by the year 2000, the 33 net exporter countries will drop to below 10, and export earnings will shrink to about US \$2 billion at current prices.

3.2 Forest Fires

Of all the agent of forest destruction, the one that plays the major role is forest fire. Forest fires wipe out the newly established plantations once the summer season sets in. An important and complementary activity of plantation establishment and maintenance is the introduction of forest protection measures like fire brakes, fuel brakes, look-out towers, guard houses, roads and trails. Such preventive measures must be implemented where they are most needed before the start of the hot season.

For 12 years, i.e. from 1970 to 1982, forest lands which were destroyed totalled 1.3 million hectares according to BFD. The available data on forested areas destroyed in 1982 showed that 19.73 % was due to kaingin making, 48.41 % due to forest fires, 29.75 % due to logging and 2.11 % due to pests and diseases.

3.3 Rate of Soil Erosion

Soil erosion is now the most serious environmental problem in the Philippines. Of the 30 million hectares total land area of the country, 13 million hectares are classified as alienable and disposable and 17 million hectares are classified as public or forest lands (Paningbatan, 1987). Statistics from the defunct National Environment Protection Council (NEPC) now Environmental Management Bureau (EMB), reveal that approximately 9 million out of the total alienable and disposable lands are eroded. The majority of the 17 million hectares of forest lands are in important watersheds. However, about 4 million hectares of these are under upland cultivation. Cultivated hilly lands and mountain slopes are considered the most severely eroded and marginally productive farming sites in the country.

Results of several studies conducted in the country relative to soil erosion are very alarming. Annual soil loss reported by various research workers was very much higher than the acceptable tolerable soil loss of 3-10 ton/ha per year (Paningbatan, 1987). For instance, Sajise (1984) cited some research results showing that in bare plots (with no vegetation and cultivation) with 27%- 29% slope, soil erosion ranges from 23 to 62.3 tons/ha per year. The same study showed that on a cultivated mountain slope, 218.2 tons/ha per year of eroded soil was recorded. Using the Modified Universal Soil Loss Equation, David and Collado (1987) estimated that sheet and rill erosion rates in Magat Watershed could reach as high as 239 tons/ha per year in kaingin areas. Similar magnitudes of annual erosion rates were also estimated to occur in the Pantabangan Watershed (Paningbatan, 1987).

An analysis by the DENR on the state of the Philippine environment showed that overall, 75% of the total cropland is vulnerable to erosion. Thirteen provinces have 50% - 90% of their areas eroded. Among these provinces are Cebu, Batangas, La Union, Ilocos Sur, Marinduque and Capiz.

The economic costs of soil erosion are often difficult to monitor and evaluate. The "onsite" effects/damages usually include loss of nutrients from the topsoil. This loss could result in abrupt decline of soil productivity and environmental catastrophes. The "offsite" biophysical effects of soil erosion are heavy stream and reservoir sedimentation, water pollution, floods, and siltation of lowland farm lands. From 1968 to 1975, crop losses due to floods during the

monsoon months and due to drought during the dry season was estimated to be 80 % of total loss in site crop production alone. In Pangasinan, the continued pollution of the Agno and Bued River systems due to mining operations (mine tailings disposal, etc.) and other anthropogenic activities in the uplands of Benguet and Mt. Province resulted in the destruction of agricultural lands and crops estimated at 200 million pesos every year. Also, many irrigation systems (canals) were heavily silted. From 1981 to 1987, the National Irrigation Administration (NIA) has spent a total of 3,337,462 pesos for desiltation of its irrigation canals. It will need an additional 24 million pesos to desilt its 190 km of silted irrigation canals, 60 km of which have become inoperable due to siltation.

4. Water-Related Natural Disasters

Water-related natural disasters are common in the Philippines and their effects are devastating but vary from region to region with the geographic location and the geomorphological and structural features of the country.

Such water-related natural disasters include tropical cyclones, floods, water-induced mass movements, and drought, to name a few. The following discusses the three most important water-related natural disasters.

4.1 Tropical Cyclones

From north to south areas (by province) have been identified as within the typhoon belt. With the westward direction of tropical cyclones, most of these such as Batanes, Leyte and Surigao, are situated in the path of tropical cyclones. Said areas are characterized by Type II Climate, i.e., with no dry season and pronounced rainfall from November to June (Figure 2). Based on the published chart of typhoon tracts and monthly tropical cyclones affecting the country (Philippine Atmospheric, Geophysical and Astronomical Services Administration [PAG-ASA], 1982), tropical cyclones crossing the country from 1951-1985 range from 5-50 per annum, with the months of July to December being the wettest months.

4.2 Floods

Flood is the most common water-related natural disaster in the Philippines. A flood is an abnormal rise of the water level of a stream that may result in the overflow of the normal levee of the stream with the subsequent inundation of areas that are not normally submerged. Floods include coastal and riverine floods. Their occurrence is usually in the aftermath of meteorological events that include: a) intensive and prolonged rainfall, and b) unusually high coastal and estuarine waters due to storm surges, seiches, etc. Floods are also caused indirectly by seismic activities.

Coastal areas are particularly susceptible to flooding due to tsunamis (seismic sea waves). To a certain extent, astronomy-influenced phenomena such as high tides coinciding with heavy rainfall frequently cause flooding (PAGASA).

Floods may cause serious damage to prime agricultural lands and major government infrastructures such as roads, bridges, irrigation dikes and flood control structures. Based on the two major categories of flood occurrence, some of the identified flood-prone areas in Northern Mindanao (Figure 3¹) are the following:

¹ **Only the provinces of Misamis Oriental and Occidental, Bukidnon and Camiguin Is are included.**

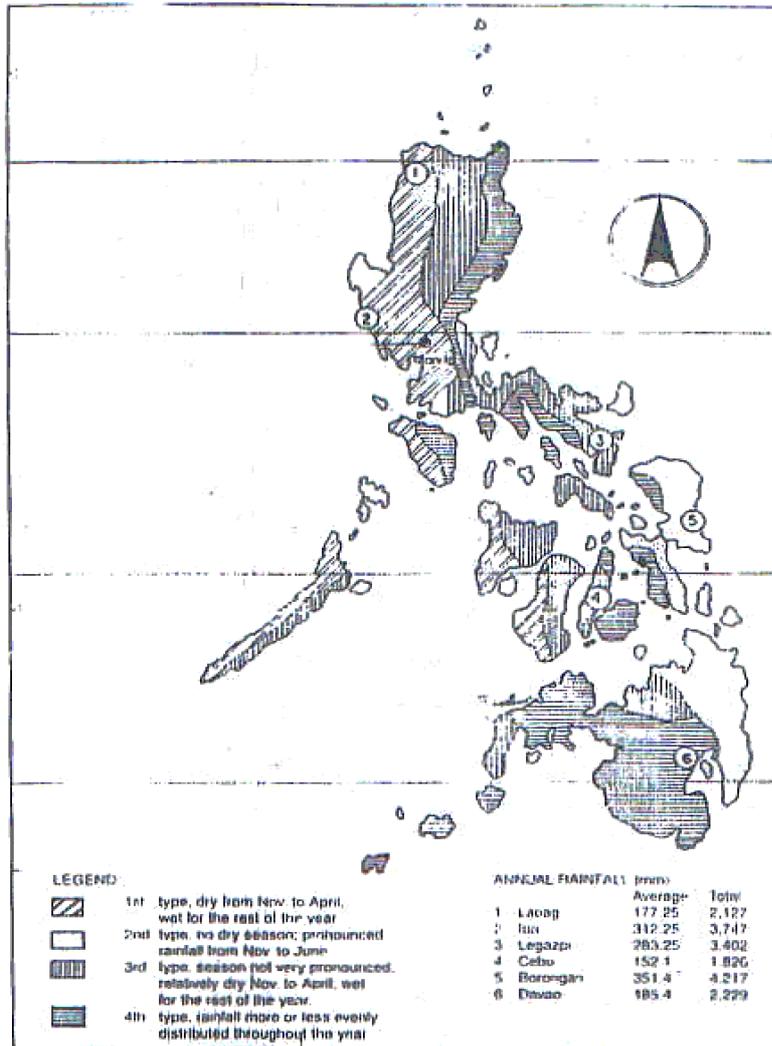


Figure 2. Climate map of the Philippines.

4.2.1 Coastal Flooding

In Agusan del Norte, the coastal areas frequently flood in the vicinity of the estuaries, the backswamps, delta and coastal plains from Bgy. La Fraternidad in Tubay to Bgy. Masao, Butuan City. Highly affected areas are adjacent and/or near the mouth of these rivers and their tributaries. Butuan City proper and its barangays are located in the Agusan River delta and are prone to coastal flooding.

In Misamis Occidental all cities and towns in the province are prone to coastal flooding except for the municipalities of Concepcion and Don Mariano. Municipalities include Sapang Dalaga, Baliangao, Plaridel, Lopez Jaena, Jimenez, Tudela and Clarin as well as the cities of Ozamis, Tangub and Oroquieta and especially Barangay Labo, Oroquieta City. The barangays near the banks and along the flood plains of the Sebasey, Tudela, Tangub, Oroquieta, and Langaran Rivers are prone to riverine flooding.

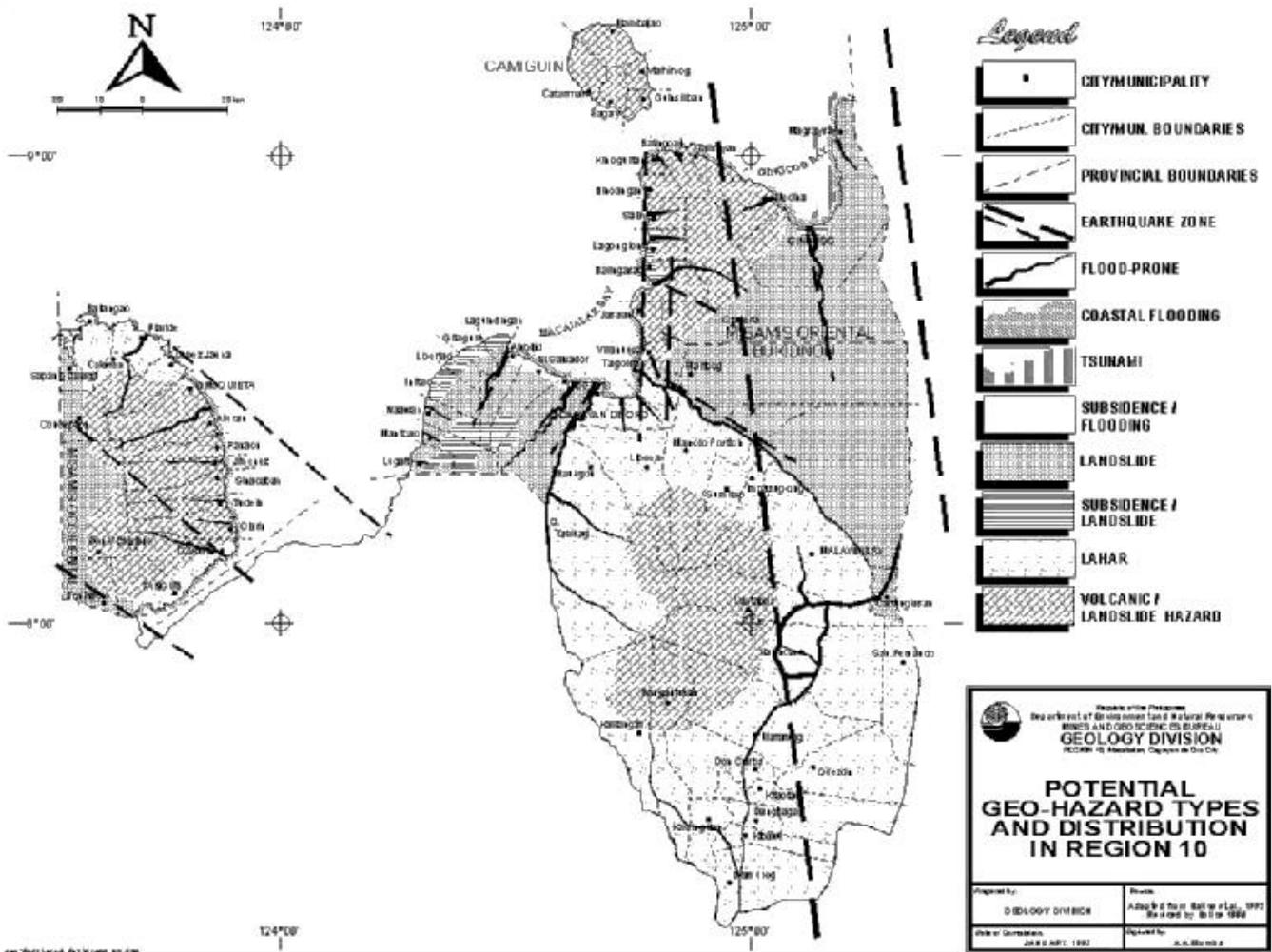


Figure 3. Flood-prone areas in Northern Mindanao

In the Province of Misamis Oriental, the barangays of the coastal lowlands along the mouths of the Odiongan and Samay rivers in Gingoog City and in Cagayan de Oro, Cugman and Agusan rivers in Cagayan de Oro City are prone to flooding. The barangays located near the banks of Gingoog, Cagayan, Iponan, Tagoloan, Alubijid, Bigaan and Salay rivers and Talisayan Creek are also known to flood.

The eastern coast of Surigao del Norte, particularly the municipalities of Gidaguit, Claver and Placer, is prone to coastal flooding. The coastal region is situated in a typhoon belt.

4.2.2 Riverine Flooding

Flood-prone areas in the low lying parts of the Agusan basin include the municipalities of Loreto, Veruela, Bunawan, Esperanza, San Luis (Rosario) and Talacogon.

Within the landlocked Province of Bukidnon, the areas near the upper course of the Maridugao River in the southwestern section of Bukidnon are prone to riverine flooding. These include the barangays near the banks of the Maridugao River in the Municipalities of Kalilangan, Pangantucan and Kadingilan. The flood of August to September, 1995 in the Municipality of

Kalilangan was aggravated by landslides on the eastern slopes of the Kadingkin Volcano (Dimakiling Mountains). Tributaries of Malutipay River drain the steep slopes of the said volcano. The increase in sediment load of the said river ultimately contributed to the alleviated flood in the lowlands of Kalilangan.

Other headstream flooding occurs along tributaries that drain the western footslopes of Mt. Kalatungan which also experience heavy precipitation. This triggers flash floods in the downstream section of the Sagayan and Makapantig Rivers with flood waters rising 2 m at the peak of the flood. Affected barangays include Pamintulan and West Poblacion (total area 210 ha).

The municipalities of Valencia, Maramag, Quezon, Don Carlos, Kitaotao, Dancagan, Kibawe and Damulog were among the areas identified areas is 'at risk' to flood hazards, especially barangays, near the banks of the Pulangi River. These areas were almost totally inundated between the early fifties and the early eighties when the NIA diversion dams and irrigations canals were not yet installed. At present, some portions of these barangays are still inundated specially those that are close (10 m to 1 km) to Pulangi River and its tributaries.

The barangay Batangan of the Municipality of Valencia suffers the most damage when the Pulangi River overflows. In this barangay, only New Camiling is considered free from flooding. Flood water height ranges from .5 meters to 5.0 meters during rain showers in the upstream areas aggravated by inadequate canal lining, dikes and box culverts.

For Misamis Oriental, in the municipality of Talisayan, areas along both banks of Talisayan creeks at the center of the town proper usually experience flash floods during periods of high precipitation or storm. Floodwaters in these areas could easily rise by two meters. The low-lying areas in the estuarine, especially between Barangay San Jose and the coastal portions of the town proper suffer most if the water current is very high due to the added tidal influence. The most devastating floods were in 1972 and 1976, one of which claimed at least 18 lives. Riverine flooding also affects most of the low-lying areas near the Cagayan de Oro River. This is especially true in the case of Isla de Oro, a presently inhabited sandbar, located downstream section of the said river. Whenever the Bitan-ag Creek overflows, because of high precipitation upstream, areas within and adjacent to the Lim Ket Kai Commercial Complex are affected by flood water.

The heart-shaped island-province of Camiguin, considered to be the prime destination in the region, has also been affected, to some extent, by riverine and coastal flooding. Extra heavy precipitation causes downstream flooding in the deltaic portions of the Alangalan, Looc, and Puti Rivers of Catarman, the Mabini and Balbogon Creeks of Mambajao, and the Mahinog and Maac Rivers of Mahinog.

4.2.3 Socio-Economic Impact of Floods

Floods have a tremendous socio-economic impact. The main effect of floods is to retard development. A flood-stricken area must first be restored to normalcy before any development activity can be carried out. Restoration can take time. Flood damage is incalculable. Floods usually occur in association with other destructive natural phenomena. In addition to the directly determinable losses the indirect potential losses may be added. These result from unproductivity in many areas, e.g. in business and trade, commerce and in other sphere as well.

4.3 Water-Induced Mass Movements

Water precipitating on hillslopes as rain is part of the hydrological cycle. When the amount of rainfall is so great that the infiltration capacity of the soil is exceeded, overland flow occurs. Most often, such overland flow carries with it soil or rock or both. This leads to the occurrence of water-induced mass movement.

Mass movement occurs in a great variety of materials, on slopes with varying gradients, with an according variety of types of movement. In view of its variability, only the most common one, i.e. the landslide, is discussed hereafter.

4.3.1 Landslides

Landslide occurrences have been noted to affect not only the pristine areas of the country, but also the active (e.g. where roads pass through), disturbed (man-induced) and inhabited sites. Areas frequently affected by landslides are those with moderate to deeply weathered slopes and heavy fracturing, such as the mountain flanks of Kennon Road in Baguio City, the Dalton Pass in Nueva Viscaya, portions of the Maharlika Highway at Southern Leyte and at the Misamis Oriental-Agusan boundary, and those within the Mt. Diwata (Diwalwal) gold-rich area (e.g. Balite and Tinago Districts).

Risks incurred with these water-induced natural disasters vary from place to place. To mention a few, during the 1992 landslide incidents in Mt. Diwata, many casualties were alleged to have been buried alive by moving earth which occurred in 3 major slope failures. The Kennon Road, even though it is of great importance to Baguio City, was permanently closed to heavy traffic in view of maintenance problem, not to mention the problem of loss of lives due to mass movements.

5. Watershed Management Legislation, Policies and Institutional Arrangements

Per Section 3 of Presidential Decree (PD) No. 705, known as the Revised Forestry Code of the Philippines, critical areas of a river system supporting existing and proposed hydro-electric power and irrigation works, need immediate rehabilitation as they are to fast denudation causing accelerated erosion and destructive floods. They are closed for logging until fully rehabilitated.

PD 705 is already a comprehensive and updated forestry law. But it was further amended by PD No. 1559 during the martial law era, there was a prolific issuance of unnecessary presidential decrees and letters of instruction. Since many of these new laws were impossible to be implemented or beyond the capacity of the forestry agency said laws remained un-implemented to this date. In spite of the designation and proclamation of many areas as mossy forests, protection forests, watershed areas, forest reserves, national parks and birds and wildlife sanctuaries for specific purposes and with corresponding prohibitions. Letters of instruction Nos. 917 and 917-A were issued for the proclamation of wilderness areas.

Concession areas covered by the existing Timber License Agreement are mostly situated in remote, steep and rocky places where the fertility of the soil is minimal, hence not favorable for any agricultural venture. In spite of this, PD No. 472, the Food Production Program was issued requiring all licenses and permittees to indulge in this activity which is not at all a forestry undertaking.

Letter of Instruction No. 818 requires planting the same species as the trees cut at one hectare of open, denuded and brushland forests area, for every hectare logged-over. So if a hectare of Dipterocarp forests would be cut, the waiting period would be 5 to 7 years for the seed of this species to grow to the seedling needed for reforestation. Extreme difficulties and failures are expected in establishing plantations in the open, denuded and brushland areas, as said interocarp species is very sensitive planting site wherein it needs fertile soil.

Memorandum Circular No. 17 Series of 1989 states that "effective immediately, all DENR offices involved in planning and implementation of watershed and reforestation programs and projects are instructed to incorporate Assisted Natural Regeneration (ANR) methods in all such projects, whenever applicable, regardless of whether these are carried out by administration, by contract or by combination thereof. In the rehabilitation and development of watersheds, protection and production forest, the DENR shall a) apply the most economical and cost-effective methods that are feasible in any given situation and b) accelerate re-establishment of the vegetative cover that approximates a natural forests in terms of species diversity and composition. In pursuit of these objectives, it shall be the policy of the DENR to prioritize the implementation of ANR methods for the rehabilitation and development of watershed, protection and production forests.

Department Administrative Order (DAO) No. 22, series of 1993, which are the Revised Guidelines for Community Forestry Programs states that, "the community program may be implemented on all upland and coastal lands of public domain areas except the following: a) established critical watersheds covered by proclamations, legislation and specific administrative issuances; b) Civil, military and other government reservations where forest product utilization is forbidden by laws, decrees, proclamation or administrative issuances; c) areas covered by existing permits, leases and/or contracts except in cases where the permittee/leasee/contractee shall execute an appropriate waiver."

Reforestation of denuded forest areas was undertaken not only by non-government organizations (NGO's) but also by the community and family members. Hence, DENR Memorandum Circular No. 11 Series of 1989 was created in order to provide rules and regulation for the implementation of contract forestation (CREF) projects funded by the DENR. It was amended by DAO No. 31, series of 1991, which are the Revised Guidelines for Contract Reforestation.

To provide the families and communities privilege in the implementation of the CREF, a tenorial instrument called Forest Land Management Agreement (FLMA) was introduced by virtue of DAO No. 71, series of 1990.

Because of the success of CREF where most of the successful implementors are communities, the Forestry Sector Project was launched using the community-based forest management strategy. By virtue of Executive Order (EO) No. 263 issued in July 1995, the Philippines adopted community-based forest management as the national strategy to ensure sustainable development of the country's forestland resources. The mechanisms for its implementation were provided in the Implementing Rules and Regulations of the EO 263.

There is also recent legislation that is now pending for approval by the Lower House. These are:

- The Sustainable Management of Forest Resources Act of 1996. This is a bill to replace PD 705, otherwise known as the Revised Forestry Code of the Philippines, to conform with fundamental laws of the land. The salient features of the act are:
 - Sustainable Forest Management and Development, which focuses on the resources rather than the products, shall be the guiding principle in the management, protection, conservation, utilization and development of forest resources. An integrated Forest Management System shall be pursued.
 - Community-Based Forest Management shall be the principal strategy to promote sustainable Forest Management and Development.
 - The promotion of participation of all sectors of society in sustainable Forest Management and Development ensuring the equitable sharing of the benefits derived from the forest.
 - The protection and the rehabilitation of forest lands and national parks including all protected areas shall be given priority to ensure environmental stability, ecological balance and enhancement of biological diversity.
 - The establishment of specific limits of forest lands and national parks.
 - The establishment of a dynamic, professional and people-oriented forest service.
 - The conservation, utilization, rehabilitation and protection of our forest resources shall bear a social function, responsibility and accountability to promote a common good.
- Billion Trees Act of 1995. This Act provides for an inter-agency coordination and implementation of the program with the DENR as lead agency. To ensure the efficient and effective implementation of the program, the Bill provides for the following:
 - Community Reforestation through Community-Based Forest Management Agreement (CBFMA) which shall be granted for twenty five (25) years;
 - Reforestation of denuded military reservations by the AFP and PNP personnel assigned in the said areas with corresponding incentives;
 - Adoption of a reforestation project or a forested area for protection by private corporations, foundations, foreign and local NGO's and similar institutions; and
 - Establishment of seedling nurseries and mini-forest parks in every city and municipality. In relation to this provision, every subdivision project to be developed after the promulgation of this act shall include the establishment of parks of not less than 25% of the required total spaced in accordance with PD 953.

6. Environmental Management

6.1 Watershed Management

In the administration and regulation of land resources for the production of water and the control of erosion, stream flow and floods, there are at least four phases of watershed management.

First, the recognition phase, which involves a survey to determine extent, location, and severity of deterioration of critical or misused areas.

Second, the reforestation phase, which includes the correction of the unstable conditions causing erosion and floods by vegetation or engineering methods.

Third, the protection phase, which involves not only protection from fires or damaging agencies but also the maintenance of existing conditions, provided they are acceptable for the uses to which the area is subject; and,

Fourth, the improvement phase, whereby practices are initiated to increase the yield of water. This phase may involve various measures of different degrees of effectiveness as far as the yield of water is concerned.

Under the conditions in the Philippines where most watersheds are critically denuded causing drying of water reservoirs and a decrease of the life expectancy of irrigation and hydroelectric power plants, reforestation plays a very important role in all four phases of watershed management.

Efficient watershed management in developing countries calls for specialized personnel and comprehensive organization. It may also require foreign aid. It certainly requires systematic education at the "grass roots" level to make people aware that it is in their own long-term interest to conserve natural resources.

Laws and regulations have too often failed to stop shifting cultivation in some developing countries of the tropics. Severe degradation caused by such slash and burn agriculture has, in fact, rapidly intensified in recent years. It is a serious socio-economic problem that is aggravated by increasing population pressure and a great dependence on agriculture for employment as well as food.

The basic cause of watershed degradation is a combination of ignorance and economic backwardness of people, outdated social systems, overpopulation and overgrazing. These lead to:

- Cultivation of poor land without adequate soil and water conservation and of land basically unsuitable for sustained agriculture.
- Spread of shifting cultivation, involving permanent forest land or reduction of forest follows periods, with soil exhaustion and grassland replacing forests.
- Deterioration in official control and preservation of forests.
- Overgrazing of forests and formation of stone screes and ravines.
- Road-building and other land-changing public works without conservation.

6.2 Watershed Rehabilitation

Watershed rehabilitation is also a major thrust of the government. The agencies involved in this activity are:

6.2.1 ASEAN-US Watershed Project (AUSWP)

Charged with the job of protecting and rehabilitating critical watershed areas, the ASEAN-US Watershed Project (AUSWP) utilizes vegetative and structural control measures and the combination of both to preventing or minimize the occurrence of soil erosion.

6.2.2 Forest Management Bureau (FMB)

Planting fast-growing tree species and grasses and utilization of check dams, bench terraces, gabions, diversion canals, ditches and ripraps are means to ensure effective control of soil movement.

Small Water Impounding Projects (SWIP) in areas such as Benguet, Bataan, Nueva Vizcaya, Pampanga, and Davao del Norte are conducted under this program. Large watersheds such as Magat and Pantabangan are also being managed and maintained with the cooperation of National Irrigation Authority.

6.2.3 National Irrigation Administration (NIA)

Irrigation development is not the only concern of the NIA. Part of their job is the maintenance of the country's reservoirs by protecting them from excessive sedimentation. Therefore rehabilitation of adjoining open areas which are the primary sources of sediments also concerns NIA. As exemplified in their Watershed Management and Erosion Control Project, existing vegetative covers are being conserved and improved vegetative covers are being introduced to rehabilitate open grasslands. Reforestation and afforestation are also practiced. This is complemented by the scientific land-use system, which in effect creates jobs for the residents.

6.3 Watershed Development Activities

The initial effort of NIA on watershed development and rehabilitation was concentrated in Pantabangan and Magat watersheds where the two largest dams in the country are situated. A project on watershed management and erosion control was implemented in the two watershed areas aimed at: controlling soil erosion in the catchment area; and minimizing reservoir sedimentation through the establishment of land-use system that will improve the vegetative covers of the open grasslands. The projects completed the reforestation with timber and agro-forestry species of about 24,500 hectares and 7,500 hectares in Pantabangan and Magat watersheds, respectively. In 1989, another 17,165 hectare of open grassland in four watersheds were reforested. This included newly identified open areas in the Pantabangan and Magat watersheds. The areas covered were as follows:

- Magat watershed - 2,500 ha (1989-1990)
- Pantabangan watershed - 3,000 ha (1989-1990)
- Balog-Balog watershed in Tarlac Province - 9,165 ha (1989-1990)
- Lake Buhi watershed in Bicol Province - 2,500 (1989-1991)

The projects were undertaken for the forestry sector of DENR and were funded through a loan from the Asian Development Bank (ADB).

6.3.1 Central Visayas Upland Regional Project (CVURP)

CVURP, in its effort to rehabilitate the highly damaged, eroded region, was able to implement various soil and water conservation measures financed by the Australian Government. The Department of Agriculture - Region VII continued the activities of the project to cover some micro-watersheds. They constructed brush and check dams, bench and broad base terraces, and established hedgerows as vegetative erosion control measures. The project covered the provinces of Cebu, Bohol, Siquijor and Negros Oriental.

6.3.2 Mindanao Baptist Rural Life Center (MBRLC)

MBRLC has come up with a project entitled Sloping Agricultural Land Technology (SALT) initiated in 1978 and located at Mt. Apo, Bansalan, Davao del Sur. This started on a one-hectare area where soil conservation measures such as establishment of hedge rows, crop rotation, cover cropping, and mulching were applied. At present, MBRLC was able to expand the area to about 70 hectares.

6.4 Watersheds In Northern Mindanao

Mt. Malindang National Park was proclaimed a Watershed Forest Reserve within DENR Region-X under R.A. 6266 dated June 19, 1971 with an approximate area of 53,262 hectares covering the municipalities of Don Victoriano, Concepcion, Calamba, Oroquieta City, Ozamiz City, Jimenez, Province of Misamis Occidental.

Northern Mindanao has been able to cater the Environment and Natural Resources Second Adjustment Loan (ENR-SECAL) Investment Program, a seven years support of Regional Resources Management Project. There are seven project cited of the ENR-SECAL Regional Resource Management (RRM) Component in Region 10. One of the project sites is the upper Salug Watershed Project located at Don Victoriano, Misamis Occidental. The local Social Development/Credit Cooperative and Institutional Strengthening Component of the project was contracted to the MATATAG TRICAP joint venture, NGO Proponent. The estimated area of this project covers a total of 8,020 hectares, alongside a total of 1,010 hectares that were surveyed in two key barangays. The province of Misamis Occidental has a goal of 365.0 hectares of plantation establishment of CY 1994 including proposed dipterocarp plantations and private tree plantations.

Bukidnon has six major watershed areas, with an estimated total area of 780,000 hectares and 321 tributaries, as indicated in the succeeding presentation:

Table 1. Major Watershed Areas in Bukidnon Province

Watershed Areas	Estimated Area (ha)	Number of tributaries
1. Pulangi River	400,000	173
2. Muleta River	70,000	26
3. Tagoloan Watershed	100,000	57
4. Cagayan Watershed	80,000	26
5. Maridugao Watershed	70,000	21
6. Davao Watershed	60,000	18
TOTAL	780,000	321

The Muleta watershed eventually drains into the Pulangi River in Cotabato, hence it can be considered a micro-watershed of the Pulangi.

Appropriate protection and conservation measures were undertaken to preserve these watershed resources. This is done through the implementation of government programs specially on the establishment of forest plantation, installation of soil conservation structures, and other activities relative to watershed rehabilitation and conservation.

In addition to these, through people empowerment, people's attitude developed towards becoming responsible for the environment. Also, timber licenses along major watershed areas have been canceled to effectively conserve these watershed resources.

6.5 Reforestation Management

The reforestation efforts are accomplished through active participation of NGO's, People's Organizations (PO's) and other government agencies in the tree planting program. Of the total 6.5 million hectares of denuded or open forest lands, about 1.4 million hectares are targeted for reforestation until the year 2000.

From 1985 to 1996, an aggregate area of 757,652 hectares had been reforested by the government and the private sectors, of which 490,441 hectares were covered by the former and 267,211 hectares by the latter group.

The agencies involved in the reforestation program of the government are mentioned hereafter:

6.5.1 Ecosystem Research and Development Bureau (ERDB)

The function of the Ecosystem Research and Development Bureau (ERDB) is to back up government programs with the necessary technology through scientific findings and technical assistance. The bureau is designed to work hand in hand with other agencies to protect and conserve our soils. Revegetation of reforestation is the primary control measure applied, complemented by structures such as terraces, check dams and gully plugs (Reyes, 1980). Different mechanical measures such as modified land management, cropping schemes and the likes are evaluated. The effects of combinations of biological and structural control measures are also studied.

6.5.2 Forest Management Bureau (FMB)

Timber and Non-timber Resources Management

Continuous availability of timber and non-timber raw materials for forest product utilization is ensured through replanting of harvested species. This practice is imposed by FMB to licensed logging concessionaires.

Range management

Rangelands are being developed through species improvement. Range areas are protected from overgrazing and uncontrolled grassland fires.

Forest protection

The primary aim of the program is to regulate destructive land-use such as kaingin making and the illegal intrusion of farmers in protected areas. Protection of forest lands from forest fires is also a part of the program. In connection with this, forest and concession guards are being mobilized to ensure protection of the forest (Cabrido, Jr., 1984).

Other Reforestation and Afforestation Programs

Erosion is minimized through planting of all open or denuded areas with forest and/ or fruit trees. With this in mind, the following schemes were developed: a) Family-based Forestation Program; b) Community-based Reforestation Program; and c) Special Projects, assisted by

foreign agencies such as the RP-Japan Technical Cooperation Project for the reforestation and afforestation of the Pantabangan area, the World Bank assisted pine plantation project in Licuanan, Abra, and the Mindoro Integrated Rural Development Project in Oriental Mindoro (Antonio, 1980). The private sector is also working to bring back the forest vegetation. The following agencies are involved in these programs:

MPM, CSDC, PTFI RMI, ALSONS

Integrated Forest Management Agreement (IFMA) holders such as Manila Paper Mills (MPM); Casilayan Softwood Development Corporation (CSDC); Provident Tree Farms, Inc.(PTFI); Royal Match, Inc.(RMI); Alcantara and Sons (ALSONS) and others are very serious in developing thousands of hectares of inadequately stocked logged-over forest into forest plantations to produce enough raw materials for their processing plants.

National Electrification Administration (NEA)

Reforestation through tree farm establishment is practiced by the NEA. Through this effort, the NEA was not only able to harness the hydro-power energy production of the country, but also to lend a hand in the government's drive to conserve soil.

Nasipit Lumber Company (NALCO)

NALCO encourages farmers to plant falcata, yemane and lumbang by providing them with seedlings for tree farm establishment. As the tree farms develop, silvipasture schemes which involve cattle raising with improved forage cover under the tree crops is practiced simultaneous with tree crop production.

Paper Industries Corporation of the Philippines (PICOP)

The Paper Industries Corporation of the Philippines (PICOP) launched their agroforestry program in 1968. The program was basically planting of *Albizia falcataria* in the farm lots of interested farmers but leaving a portion of the land for agricultural crops.

Bukidnon Forest Incorporated (BFI)

This project is a joint venture with the New Zealand government. Its objective is to operate as a commercially viable enterprise in the business of forestry plantation through the establishment of 21,000 hectares of sustainable forest plantations in Bukidnon that will provide an alternative wood resource to the rapidly depleting indigenous timber supply thereby helping remove exploitation pressures from remaining natural forest resources. Since the start of the project in 1989, the project has planted 6,645 hectares of their 7,356 hectare-target (1989-1996).

7. Funding Arrangements

Generally, lands open for bidding for reforestation purposes are funded by the Asian Development Bank (ADB) and the Overseas Economic Cooperation Fund (OECF). Reforestation loans from the ADB and the OECF in 1989, so far amounted to \$ 240 million, divided equally among the two institutions.

Private sector such as the Paper Industries Corporation of the Philippines (PICOP) assisted farmers in establishing falcata plantations either financially through a loan from the Development Bank of the Philippines (DBP) or by giving technical assistance. A marketing

agreement was inked between PICOP and the landowner for PICOP to be given priority in the sale of the pulpwood during harvest time. To date, thousands of farmers/participants were able to establish more than 30,000 hectare. Many had already harvested their mature falcata and earned extra income from their tree farming. The program was able to uplift the economic condition of the people.

The government and the Philippine Wood Products Association (PWPA) are believed to have agreed on the mechanics and procedures that will govern the collection and disbursement of a reforestation trust fund. It is estimated to exceed 400 million pesos annually- that will ensure as "honest to goodness" effort at greening open and denuded areas in all logging concessions. In fact, the Department of Environment and Natural Resources (DENR) has announced the issuance of a set of guidelines needed to ensure the full enforcement of a requirement for every timber license agreement (TLA) holder to deposit 10,000 pesos for every hectare of forest which he intends to log.

The guidelines signed by then DENR Secretary Fulgencio S. Factoran Jr. states that all loggers must remit to the DENR - 25% of their total annual contribution within the first five days of each quarter, starting in the second quarter of 1988. Failure by any logger would be penalized with a daily surcharge of 0.1% of the total amount due. This surcharge will increase to 0.15% daily if the delay in payment exceeds 90 days. But a delay to remit beyond 180 days would mean a 30-day suspension of a logging company's cutting operations during which, payment must be made, or the TLA will be automatically canceled after the suspension periods expires and no compliance was made.

All proceeds of the required reforestation trust fund deposit will be kept as a private joint account in a reputable bank. The regulation also required all loggers to reforest an area not less than 50% of the hectarage they have earmarked for cutting operations. However, if the area subject to reforestation was located outside of the TLA area, the planting goal had to be more than 5% of the cutting area.

To withdraw the funds needed for the reforestation work, however, the licensee has to submit to the management committee a work and financial plan which is to be made under oath. The reforestation accomplishment will be monitored by DENR.

Aside from the above, the Lower House showed concern over the diminishing forest resources. Hence, they provided funds for reforestation and watershed rehabilitation through their Congressional Initiative Allocation (CIA) or their Countryside Development Fund (CDF).

8. Community Participation

In order to minimize and control further degradation of the forest areas, the government through the DENR implemented various community-based forestry programs. Some of the current efforts are presented hereafter.

8.1 Current Efforts

8.1.1 Forestry Sector Project

This project aims to reforest a portion of denuded forest lands through community-based forest management. Aside from this, it also aims to uplift the economic condition of the upland farmers and coast dwellers. In a community-based forest management project, the prime beneficiaries are the communities within the project area. With the collaboration of non-governmental

organizations (NGOs) and local government units (LGUs), the project has already covered 120 sites with an area of 57,800 hectares. This covers 120 communities with approximately 350 households.

8.1.2 Community Forestry Program (CFP)

This program is envisioned to establish a partnership among DENR, local communities, local government units and non-government organizations in community-based resource management. The strategy is to encourage the direct and active participation of local communities located near public forests in the protection of forest resources. With this arrangement, the communities are allowed to do sustainable forest utilization. Since 1989, the CFP has covered 250,000 hectares and benefited 23,000 households.

8.1.3 Integrated Social Forestry (ISF)

In more than a decade of implementing the ISF Program all over the country, parcellary surveys were made of about 900,000 hectares and more than 300,000 Certificates of Stewardship Contracts were issued. Also for every province, a model social forestry project was established called the Center for People Empowerment in the Uplands (CPEU's). These CPEU's serve as nuclei or centers for future area expansion of upland development and as training centers in capability development of LGU's in their effort to continue and expand the implementation of ISF projects in their own localities.

8.1.4 Forest Plantation Development

Reforestation of denuded forest is still one of the major programs of DENR. Appropriate approaches such as Forest Land Management Agreements (FLMAs), Industrial Forest Management Agreements (IFMAs) and Social Industrial Forest Management Agreements (SIFMA) have been developed to encourage communities and the private sector to be involved in the massive reforestation program of the country.

8.1.5 Watershed Development

Considering that even watershed reserves are already occupied by upland farmers, the DENR has shifted its strategy on the rehabilitation of watershed areas from pure protection of nature to combination of rehabilitation and protection with sustainable production.

8.1.6 Protected Areas Diversity

The passage of the National Integrated Protected Areas System (NIPAS) Act in 1992 redefined the approaches in the management of national parks. It is now based on the principle of sustainable development and biodiversity conservation. To date 18 priority Integrated Protected Areas (IPA's) in the country are being developed following prescribed management plans. A total of 198 more areas are waiting to be developed.

8.1.7 Coastal Environment Program (CEP)

Through DENR Administrative Order No. 19 which was signed April 22, 1993, the CEP was implemented to protect, conserve and manage the remaining mangrove resources, the sea grasses and coral reefs of the country through the active participation of coastal communities in planning, decision making and implementation of the program.

8.1.8 Multi-Sectoral Forest Protection Councils (MFPCs)

The DENR initiated the organization of MFPCs which also include local civic leaders, NGO's, church leaders, media, and private sectors. The MFPC's which are organized in critical areas aim to intensify forest protection.

9. Priority Concerns

Significant accomplishments in watershed management including biodiversity programs were made possible by the DENR with international cooperation. However, the current accomplishments are but a small fraction of what is really to be attained. Support in terms of financial and active involvement of the different sectors is still needed to implement plans and programs for the sustainable management and development of watersheds including biodiversity resources, with the aim among others, to mitigate the impact of water-related natural disasters.

In this context, the Philippine government, through the DENR, has drawn up plans to implement programs and projects in the following areas of concerns (Marcelo, 1996).

9.1 Expansion Of Community-Based Forestry Program

The success gained so far from Community-Based Forestry Management (CBFM) pilot sites has boosted the DENR's confidence in expanding the area covered by the program to 1.5 million hectares over the next decade. This initiative also supports the Philippine Strategy for Sustainable Development, the Social Reform Agenda and the Executive Order No. 263.

9.2 Strengthening Capabilities Of Centers For People Empowerment In The Uplands

In line with the objective of empowering upland communities and making them-self-reliant, especially in disaster preparedness including mitigation, Centers for People Empowerment in the Uplands (CPEU's) have been identified in every province. The challenge is to bring within the fold of sustainable development the millions of uplanders all over the country.

The CPEU's would serve as the nucleus for expansion of upland development approaches and techniques learned from experience and applied to other upland areas.

9.3 Integrated Watershed Management

The supply of water in terms of rainfall theoretically exceeds demand, and yet there is water crisis. The problem lies in the inability to catch, store and discharge water where it is needed. Among the reasons of this inability is the denudation of the watersheds. In the light of this issue, the DENR is boldly going forward and targeting the rehabilitation of major watersheds by the year 2000.

9.4 Land Information System

Land, being a limited and scarce resource, should be used in a rational and sustainable way. Hence, there is an immediate need to develop a coherent and systematic records management system as a tool for land use planning. A land use code, which is expected to be passed by the Philippine Congress, also makes land information systems a basic requirement for sustainable development.

9.5 Geohazard Survey And Risk Assessment

The Philippines is prone to various types of geologic hazards that include landslides, floods, earthquake, ground subsidence, saltwater intrusion, groundwater lowering, desertification, and coastal erosion. This project on geohazard survey and integrated risk assessment would generate geoscientific data and provide monitoring networks to determine geological changes and behavioral patterns. The program would help provide a scientific basis for integrated land use planning.

At present, the DENR capability to produce effective and integrated geohazard zonation maps and risk mitigating measures is hampered by the lack of high-resolution geoscientific data and inadequately trained technical manpower. To develop modern and sophisticated knowledge and technology for a geo-environmentally sound development in the country, the following project components will be undertaken (Ganapin, 1996).

- Baseline data sourcing and generation;
- Regional reconnaissance and geohazard surveys;
- Site-specific geohazard surveys coupled with multi-disciplinary risk assessment, and
- Modelling, prediction, monitoring and evaluation with the application of Geographic Information System (GIS)-based hazard zonation schemes.

10. Conclusion

The state of the Philippine environment is not at all rosy. The Department of Environment and Natural Resources is therefore accelerating its efforts to protect the country's dwindling forest resources. The government, through concerted efforts with all sectors and stakeholders, can minimize, and hopefully stabilize, the crisis by focusing on priority areas of concern. Likewise, an integrated land use plan, especially for watershed management, backed by intensive research studies, can provide the nucleus that would ultimately mitigate the prevailing problems on natural disasters.

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