The First Philippine National Report to the *Convention on Biological Diversity*

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May 1998

Protected Areas and Wildlife Bureau
Department of Environment and Natural Resources
Republic of the Philippines

Foreword

In many ways, this First National Report covering the achievements of the Philippines in fulfilling its obligations to the Convention on Biological Diversity (CBD), is significant.

The Philippines was among the active countries that have participated in the drafting the Convention, and saw it through the signing in Rio de Janeiro during the Earth Summit in 1992. We were also among the first 3 1 countries to ratify the convention which put the agreement into force in 1993. We participated actively in the first three Conferences of the Parties and all the inter-sessional meetings and conferences organized by the Secretariat of the Convention. The dynamic involvement of the Philippines has contributed to the success of the Convention and in bringing forward the significant achievements. This report documents the attainments of the country and how in our own way WC have contributed to the realization of the Convention's objectives.

The first national report is also significant because it covers the period of the Ramos Administration (1992- 1998) hence it provides documentary proof of the President's commitment to the environment and to biodiversity. In 1997, the international press dubbed the Philippines as 'the green tiger" of Asia, for giving "Southeast Asia its first real taste of environmental politics". This report further enhances this complimentary tag, because it lends credence to how the country is putting into action its vision for a sustainablc future. Among the highlights of the Ramos Administration is its demonstration of its commitments to the Earth Summit by taking bold initiatives ahead of most of the other countries in putting into effect the agreements entered into in Rio de Janeiro. The creation of the Philippine Council for Sustainable Development now serves as a model to other countries, and it was through the Philippines that sustainable development was placed in the agenda of the Asia Pacific Economic Cooperation (APEC). This national report therefore reinforces the record of the present leadership, and leaves a considerable mark in "ecological governance" that hopefully. will set a trend for the national leadership in the years to come.

The third significance is that this report has been prepared at a most momentous occasion for the Philippines: the celebration of its Centennial of Independence. This marks the beginning of the country's coming into its next 100 years, and this document acts as a report card to the country on how it has performed as steward to its biological diversity. The card will speak for itself to future generations, but the more important fact is that we took time to reflect on our achievements or even our mistakes, with the hope that future generations will replicate our successes, and learn from our mistakes.

We therefore humbly submit this report, not only to the Secretariat of the Convention on Biological Diversity in compliance to the provisions of the CBD, but also to the Filipino people. With our accomplishments, we hope that the cause for the conservation of biodiversity be taken up by future generations in partnership with other nations, since we all share the same vision which we all hope to achieve through the Convention on Biological Diversity.

VICTOR 0. RAMOS
Secretary
Department of Environment and Natural Resources

Preface

In June 1992, the United Nations Conference on Environment and Development (UNCED) also known as the "Earth Summit" was convened in Rio de Janeiro to address the worldwide call for a well-balanced economic development. The Earth Summit paved the way for the formulation of an Earth Charter, the adoption of Agenda 21 and the Rio Declaration, the negotiation of the Forest Principles, and the signing of the UN Framework Convention on Climate Change and the Convention of Biodiversity (CBD) by a majority of the more than 170 member-nations that attended the UNCED. The CBD, in particular, was signed by 156 countries, the Philippines included, after several intergovernmental negotiating sessions agreed on the text of the Convention.

In September 1992, the Philippine Council for Sustainable Development (PCSD) was created by Executive Order No. 15 as a manifestation of the country's adherence to the principles set forth at the Earth Summit. The PCSD institutionalized the government's commitments to the UNCED and and is therefore expected to ensure the implementation, coordination and monitoring of these commitments. It was also mandated to coordinate the formulation of Philippine Agenda 21 (PA 21). The PCSD was further strengthened in 1996 through Executive Order (EO) No. 370. Said EO provided for the creation of PCSD Committees and Sub-Committees, one of which is the Sub-Committee on Biodiversity under the Committee on the Conservation and Management of Resources for Development (CCMRD). This move heightened the participation of both government and civil society in biological diversity conservation and provided for deliberation of biodiversity-related issues.

The Philippines actively participated in the inter-governmental negotiation sessions on the draft text of the CBD before it was finally signed in 1992 during the Earth Summit. In October 1993, the Philippines ratified the CBD, underscoring the genuine concern of the government for the conservation of biological diversity and the wise use of its components for present and future generations.

Following the ratification of the CBD, the Philippine Strategy for Biological Diversity Conservation (PSBDC) was formulated through the concerted efforts of the Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR) and the members of the PCSD-CCMRD Sub-Committee on Biodiversity. In April 1994, the President approved in principle the PSBDC. The PSBDC identified the problems and issues confronting biodiversity conservation in the Philippines and proposed strategies to address them. It later became the basis for the preparation of the National Biodiversity Strategy and Action Plan (NBSAP).

The President issued Executive Order No. 289 in September 1995 directing the integration of the PSBDC into the sectoral plans, programs and projects of the national government agencies.

In September 1996, PA 21 or the national action agenda for sustainable development was adopted. Memorandum Order No. 399 was signed by the President "Directing the operationalization of the Philippine Agenda 21 and monitoring of its Implementation". PA 21 is the major response of the country to fulfill its commitments to the Earth Summit in 1992. It is a document crafted by various stakeholders in government, business and civil society and was formulated after an extensive and intensive process of coordination, cooperation, counter-parting and consensus building among the various stakeholders.

The Philippines' commitment to the CBD is continuously implemented and strengthened through participation in the Conference of the Parties (COP) and various inter-sessional meetings. From Nassau to

Jakarta to Buenos Aires, the Philippine positions to the various agenda of the COP have been fully articulated. The Philippines has also sent delegates to the SBSTTA and the Ad Hoc Working Group on Biosafety and continues to actively participate in the various workshops convened to discuss the clearing house mechanism and such contentious areas like Article 8J, access and benefit-sharing, and other issues of importance to developing countries.

This Report was prepared in compliance to Article 26 of the Convention. As agreed during the Third Meeting of the Conference of the Parties to the CBD held in Buenos Aires in November 1996, the first national report was to be submitted in January 1998. Due to unforseen delays, however, this Report is being submitted in time for the Fourth Conference of the Parties to be held in Bratislava in May 1998.

Organization of the Report

The preparation of the Philippine First National Report to the Convention on Biodiversity was guided by the "Suggested Guidelines for National Reporting on the Implementation of Article 6 of the CBD". 'For coherence and to demonstrate that provisions in the CBD are mutually supportive of each other, this report has been organized into six parts.

Part 1 presents a short profile of the biological resources in the Philippines.

Part 2 of this Report presents the National Biodiversity Strategy and Action Plan or the Philippine NBSAP as stipulated in Article 6. It chronicles the processes and events that eventually lead to the approval of the NBSAP by the President of the Philippines. It also describes the identified strategies and action plans as well as gives an update on its implementation.

Part 3 reports on measures implemented to conserve biodiversity since 1992 up to the present. This includes identification and monitoring, in-situ conservation, ex-situ conservation, sustainable use of biological components, incentive measures, impact assessment and minimizing adverse impacts, and technical and scientific cooperation (Articles 7, 8, 9, 10, 11, 14, and 18).

Part 4 deals with the implementation of national access and benefit sharing regimes in relation to Articles 15, 16 and 19 of the CBD. This covers discussions on access to genetic resources, access to transfer of technology and handling of biotechnology and distribution of its benefits.

Part 5 attempts to describe the coutry's capacity to implement biodiversity conservation measures in terms of research, training, public education and awareness, and information exchange.

Part 6 presents the level of support in terms of financial resources earmarked for biodiversity (and biodiversity-related) management activities in the country.

Finally, future directions for biodiversity conservation in the country are spelled out in the Postscript.

This Report complements the earlier publication entitled "Philippine Biodiversity: An Assessment and Action Plan" which was the result of the UNEP-funded Country Study done in 1996. That book contains the National Biodiversity Strategy and Action Plan of the Philippines. It is extensively quoted in this Report as a reference and is referred to simply as NBSAP. In a way, the Philippine National Report is an attempt to present the progress of implementation of the NBSAP within the framework set by the reporting requirements of the CBD.

Acknowledgements

The preparation of this report is the collaborative effort of the Department of Environment and Natural Resources, through the Protected Areas and Wildlife Bureau, and their various partners in biodiversity conservation, with the generous support of the UNDP-Philippines, who facilitated the provision of funding from the GEF. This support from the UNDP-Philippines is an extension of their previous assistance in the preparation of the National Biodiversity Strategy and Action Plan (NBSAP) for the Philippines. It is but one of the many cooperative efforts of Ms. Sarah Timpson, Resident Representative of UNDP, Mr. Jorge Reyes and Ms. Clarissa Arida that contributed greatly to the writing of the report.

The information in the report was largely based on the NBSAP, however, additional data came from various sources such as the Ecosystems Research and Development Bureau, PCCARD, SEARCA, Bureau of Fisheries and Aquatic Resources, Foundation for Philippine Environment, Department of Tourism, WWF-KKP, Philippine Sustainable Development Network, SEARICE, UPLB Institute of Biotechnology, and many others.

The members of Sub-Committee on Biodiversity under the Philippine Council for Sustainable Development also provided guidance and additional information to the Drafting Committee in the preparation of the report. Meetings of the Sub-Committee have been organized to present the outline of the report, then the first and second drafts of the report, and then the final draft. The invaluable inputs, and recommendations of the members helped shape the final substance of the report.

WILFFUDO S. POLLISCO
PAWB *Director* and
Chairman, Drafting Committee

Acronyms

ADB	Asian Development Bank
AEP	Aquatic Environments Program
ARCBC	ASEAN Regional Center for Biodiversity Conservation
ASEAN	Association of South-East Asia Nations
AUSAID	Australia Agency for International Development
BCN	Biodiversity Conservation Network
BFAR	Bureau of Fisheries and Aquatic Resources
BSWM	Bureau of Soils and Water Management
CADC	Certificates of Ancestral Domain Claim
CBD	Convention on Biological Diversity
CBFM	Community-Based Forest Management Program
CBFMA	Community-Based Forest Management Program Agreement
CEP	Coastal Environment Program
CEPCO	Coastal Environment Program Coordinating Office
CFI	Crocodile Farm Institute
CFP	Community-Based Forestry Program
CHM	Clearing house mechanism
CIDA	Canada International Development Agency
CITES	Convention on the International Trade in Endangered Species of Wild Flora and Fauna
CMCP	Cave Management and Conservation Program
CPPAP	Conservation of Priority Protected Areas Project
CRM	Coastal Resource Management
DA	Department of Agriculture
DAO	DENR Administrative Order
DANIDA	Danish International Development Agency
DENR	Department of Environment and Natural Resources
DOST	Department of Science and Technology
ECAN	Environmentally Critical Areas Network
ECC	Environmental Compliance Certificate
EEC	European Economic Community
EEP	European Endangered Species Breeding and Research Center
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMB	Environmental Management Bureau
ENRAP	Environment and Natural Resources Accounting Project
EO	Executive Order
ERDB	Ecosystems Research and Development Bureau
ESF	Economic Support Fund
EU	European Union
FAO	Food and Agriculture Organization
FMB	Forest Management Bureau
FMDP	Fisheries Management and Development Plan
FNP	Fund for Nature of the Philippines

FPE	Foundation for the Philippine Environment
FRAMP	Fisheries Resources Assessment and Management Program
FSDI	Foundation for Sustainable Development, Inc.
GATT	General Agreement on Tariffs and Trade
GEBP	Germplasm Enhancement and Breeding Program
GEF	Global Environment Facility
GTZ	German Technical Assistance
HFCNR	Haribon Foundation for the Conservation of Natural Resources
IAASP	Integrated Aquaculture-Agriculture Systems Program
IACBGR	Inter-Agency Committee on Biological and Genetic Resources
ICC	Indigenous Cultural Communities
ICLARM	International Center for Living Aquatic Resources Management
IDA	International Development Agency
IDRC	International Development Research Center
IEC	information, education and communication
IEMSD	Integrated Environmental Management for Sustainable Development
IIRR	International Institute for Rural Reconstruction
IP	Indigenous People
IPAS	Integrated Protected Areas System
IPR	intellectual property rights
IPRA	Indigenous People's Rights Act
IRRI	International Rice Research Institute
IRT	Ifugao Rice Terraces
ITC	Ifugao Terraces Commission
ITCPH	International Training Center on Pig Husbandry
IUCN	International Union for the Conservation of Nature and Resources / World Conservation Union
JICA	Japan International Cooperating Agency
KKP	Kabang Kalikasan ng Pilipinas
LDC	Livestock Development Council
LEIS	Lake Environment Information System
LEMS	Lake Environment Monitoring System
LEPS	Lake Environment Policy Studies
LESMP	Lake Environment Social Mobilization Program
LRNRC	Legal Rights and Natural Resources Center
MIS	Management information system
MOA	Memorandum of Agreement
MTPPDP	Medium-Term Philippine Development Plan
NBC	National Biodiversity Center
NBRU	National Biodiversity Reference Unit
NBSAP	National Biodiversity Strategy and Action Plan
NCIP	National Commission on Indigenous Peoples
NFFTRC	National Freshwater Fisheries Technology Research Center
NIPAP	National Integrated Protected Areas Project
NIPAS	National Integrated Protected Areas System
NGO	Non-Government Organization
NORDECO	Nordic Agency for Development and Ecology
NPGRL	National Plant Germplasm and Resources Laboratory
NPPSC	National Program and Policy Steering Committee
NRMP	Natural Resources Management Program

NTA	National Tobacco Authority
OECF	Overseas Economic Cooperation Fund.
PAMB	Protected Area Management Board
PA	Protected Area
PAWB	Protected Areas and Wildlife Bureau
PCAMRD	Philippine Council for Aquatic and Marine Research and Development
PCARRD	Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development
PCC	Philippine Carabao Center
PCG	Philippine Coast Guard
PCSD	Palawan Council for Sustainable Development
PCSD	Philippine Council for Sustainable Development
PEBAP	Primate Exporters and Breeders Association of the Philippines
PECF	Philippine Eagle Conservation Foundation
PNP	Philippine National Police
PHILFIS	Philippine Fisheries Information System
PSBDC	Philippine Strategy for Biological Diversity Conservation
PSSD	Philippine Strategy for Sustainable Development
PEBAP	Primate Exporters and Breeders Association of the Philippines
PIAF	Philippine Institute of Alternative Futures, Inc
PNM	Philippine National Museum
PRIAP	Policy Research and Impact Assessment Program Fauna and Flora
PSBDC	Philippine Strategy and Action Plan for Biological Diversity Conservation
PSSD	Philippine Strategy for Sustainable Development
RAW00	(Advisory Council for Scientific Research in Development Problems) of the Netherlands
RED	Regional Executive Director
SEAFDEC	Southeast Asian Fisheries Development Center
SEARCA	SEAMEO Regional Center for Graduate Study and Research in Agriculture
SEP	Strategic Environment Plan
SESAM	School for Environmental Science and Management
SICONBREC	Simian Conservation Breeding and Research Center
STCC	Science and Technology Coordinating Council
TDC	Tambuyog Development Center
TLA	Timber Licensing Agreements
TRIPS	Trade Related Aspects of Intellectual Property Rights
TURF	Territorial Use Rights in Fisheries
UNDP	United Nations Development Programme
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UP-MSI	University of the Philippines - Marine Science Institute
UP-SRF	University of the Philippines - Science Research Foundation, Inc.
USAID	U.S. Agency for International Development
USM	University of Southern Mindanao
VISCA	Visayas State College of Agriculture
WCSP	Wildlife Conservation Society of the Philippines
WHL	World Heritage List
WRI	World Resources Institute
WWF	World Wide Fund for Nature (formerly World Wildlife Fund)

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1.0 Profile of Philippine Biodiversity Resources

1. I Physiography

The Philippines is a tropical archipelago of 7,100 islands located off the southeastern coast of mainland Asia. The land area is approximately 299,404 square km while the territorial waters cover around 2,200,000 square km.

The Philippine coastal zone covers 11,000 square km of land and 267,000 square km of coastal waters, while the Philippine marine territorial waters cover approximately 2.2 million square km (the extent of the Philippine Exclusive Economic Zone), about 90 percent of which are oceanic waters.

I.2 Population

The population of the Philippines was 69 million in 1995. Growth rate, which is at 2.4 percent per year, is one of the fastest in Asia. If this trend continues, Philippine population is likely to reach 78 million at the turn of the century and tripling may occur in a span of four decades.

I. 3 Biological Diversity

I. 3. *l Ecosystem Diversity*

The Philippines is characterized by a) varied topography with numerous mountains of great heights, b) varying exposures to the shifting winds and typhoons, c) peculiar distribution of rainfall, and d) the *Kuro-Siwo* or Japanese current, which are warm equatorial waters flowing northward along the eastern coast. Such combination of factors have doubtless been responsible for the islands' complex mix of terrestrial and aquatic ecosystem and habitat types which include: natural terrestrial ecosystems: lowland evergreen rainforest, lower montane forest, upper montane forest, sub-alpine forest, pine-forest, forest over ultrabasic soils, semi-deciduous forest, beach forest and grassland; natural aquatic ecosystems: lakes, ponds, rivers, streams, freshwater marshes, peat swamps, mangrove swamps, nipa swamps, mudflats, seagrass beds and coral reefs; and man-made ecosystems: forest plantations, agroforest areas, protection forests, agro-ecosystems, aquaculture ponds and reservoirs.

a) Diversity in Forest Ecosystems

As the Philippines is an archipelago with varying terrain its species of flora vary. The Philippine forests can be classified into: dipterocarp (66%), mossy (19%), sub-marginal (9%), pine (4%), and mangrove (2%) (EMB, 1996). Another classification was cited by Sajise

(1997), which divided the country's principal terrestrial upland communities into seven broad categories, namely: beach, mangrove, molave, dipterocarp, ultra-basic, pine and montane.

The flora in the Philippine forests is composed of at least 13,500 species which represent five percent of the world's flora. The flowering plants is estimated to be between 8,000 to 12,000 species in 200 families and 1,500 genera; 20 percent is unknown while 27 to 75 percent is endemic (Sajise, 1997). The ferns and fern allies are estimated to be about 1,011 species; endemism is estimated at about 30 percent (Zamora et al, 1986). There are about 506 species of mosses and 23 percent (116 species) of these is confined to the country (del Rosario, 1986).

Animals found in the Philippine forests can be divided into two major groups: vertebrates and invertebrates.

- Vertebrates. There are 185 species of Philippine terrestrial mammals, and 62 percent (115 species) of which is endemic (PAWB-NBU, 1996). About 558 species of birds have been recorded and 17 1 of these are known to be found only in the Philippines (Tabaranza and Mallari, 1995). A total of 95 amphibian species are recognized to be found in the country, of which 54 percent (5 l species) is considered endemic (Espiritu-Afuang, 1995). Three amphibian species are known to be introduced in the country: *Bufo marinus*, a marine toad introduced in the 1930s to control beetle infestation of sugarcane; *Rana catesbeiana*, a bullfrog introduced in the 1970s for breeding and export as food; and *Rana rugulosa*, introduced in the 1990s for breeding and export as food.

- Invertebrates. The number of species of mollusks found in the Philippines is 2,782 (Faustino, 1928 in Pagulayan, 1995). There are 54 and 44 number of species of millipedes and centipedes, respectively (Wang, 1950). The number of insect species is reported to be more than 20,000 (Baltazar, 1990). Many more species remain to be discovered and identified, and level of endemism is generally poorly known.

b) Diversity in Freshwater Ecosystem

Philippine freshwaters are endowed with a rich diversity of flora (1,6 16 species) and fauna (3,675 species). These consist of algae, aquatic macrophytes, aquatic invertebrates, insects and fisheries, which represent the dominant components of the complex food webs of the ecosystems. While inventories of these groups have yet to cover the 78 lakes, 42 l major rivers, 4 major swamps/marshes and the many bays, estuaries and mudflats of the country, the initial biodiversity record of 5,291 species is impressive enough (PAWB-NBU, 1996).

The algae, which contribute substantially to the primary productivity of freshwaters, include 1,177 species in 2 12 genera and 6 classes. However, of the 360 species of blue-green algae reported, about 70 percent often occurs in terrestrial habitats, Aquatic macrophytes include 43 1 species of angiosperms, 1 bryophyte species and 7 species of ferns and fern allies in 73 families. Of these 439 species of macrophytes, only 13 are endemic.

From the FishBase (1997) data of ICLARM, the Philippines has a total of 230 freshwater fish species: 97 are primary, 103 are secondary, and 30 are introduced. Of these, 228 are reportedly threatened species, 3 l are endemic, while 53 species are used in fisheries. Ten classes of invertebrates representing 1,703 species have so far been recorded, with the mollusks (728 species) and arthropods other than insects (498 species) as the biggest groups.

The insects cover 1,764 species in 395 genera, 73 families and 9 orders; of these, 1,146 species are endemic and often confined to specific localities within the country.

c) Diversity in Coastal and Marine Ecosystems

Results of inventories and surveys so far conducted in the Philippine coastal and marine ecosystems indicate that at least 4,95 1 species of marine plants and animal exist. Of these, 1,396 species (28 %) are economically important, 403 species (10%) are flagship species, while 142 species (2.4%) are under threat, 15 species are listed as endangered, and 16 species are endemic (Mendoza and Magpantay, 1997).

In terms of distribution among the ecosystems along the Philippine coasts, coral reefs are the most diverse with 3,967 species, covering an area of about 25,000 square km. There are 400 species of hard corals belonging to 70 genera in the Philippines (McManus, 1997).

FishBase (1997) data recorded 1,771 marine species, 237 species in marine/brackishwater, and 1 introduced species. Of these, 721 species are used in fisheries, while19 and 23 species are reported threatened and endemic, respectively.

Next to coral reefs, seagrass beds are the most diverse with 48 1 species. The 16 taxa of seagrasses give the country the second highest seagrass species richness in the world. The diversity of Philippine mangroves has also been found to be high with 370 species (PAWB-NBU, 1996). On the other hand, the soft bottom communities has the lowest recorded species richness - 70 species.

d) Diversity in Agriculture (Agrobiodiversity)

The results of various studies and inventories consolidated a total of 1,210 species of plant species relevant to agriculture. Of these, 477 angiosperms relevant to agriculture have food values, 20 l have ornamental values, and 35 species are considered fiber crops.

On domesticated exotic species, the animal population in 199 1 as reported by the NSO totaled 2,766,000 carabaos, 1,99 1,000 cattle, 286,000 horse, 7479,000 hogs, 2,403,000 goats and 56,000 of the domesticated exotic species. Aggregate poultry population which includes chicken, ducks, quails, geese, turkeys and pigeon total 10 1,235,000 heads. From among the eleven domesticated exotic species types (including poultry) only carabaos showed substantial decrease in numbers. The others increased their respective population during the eleven-year period.

1.3.2 Species Diversity

The spectra of ecological niches or habitat types support innumerable life forms: monerans, protists, fungi, plants, and animals which make the Philippines a country of high species diversity. The number of species is estimated to be more than 53,577+. This includes more than 4,855 monerans, protists, viruses, fungi, lichens and algae; more than 10,450 plants comprised of bryophytes (1,271), ferns and their allies (1,031), gymnosperms (33) and angiosperms (8,120+); and more than 38,267 animals comprised of poriferans (200), cnidarians (400+), platyhelminths (undetermined), nematodes (undetermined), annelids (700+), anthropods (25,000+), molluscs (8,000+), echinoderms (641) and chordates (3,326+). High species endemism is observed among algae (90 of 865+ or 14%), lycopsids (38 of 77 or 49%), ferns (296 of 950+ or 31%), flowering

plants (5,800 of 8,091 or 72%), amphibians (41 of 65 or 63%), reptiles (74 of 101 or 73%), birds (169 of 556) and mammals (122 of 240 or 51%).

1.4 Spatial Pattern of Biodiversity

Eighteen sites have been identified as centers of plant diversity (Table 3) in the Philippines. Nearly all of them represent various types of protected areas which harbor species of great economic importance and are under some kind of threat in varying degrees. Many of them remain botanically undercollected, and surveys are expected to yield new and endemic taxa.

Six major island groups, namely: the Greater Luzon, Greater Mindanao, Greater Palawan, Greater Negros-Panay, Greater Sulu, and Mindoro contain unique fauna1 assemblages, most of which are single island endemic, i.e., they cannot be found in other islands of the Philippines nor anywhere else, and are thus considered as centers of animal diversity. To illustrate the single island endemism, a recent biodiversity inventory of Camiguin islands by Heaney, et al, resulted to the addition of three to four species of mammals found in the islands since 1960, three to four species of which are described for the first time. Heaney's group concluded that Camiguin Island, which is about 265 square km could be the smallest island in the Philippines to have unique species of mammals. It could also possibly be the smallest island in the world to contain three unique species of mammals. The possibility that other such discoveries could be made is so strong that this should be one of the priority areas of research in any biodiversity program.

The Philippines can also be divided into two distinct zones based on the distribution of the marine taxa, namely: a high diversity South China Sea Zone in the west and a lower diversity Pacific Ocean Zone in the east. High marine biodiversity areas include: Central Visayas, North and Central Luzon, Southern Luzon, and Mindoro. The observed patterns of distribution and recruitment of marine organisms point to the importance of the northern part of the country in the straddling stocks of migratory species such as marine mammals, marine turtles and fish species like tuna, mackerel and sardines. It is postulated that the reef areas in the Spratly's Islands may play a crucial role in being the source of larvae for the rest of South China Sea. On the other hand, larvae coming from Palawan could be carried down to Borneo or Malaysia. Hence, the Philippine reefs could be a rich source of genes and biodiversity in various parts of Southeast Asia.

The Philippines is divided mto fifteen biogeographic zones based on floristic, faunistic, and geological composition of geographic areas in the country. They are: Batanes, Northern and Southern Luzon, Cordillera, Sierra Madre, Zambales, Mindoro, Calamian, Eastern Visayas, Western Visayas, Central Visayas, Palawan, Mindanao, Zamboanga, Liguasan and Sulu (Table 1 and Figure 2).

1.5 Rates of Change in the Biodiversity

The rate of biodiversity loss has been rapid. To illustrate, the forest cover in the country has been reduced from more than 50 percent to less than 24 percent over a 40 year period (1948-1987); only about 5 percent of the country's coral reefs remains in excellent condition, 30-50 percent of its seagrass beds in the last 50 years, and about 80 percent of its mangrove areas in the last 75 years has been lost. It has been estimated that about 50 percent of national parks are no longer biologically important.

1.6 Threats to Biodiversity

Biodiversity loss in the Philippines stems from causes classified into four broad categories:

- Habitat destruction and loss. Habitat destruction and loss can be traced to anthropogenic activities such as: destructive and unsustainable practices such as logging, human-induced fires, land conversion, siltation, destructive fishing methods and encroachment and occupancy in protested areas; and natural calamities like volcanic eruptions, earthquakes, natural fires, typhoons, and pests and diseases.

- Overexploitation. Population pressure, poverty and paucity of livelihood opportunities, changes of values, and the "open access" nature of many bio-resources all contribute to the overexploitation and non-sustainable use of the country's biodiversity.

- Chemical or environmental pollution. The wetlands ecosystems in particular, take much toll from chemical wastes from mine tailings, hazardous wastes from industrial plants, factory discharge, mine tailings, agricultural fertilizer and pesticide run-offs, and even household wastes.

- Biological pollution. The introduction of exotic species (biological pollution), has occurred by and large in wetland ecosystems, particularly in lakes and rivers, and has been at the expense of the local endemic and indigenous species either directly through predation, competition, and hybridization or indirectly through parasites and habitat alteration.

2.0 *The National Strategy for Biodiversity Conservation*

In 1987, the Department of Environment and Natural Resources was created through Presidential Executive Order No. 192, which also mandated the said department to formulate a National Conservation Strategy. This resulted in the drafting of the Philippine Strategy for Sustainable Development (PSSD) that was subsequently approved by the President of the Philippines in 1989.

2.1 *Background*

The PSSD was the country's response to the global call for a well-balanced development and meeting present needs without limiting options for the future. The PSSD aims to achieve and maintain economic growth without depleting the stock of natural resources and degrading environmental quality.

There are ten major strategies in the PSSD, namely:

1. Integration of environmental considerations in decision-making.
2. Proper pricing of natural resources.
3. Property rights reform.
4. The conservation of biodiversity.
5. Rehabilitation of degraded ecosystems.
6. Strengthening of residuals management.
7. Population management, and the development of human resources.
8. Inducing growth in the rural areas.
9. Promotion of environmental education.
10. Strengthening of citizens' participation

The PSSD provided the foundation for the implementation of a new paradigm for development in the country. It was the framework that eventually led to the formulation of future sustainable development policies, programs and projects throughout the nation. It also prepared the country for the Earth Summit that was to be held in Rio de Janeiro in June 1992. Among the agreements signed at the summit was the Convention on Biological Diversity (CBD), with the Philippines as one of the signatories. The country's commitment to the conservation of biodiversity is one of the basic objectives of the PSSD.

In September 1992, the President of the Philippines created the Philippine Council for Sustainable Development (PCSD) to respond to the commitments of the country at the Earth Summit. The PCSD was tasked, among others, to formulate the Philippine Agenda 2 1 as the national blueprint for sustainable development. Supporting the PCSD are the various sub-committees one of which is the Sub-committee on Biodiversity. This is chaired by the Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR), and is also the National Focal Point of the Convention on Biological Diversity.

The initial proviso in the Convention on Biological Diversity calls for the development by the Contracting Parties of national strategies plans and programs for biodiversity conservation. These should reflect the measures set forth in the Convention, and as far as possible, should be integrated into the sectoral plans, programs and policies of the country. In compliance with this provision, and in order to further elaborate on the PSSD strategy of biodiversity conservation, the Sub-Committee on Biodiversity began in 1994 to formulate the Philippine Strategy for Biological Diversity Conservation (PSBDC). This was to serve as a framework for a national biodiversity program for the country. This document contained 18 broad objectives addressing the following concerns: a) biodiversity policy; b) sustainable use; c) sustainable agriculture; d) biotechnology; e) property rights, f) community-based management, g) stakeholder participation, h) in-situ and ex-situ conservation, i) inventory and research, j) ancestral domains, k) education, 1) traditional knowledge, and m) capacity building.

The PSBDC was completed and approved by the President in that same year. To further support the conservation of biodiversity and underscore the significance of the PSBDC, the President of the Philippines signed Memorandum Order No. 289 in July 1995. This Order mandates the integration of the PSBDC in the sectoral plans, programs and projects of all government agencies. It also includes the operationalization of the objectives of sustainable use of biodiversity resources as embodied in the PSBDC.

As one of the major recommendations of the PSBDC and in response to the country's commitment to the Convention on Biological Diversity, the PAWB embarked on the preparation of the Biodiversity Country Study in 1995 This project was realized with funding assistance from the United Nations Environment Program (UNEP). The project also included the refinement of the PSBDC into the National Biodiversity Strategy and Action Plan (NBSAP) for the Philippines.

The formulation of the NBSAP involved the participation of a multidisciplinary team of noted experts from the academe, govemmcnt, NGOs and the private sector. It has undergone a planning process that includes multi-sectoral consultative forums not only at the central government level but also down to the regional level. UNEP's Ten Guiding Principles guided the planning process for Biodiversity Planning, which prescribes an adaptive, cyclical and participative undertaking.

The NBSAP was completed in 1996 and was submitted to the Philippine Council for Sustainable Development for approval and endorsement to the President. The President approved this in June 1997 with the corresponding instructions for the integration of the NBSAP into the sectoral plans at the national and local levels. A summary of the NBSAP is presented as follows.

2.2 *The Philippines Biodiversity Country Study and the National Biodiversity Strategy and Action Plan*

2.2. I Goals and Objectives

The goals of the NBSAP, which are consistent with those of the Convention on Biological Diversity, are:

a) The conservation of biodiversity through improved knowledge and management systems;

b) research and development, better information available, and institutional support mechanisms;
c) The sustainable use of biodiversity; and
d) The equitable sharing of the benefits of biodiversity.

The objectives of NBSAP are:

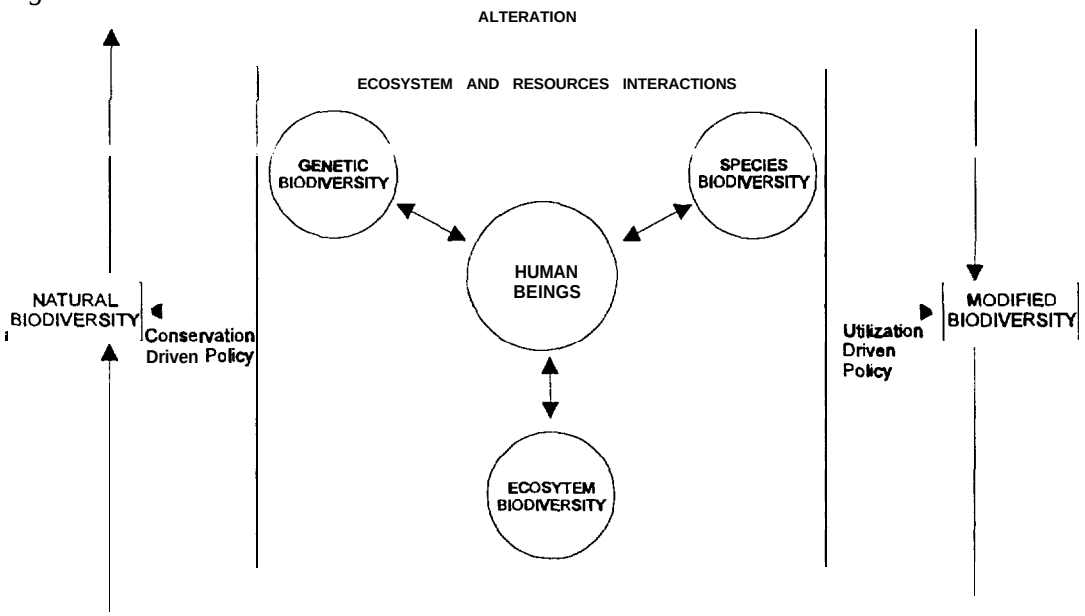
a) The collaborative application of conservation strategies and management approaches;
b) The formulation of policies for the conservation, sustainable use, and equitable sharing of biodiversity;
c) The integration of biodiversity conservation strategies in development planning;
d) The practice of conservation ethics for biodiversity;
e) Multi-sectoral participation in biodiversity conservation; and,
f) The fulfillment of the country's obligations to the various international agreements on biodiversity.

2.2.2 *Framework*

The framework of the NBSAP is anchored on the symbiotic relationship between man and the components of biodiversity and the need to keep this in equilibrium in order to achieve sustainability.

Figure 1 below, shows the diagrammatic linkages within the NBSAP framework. At the core are the components of biodiversity, namely genes, species and ecosystems and their interactions. These are connected to man who occupies center stage playing a key role in balancing the lasting existence and sustainability of these components in order to survive and improve the quality of his existence.

Figure 1



The figure shows the forces affecting the various components as changes occur naturally or through human necessity. When man uses biodiversity sustainably, biodiversity is conserved. When demands increase, there is inevitable pressure on the present stock. Hence, the logical direction is conservation or preservation of biodiversity.

The formulated strategies, programs and projects that make up the action plan are focused on achieving the balance sought by the established framework and the human interaction with biodiversity.

2.2.3 *Strategies and Actions*

Strategy 1 *Expanding and improving knowledge on the extent, characteristics, uses and values of biological diversity*

The thrusts of this strategy are threefold: a) the augmentation of knowledge on species and ecosystems, b) estimating the current uses and values of biodiversity, and c) underscoring the need to hedge for the future.

The first thrust - the increase in knowledge of biodiversity- is a basic requirement for biodiversity conservation and management. There should be efforts to intensify the inventories of flora and fauna. This knowledge should also be made accessible in order to promote conservation, and proper planning and management. The proposed programs and projects for this strategy aim to increase knowledge on the components of biodiversity.

The second thrust focuses on the need to study the values of biodiversity in terms of its economic. social, ecological, and cultural importance. The third thrust, in relation to the second emphasizes the need to determine options for the future with respect to biodiversity.

There are three programs identified under Strategy I. The first one is biodiversity inventory, which aims to fill the data gap and create baseline information. Under this program, there are twelve projects that include: plant, animal and microbial resources inventories; carrying capacity assessments of critical habitats and ecosystems; interhabitat connectivity studies; ecological and population studies; estimation of rates of change in coral reefs; and determining environmental indicators.

The second program is on ecosystem mapping/data validation and aims to geographically locate the distribution of biological resources in the country, primarily through geographic information systems, use of aerial photos and base mapping. This program has five projects such as: mapping of biodiversity-rich areas; and the use of geographic information systems.

The third program consists of socio-economic studies on aspects covered by five projects. The first project is aimed at indigenous knowledge systems. Indigenous communities are traditional repositories of biodiversity information that have for centuries been the primary factor in its conservation. The established values attached to biodiversity by indigenous communities are part of the worth of biodiversity. The second project deals with valuation of biological resources, and the third one focuses on valuation of coral reef and seagrass resources. The fourth project is the integration of biodiversity in the Philippine Population Management Program, and the fifth project is the development of ecologically oriented population database.

Strategy 2 ***Enhancing and integrating existing andplanned biodiversity conservation efforts with emphasis on in-situ activities***

The second strategy focuses on three thrusts. The first one is the evaluation of present biodiversity conservation and management approaches, both in-situ and ex-situ, and identifying potential ones. All on-going endeavors such as programs and projects for in-situ conservation of biodiversity should be appraised in terms of effectiveness to the overall national conservancy goals. Ex-situ conservation should be seen as a last resort, and to complement in-situ efforts.

The next thrust is the consolidation of research and development programs for in-situ and ex-situ conservation of biodiversity. In terms of research at the ecosystem level, there are two interdependent components: the preservation of ecosystems and/or the restoration of those that are degraded. At the species level, research work is focused on their biology and ecology. At the genetic level, work is centered on germplasms. At present, all of these are done independently. There is a need to integrate the research and development program for a more focused approach.

The third thrust is the setting up networks of conservation centers such as botanical and zoological gardens, gene banks, seed banks, captive breeding farms, and sanctuaries. This is to ensure the survival of endangered species. There is also a need to link in order to complement each other.

There are two major programs to implement this strategy. The first program is on in-situ conservation, with eleven proposed projects. Among these are: the rehabilitation of damaged critical habitats and ecosystems; restoration of coastal ecology in seagrass and coral reefs; conservation of mother trees for seed and seedling production; in-situ conservation centers for wild relatives or economically-important species; landscape-lifescape approach to watershed management; ecotourism development plans; and whale watching stations.

The second program is on es-situ conservation, with four projects, These include the recovery and reintroduction of endangered species: the establishment of botanical gardens and wildlife rescue centers; and the establishment of gene and seed banks.

Strategy 3 ***Formulation of an integrated policy and legislative framework for the conservation, sustainable use and equitable sharing of benefits of biodiversity***

Under this strategy, there are two major thrusts, the first of which is the alignment of policies on the use of biodiversity by pursuing a systematic evaluation of policies. There are numerous policies on biodiversity and there seems to be a problem of implementing them. This lack of political will has resulted in conflicts of uses and the depletion of biodiversity resources over the years. An important task is the codification of all these policies in order to address most of the conservation issues on biodiversity.

The second thrust involves the formulation of policies that promote the proper use of biodiversity in order to make it sustainable and encourage its equitable use. The use of biodiversity resources should be set within the limits of its sustainability. National policies on utilization of natural resources have had great impact on biodiversity, particularly since these policies have tended to promote exploitation.

There are three projects and three activities proposed under this strategy. The first project is the review and codification of existing policies and the formulation of new policies that are responsive to current conservation goals. **Second,** the development of a realistic system of economic instruments for the use of biodiversity resources. The third project is the delineation of ancestral domains.

The first activity under this strategy is policy advocacy to support the inclusion of biodiversity concerns in pending bills, and to push for the enactment of legislation related to biodiversity conservation. The second activity is the formulation of guidelines for proper land use planning with particular focus to integration of biodiversity conservation concerns. This intends to cover the development of a methodology for biodiversity conservation planning. The third activity is the assessment of protected areas under the National Integrated Protected Areas System (NIPAS).

Strategy 4 ***Strengthening capacities for integrating and institutionalizing biodiversity conservation and management***

The fourth strategy has two major thrusts, and two programs. The first thrust is the integration of the planning, implementation, evaluation and monitoring of biodiversity conservation and management in all levels of government and non-government sectors. The second thrust involves the strengthening of human resources capability for biodiversity conservation and management.

The first program under this strategy is the institutional capacity building, which has three projects and two activities. The first project is the establishment of a Philippine Biodiversity Center that will undertake the responsibility of maintenance and dissemination of information on biodiversity, oversee the implementation of the NBSAP, coordinate all biodiversity activities in the country, and to conduct trainings on biodiversity conservation and management. The second project is the establishment of an inter-agency advocacy group on Population-Biodiversity-Environment. The purpose of this group is to create a mechanism whereby the knowledge on population, development and environment with explicit biodiversity specifications may be translated into policies and programs. The third project is the enhancement of population-biodiversity specification of the EIA System.

The first of two activities under the first program is the creation of the Philippine Marine Biodiversity Conservation Committee to integrate and coordinate all activities pertaming to the conservation and management of marine biodiversity in the country. The second activity is the expansion of the membership of the PCSD Sub-committee on Biodiversity.

The second program under Strategy 4 is human resource development. It includes two projects and one major activity. The two projects involve the development of capacity on biodiversity conservation planning for private sector stakeholders, and then for government decision-makers. The activity under this program is the creation of a curriculum development Committee for school courses that incorporate biodiversity conservation in secondary and tertiary levels.

Strategy 5 ***Mobilization of an integrated IEC system for biodiversity conservation***

There are three thrusts and three programs under this strategy. The primary thrust is increasing the access to updated biodiversity information and database systems. The second thrust is the institutionalization of community-based education and research on biodiversity conservation.

The third thrust is the harnessing of traditional and alternative media to increase public awareness and support for biodiversity conservation.

The first program under this strategy is on biodiversity conservation awareness and information for local communities. This is premised on the importance of people's participation in biodiversity conservation. For this program, there are three projects. The first one is the popularization of educational materials on biodiversity conservation ethics and strategies. The second project involves the implementation of an integrated IEC system for biodiversity conservation, the purpose of which is to develop, disseminate and evaluate the impacts of, materials promoting biodiversity conservation drawing on local and indigenous knowledge. The third project is community organizing and biodiversity conservation training for local stakeholders. This is meant to enhance the organizational capability of stakeholders in managing biodiversity programs and projects.

The second program for Strategy V is community-based biodiversity conservation education and research, in order to ensure truly grassroots participation. Three projects are included in this program. First is the technical competency training on biodiversity research and management information system (MIS). This aims to develop a pool of competent researchers and to set up MIS at various local levels. The second project is the development of a pilot village biodiversity research and MIS, to try out on a limited scale, and for possible replication in other villages. The third project involves the integrated research, development and training program for enhancing biodiversity and productivity of Philippine grasslands.

The third program is the development of value-added products and alternative sustainable livelihood for communities that are dependent on biodiversity resources. This is in order to provide incentives to communities to maintain and protect biological resources, and use them sustainably. The single project under this program is for the building of local capability for development and management of alternative sustainable development livelihood enterprises. This is aimed at lessening the dependence of local communities on biodiversity resources through development of alternative enterprises.

Strategy 6 *Advocating stronger international cooperation on biodiversity conservation and management*

As signatory and active participant to the various major international agreements on biodiversity and its components this strategy advocates for stronger cooperation. There are three thrusts for this strategy. First is the operationalization of the Philippine commitments to international agreements related to the Convention on Biological Diversity and other similar agreements. To support this, the second thrust is for the creation of oversight institutions to oversee the coordinated implementation of the CBD and other agreements such as the Ramsar Convention, CITES, Bonn Convention and others. The third thrust envisions the strengthening of NGO linkages with international counterparts for biodiversity conservation.

A major project proposed for this is the establishment of the ASEAN Regional Center for Biodiversity Conservation (ARCBC) in the Philippines. As a leading proponent of biodiversity conservation in the ASEAN, the Philippines is the host country for this project. The principal objective of the project is the development of a network of institutional links among ASEAN member countries in order to enhance the capacity of ASEAN in biodiversity conservation.

The project has four principal components: network and institution building, training, research, and database establishment.

2.3 *Status of Implementation*

The approval by the Philippine Council for Sustainable Development in 1996 and subsequently by the President in 1997 marked the official implementation of the NBSAP. An initial activity to promote the NBSAP was its presentation to the donor community in order to convey to them the directions that the Philippines would like to take in order to advance the conservation of biodiversity. This presentation was held during the Consultative Meeting on the Conservation of Biodiversity held on June 20, 1996. The meeting was participated in by the international donor community in the Philippines, such as the World Bank, UNDP, FAO, UNESCO, Asian Development Bank, Japan International Cooperation Agency, USAID, World Wide Fund for Nature (WWF), AUSAID, GTZ, World Resources Institute, and many others, including local donors such as the Foundation for Philippine Environment (FPE).

As a result of the consultative meetings, various programs and projects are now under consideration. Since that time, some projects have been submitted to the Global Environment Facility through UNDP for consideration, and a major GEF project is forthcoming for an in-situ conservation program in Samar Island. Other major GEF projects are under review by UNDP, and all of these are based on the NBSAP. Other donors have provided funds such as the World Resources Institute (WRI) which is currently funding the initiatives on bioprospecting. An exchange program with the Government of Costa Rica is in the offing for the sharing of expertise, training and information on biodiversity conservation particularly in the aspects of bioprospecting and protected area planning and management.

The valuation of biodiversity resources is also now in the agenda of the government's Environment and Natural Resources Accounting Project (ENRAP). Under this project, four studies are now being conducted and these involve the contingent valuation of protected area fees, the determination of user fees for protected area resources, the computation of access fees, and the development of a manual for valuation with respect to protected area management.

As envisioned in the NBSAP, the delineation of ancestral domains will be hastened with the enactment of the Indigenous Peoples Rights Act (IPRA) which recognizes the rights of indigenous peoples to their ancestral domains. This law now provides the basis for the identification, delineation and management of ancestral domains, and creates the institution to carry out this mandate.

The establishment of the National Biodiversity Center (NBC) is also underway with funding assistance from IUCN, and supported by UNDP-GEF, and soon with the establishment of the ASEAN Regional Center for Biodiversity Conservation (ARCBC). The NBC shall serve as the Clearing-house Mechanism for the Convention on Biological Diversity as provided for under the convention.

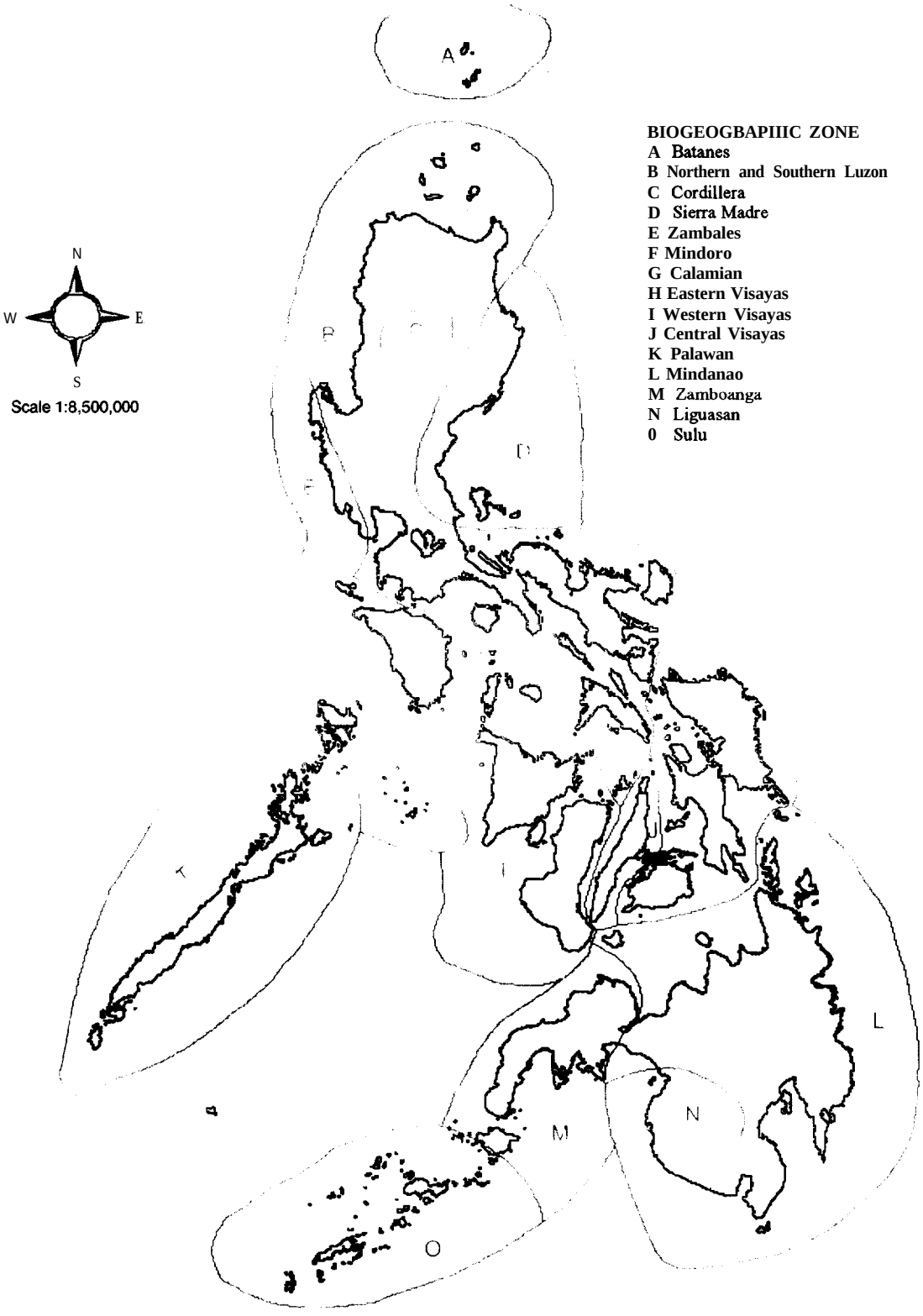
The establishment of the ARCBC has been realized through the approval of the Financing Agreeement between the Philippines, in behalf of ASEAN, and the European Union for a grant of 8.5 million ECU to set up the center. The project will assist ASEAN member countries in developing improved technical and institutional approaches for managing biodiversity

conservation. The Agreement was signed in July 1997 and the project commenced thereafter. Support will also be provided for the establishment of National Biodiversity Reference Units in the AS EAN member countries.

Many of the programs and projects that advance the cause of the NBSAP are discussed at the appropriate chapters of this report. Needless to say, these various programs and projects and the others that are currently being implemented by the various agencies and NGOs involved in biodiversity conservation, are based on the NBSAP, and are reflective of the strategies and thrusts as envisioned.

Figure 2

BIOGEOGRAPHIC ZONES
Philippines



3.0 Biodiversity Conservation Measures Implemented (1992-l 998)

Biological diversity, or biodiversity, is an umbrella term for the degree of nature's variety (WRI, 1992). It also refers to the variety and variability among living organisms (moneran, protista, fungi, plants and animals) and the ecological complexes in which said organisms occur. Biodiversity is usually divided into three hierarchical categories - genetic diversity, species diversity, and ecosystem diversity.

a) *Genetic Diversity* is the sum total of genetic information, contained in the genes of individual organisms that inhabit in the earth. It refers to the variation of genes within a species (WRI, 1992). Each organism is indeed a repository of immense number of genetic information which can be as much as 1,000 genes in single-celled organisms to more than 400,000 in flower-bearing plants and animals. Measurements of genetic diversity has until recently been applied mainly to domesticated species and populations held in zoos or botanic gardens, but the techniques are increasingly being applied to wild species (WRI, 1992).

b) *Species* ***diversity*** refers to the variety of species within a region (WRI, 1992). It is the variety of living organisms on earth which is estimated to be between five and fifty million or more, although only about 1.4 million have been described. A group of organisms genetically so similar that they interbreed and produce fertile offsprings is called a species. Members of a species are usually recognizably different in appearance, allowing one to distinguish one from another, although sometimes the differences are subtle. There are many different ways of measuring species diversity, and scientists have not settled on a single best method. The number of species in a region - its species richness - is often used as a measure of species diversity, but a more precise measurement, "taxonomic diversity", takes into account how closely related species are to each other (WRI, 1992).

c) *Ecosystem* ***diversity*** relates to the variety of habitats, biotic communities, and ecological processes in the biosphere as well as the tremendous biodiversity within ecosystems in terms of habitat differences and the variety of ecological processes. Two different phenomena are frequently referred to under the term ecosystem diversity: i) the varieties of species within different ecosystems: the more diverse the ecosystems contain more species; and ii) the variety of ecosystems found within a certain biogcographical or political boundary. Ecosystem diversity is harder to measure than species or genetic diversity because the "boundaries" of ecosystems and communities are hard to define. Nevertheless, as long as a consistent set of criteria are used to define communities and ecosystems, their number and distribution can be measured (WRI, 1992).

WRI (1992) advances that human cultural diversity could also be considered part of biodiversity, as, like, genetic or species diversity, some attributes of human cultures (e.g., nomadism or shifting cultivation) represent "solutions" to the problems of survival in particular environments. Cultural diversity is said to be measured by diversity in language, religious beliefs, land management practices, art, music, social structure, crop selection, diet, and any number of other attributes of

human society. Shengji and Sajise (1995) note that biodiversity as an ecosystem feature is a product of the interactions between the natural and social systems in a given situation. While biodiversity in the natural system is a manifestation of interactions between various units and levels (i.e., genetics, species, populations, communities, ecosystems, landscapes, and biogeographic units), the social system interacts with the natural system in terms of culture, technology, economics, information organization, indigenous knowledge, and others.

3.1 *Identification and Monitoring*

The basic requirement for the formulation of a sound biodiversity conservation strategy is to have a good knowledge base of the resource and its components. This means adequate scientific characterization involving the main units of variations (e.g. genes, species, ecosystems), and the quantification of variation within and between them (GBA, 1995). To date, there has been limited work in basic inventory of the country's biological diversity.

3. *I. I Ecosystems and Habitats*

Organisms are not evenly distributed, rather, they occur in an intricate spatial mosaic, classified on a world scale into biogeographic zones, biomes, ecoregions and oceanic realms. These also occur at a variety of smaller landscapes into ecosystems, communities and assemblages.

The Philippine Biodiversity Country Study was able to identify several classifications of ecosystems and habitats as to biogeographic zones, biodiversity-rich ecosystems, centers of diversity, as well as areas for migratory species. Additional areas such as protected areas for agriculture, research sites, sites of cultural importance and areas of high endemism are included in this report.

a) Biogeographic Zones

The Philippines has been ecologically divided into fifteen biogeographic zones. These zones were delineated based on floristic, faunistic and geological composition of geographical areas in the country (Figure 2). Table 1 shows the biogeographic zones of the Philippines, their corresponding areas and their respective biodiversity quality

Table 1 Biogeographic zoning of the Philippines

Biogeographic Zone	Total Area (hectares)	Low Biodiversity Quality (hectares)	Medium Biodiversity Quality (hectares)	High Biodiversity Quality (hectares)
1. Batanes	19,887	19,887	0	0
2. Northern and Southern Luzon	8,760,910	7,34 1,208	976,010	443,692
3. Cordillera	62 1,627	446,225	150,571	24,83 1
4. Sierra Madre	1,680,159	646,739	54,620	492,800
5. Zambales	322,556	283,365	24,775	14,416
6. Mindoro	1,018,068	923,259	56,564	38,245
7. Calamian	164,554	112,25 1	37,126	15,177

Biogeographic Zone	Total Area (hectares)	Low Biodiversity Quality (hectares)	Medium Biodiversity Quality (hectares)	High Biodiversity Quality (hectares)
8. Eastern Visayas	2,156,908	1,882,145	394,292	240,471
9. Western Visayas	2,649,736	2,476,122	113,247	60,367
10. Central Visayas	456,743	436,450	1,523	18,770
11. Palawan	1,258,920	589,932	135,601	533,387
12. Mindanao	7,035,944	4,486,166	1,613,906	935,872
13. Zamboanga	1,668,032	1,323,057	240,599	104,376
14. Liguasan	1,109,423	965,260	122,587	21,576
15. Sulu	358,484	335,437	11,926	11,121
Total	29,642,951	22,267,503	4,419,347	2,955,101
% of Total		75	15	10

Source: Philippine Biodiversity: An Assessment and Action Plan, 1997

b) Biodiversitv-rich Ecosystems

Evaluation of biodiversity quality is a subjective measure of the likely condition of biodiversity in a given land use. This measure is a qualitative assessment of the level of disturbance or loss of biodiversity within the land use type, and thus categorized as high, medium and low biodiversity. In this assessment, high biodiversity quality is considered biodiversity-rich area (NBSAP, 1997).

Dipterocarp, mangrove and mossy forests, and coral reefs are identified as biodiversity-rich ecosystems in the Philippines. Shown in the table below are their respective areas in hectares per biogeographic zone.

Table 2 Biodiversity-rich ecosystems in the Philippines

Biogeographic Zones	Dipterocarp Forests (hectares)	Mangrove Forests (hectares)	Mossy Forests (hectares)	Coral Reef (hectares)	Total Area (hectares)	% of BZones' Area
1. Batanes	0	0	0	0	0	0
2. Northern and Southern Luzon	278,434	21,834	48,226	95,198	443,692	15.0
3. Cordillera	16,159	0	8,672	0	24,831	0.8
4. Sierra Madre	373,081	3,284	108,599	7,836	492,800	17.0
5. Zambales	10,821	53	0	3,542	14,416	0.5
6. Mindoro	19,519	2,659	12,777	3,290	38,245	1.0
7. Calamian	0	1,944	0	13,233	15,177	0.5
8. Eastern Visayas	142,326	34,385	2,617	61,143	240,471	8.0
9. Western Visayas	40,446	1,558	1,665	16,698	60,367	2.0

Biogeographic Zones	Dipterocarp Forests (hectares)	Mangrove Forests (hectares)	Mossy Forests (hectares)	Coral Reef (hectares)	Total Area (hectares)	% of BZones' Area
10. Central Visayas	0	40	0	18,730	18,770	0.6
11. Palawan	403,896	3 1,582	39,372	58,535	533,387	18.0
12 Mindanao	873,617	21,443	8,500	32,3 12	935,872	32.0
13. Zamboanga	59,927	17,059	0	27,390	104,376	3.5
14. Liguasan	17,387	961	0	3,237	21,576	0.7
15. Sulu	0	6,503	0	4,618	11,121	0.3
Total	2,235	143,307	230,428	345,762	2,955,101	100.0
% of Total Area of Biogeographic Zones	7.5	5	8	12	100	100.0

Source: Philippine Biodiversity: An Assessment and Action Plan, 1997

Protected areas such as watershed forest reserves, wilderness areas, game refuges, wildlife sanctuaries and national parks are also considered as areas rich in biodiversity. However, it should be noted that only parts, and not the whole protected areas are actually biodiversity-rich.

c) Centers of Diversity

A combination of factors have been responsible for the existence of the complex mix of ecosystem and habitat types that characterizes the Philippine landscape and waterscape. These factors include a) varying exposures to the shifting winds and typhoons, b) great heights of numerous mountains, c) peculiar distribution of rainfall, which in reality is conditioned by (a) and (b) above. Last but not the least of these factors is the *Kuro-Siwo* or Japanese current which are warm and equatorial waters flowing northward along the eastern coast of the archipelago.

Centers of Plant Diversity

Eighteen sites have been identified as ecosystems and habitats containing high plant diversity in the country. To be included as a center of plant diversity, a set of criteria developed by the Threatened Plants Unit at Kew, England was considered (Cox, 1988). Table 3 shows these centers with their respective location/biogeographic zone.

Table 3 Centers of plant diversity in the Philippines

Centers of Plant Diversity	Biogeographic Zone
1. **Mount Iraya + Sabtang island**	Batanes
2. **Sierra Madre Mountains (Isabela)**	Sierra **Madre**
3. Mount Pulog (Benguet)	**Cordillera**
4. Mount Arayat (Pampanga)	**Not-them/Southern Luzon**
5. Mount Makiling (Laguna)	**Northern/Southern Luzon**
6. Lobo (Batangas)	**Northern/Southern Luzon**
7. **Mount Isarog** (Camarines Sur)	**Northern/Southern Luzon**

8. Mount Halcon (Mindoro)	Mindoro
9. Coron Island (Calamianes Group)	Calamian
10. Palawan Mainland	Palawan
11. Southern Samar	East Visayas
12. Sibuyan Island (Romblon Group)	West Visayas
13. Mount Canlaon (Negros Oriental)	West Visayas
14. Mount Talinis + Lake Balinsasayao	West Visayas
15. Mount Baloy (Central Panay)	West Visayas
16. Mount Kitanglad (Bukidnon)	Mindanao
17. Agusan Marsh (Agusan del Sur)	Mindanao
18. Mount Apo (Davao City, Davao del Sur, Northern Cotabato	Mindanao

Source: *Philippine* ***Biodiversity: An Assessment and Action*** *Plan,* ***1997***

Centers of Animal Diversity

Six major islands are also identified as centers of animal diversity, namely: the Greater Luzon, Mindoro, Greater Palawan, Greater Negros-Panay, Greater Mindanao, and Greater Sulu. These island groups and their sub-provinces contain unique fauna1 assemblages, most of which are endemic and cannot be found in other islands of the Philippines.

Centers of Marine Diversity

The Philippines can also be divided into two distinct marine biodiversity zones, namely: a high diversity South China Sea Zone in the west, and a lower diversity Pacific Ocean Zone in the east. These divisions coincide well with the types of tides dominating the western and eastern sections of the Philippines. The influence of the South China Sea is greater, and mixed diurnal tides predominate at the west coast. Whereas, semi-diurnal tides predominate on the eastern side where the effect of the Pacific Ocean is greater. Variations of tides provide increase in the exposure to changes in the environment. These changes are often sufficient to account for the abrupt restrictions in the vertical distribution and presence of species (NBSAP. 1997).

d) Areas for Migratory Species

The Philippine archipelago lies 97 km south of Taiwan, 965 km from mainland Asia, and within a few kilometer off Borneo. It is ideally situated to form an important link in pathways for migratory birds, such as East Asian Flyway. Migrating birds are dependent on the availability of rich feeding grounds, such as inter-tidal flats, shallow lakes and marshlands, to allow them to accumulate fat reserves necessary for long distance movements.

Although there are many other significant areas in the Philippines, the two most important sites identified for migratory waders are Manila Bay and Olango Island. Migratory species like the threatened Speckled Reed Warbler (*Acrocephalus sorgophilus*) of China, the vulnerable Chinese Egret *(Egretta eulophotes)* which breeds in North Korea and China, and the Japanese Night-heron *(Gorsachius goisagi)* are known to winter in these sites.

e) Protected Areas for Agriculture

A network of protected areas for agriculture has also been established by the Department of Agriculture (DA) to cover the following:

- all irrigated and potentially irrigable lands;
- all alluvial plains highly suitable for agricultural production as determined by the Bureau of Soils and Water Management (BSWM);
- all sustainable lands that are traditional sources of food;
- all croplands that support the existing economic scale of production required to sustain the economic viability of existing agricultural infrastructure and agro-based enterprises in the province or region;
- all productive lands in low calamity-risk areas suited for the production of economic trees and other cash crops; and
- all agricultural lands that are ecologically fragile and whose conversion will result in serious environmental problems.

f) Research Sites

In general, some protected areas are to some extent research sites. However, based on completed and on-going studies on biodiversity conservation, the following could be considered as important research sites:

1. Irawan Flora and Fauna Reserve
2. Mount Kitanglad
3. Mount Guiting-Guiting
4. Bicol National Park
5. Subic Bay Forest
6. Sierra Madre Mountains
7. Mount Makiling
8. Cape Bolinao
9. Sumilon Island
10. Olango Island
11. Liguasan Marsh
12. Calauit Island
13. Laguna de Bay
14. Tubbataha Reef
15. Turtle Island
16. Camiguin Island

g) Sites of Cultural Importance

The Ifugao Rice Terraces (IRT) of the Cordilleras was listed in the UNESCO World Heritage List (WI-IL) under the new category "Living Cultural Landscape" in December 1995. These rice terraces are about 2,000 years old. Although there is no exact figure on its dimensions, it is said that if connected on ends, its total length would span halfway of the globe. Its inclusion in the WHL is a recognition of IRT as one of human being's greatest achievements. The Management Plan formulated by the Ifugao Terraces Commission (ITC) for the preservation and

development of the rice terraces, includes, among others, massive reforestation, water and watershed management, and agricultural management program. ITC was created by virtue of Executive Order No. 158 to serve as an advisory body to the President for the formulation of short- and long-term plans for the restoration and preservation of IRT.

h) Areas of High Endemism

There are strong geological and zoogeographic evidence to support the view that the island of Palawan was once have been connected to Borneo during the Pleistocene Period. However, the islands of Luzon, Mindanao, Mindoro and Negros-Panay were not connected to the Asian mainland , and most probably with one another (Heaney, 1986). The implication is that the islands of the Philippines have a very high degree of endemism; about 67% of the species among the major groups of animals and plants in the Philippines occur nowhere else in the world (NBSAP, 1997). Table 4 shows a comparison of endemism in the faunal regions of the Philippines and the Sunda Shelf Islands in terms of native of non-volant mammals. The extraordinarily high percent of uniqueness or 'endemicity' among these species can be noted in the Philippines compared to those in Sunda Shelf Islands. It also shows that Palawan having been connected once to Mainland Asia has lower endemism than Luzon or Mindanao.

Table 4 Comparison of endemism in the Philippines and Sunda Shelf Islands

Fauna1 Region	**Number of Native** Species	**Number of Endemic Species**	**Percent of** Species Endemic
Sunda Shelf Islands			
Borneo	124	31	23-35
Sumatra	110	7	6
Java	61	7	11
Malay Peninsula	112	3	2
Philippines			
Greater Mindanao	33	26	79
Greater Luzon	29	20	71
Negros-Panay	8	9	12
Mindoro	15	6	40
Greater Palawan	25	11	44
Total (Philippines)	93	79	85

Source: *Hearrey 1985* *Note : Introduced* Species *Excluded*

3.1.2 *Species and Communities*

The most threatened endemic mammal in the Philippines is the Tamaraw, *Babalus mindorensis, while the* most threatened endemic bird is the Philippine eagle, *Pithecophaga jeffetyii.* Both species are estimated to have a wild population of less than 200 each, and are now the subject of captive breeding studies.

Eighty-six species of birds found in the Philippines are under various forms of threats ranging from being vulnerable to being extinct in the wild. Forty-five of these eighty-six species are either extinct in the wild, critical, or endangered. Forty of these forty-five species are endemic birds,

making the Philippines, the number one country in the world in terms of threatened endemic species of birds (NBSAP, 1997).

Only two species of amphibians and three species of reptiles in the Philippine forests are classified under various threatened categories. Also, thirty species of terrestrial mammals are classified under various threat categories, from being rare to being endangered (IUCN, 1994). These numbers, however, will change once the various on-going inventories are completed.

Madulid (EMB, 1996) of the Philippine National Museum cited ten Philippine plant species that are either rare, endemic and/or endangered, namely:

- *Rafflesia manillana* Teschem. (Rafflesiaceae)
- *Cinnamomum cebuense* Kosterm. (Lauraceae)
- *Cycas chamberlainii* Br. and Kienh. (Cycadaceae)
- *Rosa transmorrisonensis* Hayata. (Rosaceae)
- *Calamus* spp. (Palmae)
- *Tectona philippinensis* Beth & Hook. f. (Verbenaceae)
- *Vana'a sanderiana* Reicho.f. (Orchidaceae)
- *Paphiopedilum* spp. (Orchidaceae)
- *Taxus sumatrana* (Mig.) de Laub. (Taxaceae)
- *Nepenthes* spp. (Nepenthaceae)

Comprehensive inventories of the plant species were provided by various authors at different periods. Based on these, a total of 1,663 plant species relevant to agriculture were consolidated. Of these plant species, 477 angiosperms have food values, 353 have feed values, 632 have medicinahherbal values, and 201 have ornamental values. Table 5 shows the numbers of angiosperm species known to be endemic, introduced or naturalized in the country.

Table 5 Uses of endemic, introduced and naturalized angiosperm species

	Food	Feed	Ornamental	Medicinal
Endemic	28			15
Introduced	87	155	64	168
Naturalized	5	12	3	9
of unknown origin	357	186	134	440
Total	477	353	201	632

Source: Philippine Biodiversity: An Assessment and Action Plan. 1997

Wildlife used by indigenous people for food, medicine and other purposes are listed in Table 6. It can be noted that the animals are not the usual commercial domestic exotic species consumed or utilized by the lowlanders. Basing on their uses, these wildstocks are of significant importance for the preservation of their cultural practices.

Table 6 Wildlife used by indigenous groups, and uses

Location / Indigenous Group	Wildstock	Uses
Cordillera and Northern Luzon: *Kankana-ey, Ifugao*	lizard, snake	symbol of life, used in tombs and weaving design

Location / Indigenous Group	Wildstock	Uses
Central and Southern Luzon: *Dumagat, Aeta, Agta*	hombill, wild pig, *bato-bato*	
Western Visayas: *Batac, Tagbanua* Mindoro: *Hanunuo*	monkey, deer, wild pig, wild chicken *man-og (snake), ibid, halo* (lizard), *kabog* (bat), *madal (white* wildcat), *garong* (black wildcat), *cagang* (crabs), *tabang* (shrimp), *sai-log-sili* (eel), etc.	for food
Mindanao: *T'boli, Moro-Magindanao; Manobo; Moro-Tanuag; Lumad-Tedurag/Tiruray*	wildpig, hombill	for food and decorations. (The beak is burned and the smoke is inhaled by ashmatic persons .)
	monkey	for medicinal purposes: to cure human skin diseases and anti-plague for chicken.
	sawa (snake)	for food; for medicinal purposes: for gall bladder problems and rheumatism
	usa (deer)	for decoration and clothing (the horn is burned)
	milo (civet cat)	for decoration; textile; symbol

*ource: **Philippine Biodiversity:** Assessment and Action Plan, 199 7*

Some species can be used as biological indicators to characterize the condition of the local environment. Its presence and absence, behavior and physiology could give useful information on the condition of habitats. Some marine species in the Philippines are identified as biological indicators primarily through field observations, and sometimes supported by literature. Little scientific studies have been conducted to prove that they are truly so. Few examples of environmental condition associated with the presence of these species/indicators in the marine ecosystems are shown in the table below.

Table 7 Some biological indicators in the marine ecosystems

Indicator Species	Condition(s) Indicated
Diadema setosum (black sea urchin)	disturbed reef condition
Cyanochloronta (bluegreen algae)	high in inorganic nutrients
Cymodocea, Halodule: *Holdule uninervis, Halophila ovalis*	branching in these species indicate limiting light condition; overcrowding generally adverse
Enhalusa coroides; Thalassia hemprichii	climax reef condition
Padina (on top of corals)	dying coral condition

Indicator **Species**	**Condition(s) Indicated**
heavy epiphyte load	eutrophication (nutrient loading)
high species diversity / low abundance	favorable condition (biological control)
low species diversity / high abundance	unfavorable condition (physical control)
Halimeda; Caulerpa	soft sediment condtion
Sargassum	hard bottom condition
Dugong dugon	sizeable seagrass bed
Sagitta setosa (arrow worm)	more coastal than oceanic waters
butterfly fish	good reef condition

Source: Philippine Biodiversity: An Assessment and Action Plan, 1997

As of December 1994, the National Plant Germplasm and Resources Laboratory (NPGRL) maintains a total of 32,446 accessions of 396 species (Table 8).

Table 8 Number of species and accessions of various crops in the NPGRL

Crops	**Species**	**Accessions**
Cereals	**3**	**3,039**
Fiber crops	**3**	**235**
Forage / pasture	**37**	**228**
Fruit trees	101	**619**
Legumes	11	11,300
Nut trees	12	66
Oil crops	12	374
Plantation crops	100	224
Rootcrops	7	1,029
Small fruits	39	172
Vegetables	71	15,160
Total	296	32,446

Source : Philippine Biodiversity: An Assessment and Action Plan, 1997

Additionally, other institutions, such as the Philippine Rice Research Institute (Philrice), Bureau of Plant Industry (BPI), National Tobacco Authority (NTA) have capacities for maintaining and conserving germplasm of important crops. Philrice reported that in 1992 it maintained, among others, twelve species of wild rice from the International Rice Research Institute (IRRI) germplasm center and from its collections in the different parts of the Philippines. The NTA reported that its germplasm collection has increased to 488 accessions in 1995 (NBSAP, 1997).

3. I. 3 Monitoring

Monitoring is the "repeated measurement of biological entities or processes over a time series" (GBA, 1995). It is closely linked with inventory and is essential in providing feedback in adaptive management programs.

To date, biodiversity monitoring efforts are few, fragmented and need to be systematized and/or standardized. Some of these efforts are components of survey/inventory activities, while others are components of research.

An initiative to standardize/systematize a monitoring system for all protected areas is currently being implemented in three CPPAP sites: Subic-Bataan, Northern Sierra Madare and Mount Kitanglad Natural Parks. This project is being funded by the Nordic Agency for Development and Ecology (NORDECO). It aims to develop a biodiversity monitoring and evaluation system, and information, education and communication in the aforementioned three sites.

3.1.4 *Initiatives to maintain and organize data*

There are efforts of various government agencies, non-government organizations and other institutions to identify and inventory the flora and fauna species in the Philippines, some of which are enumerated hereunder.

- Book on Flora of the Philippines. The preparation of the Book on Flora of the Philippines involves a thorough inventory of the flowering plants of the country, the establishment of a.. comprehensive systematic record and specimen collection of various plant species in the country and the consequent publication of the book. The inventory activities include collection of herbarium specimens in 10 replicates; plant description and identification; habitat description; and plant processing, sorting, and distribution to different herbaria abroad. Approximately 70,000 specimens have been collected throughout the country and are now distributed in various herbaria in the United States, Europe, Philippines and other Asian countries. The project is initiated by the Philippine National Museum (PNM), in collaboration with the Botanical Research Institute of Texas.

- Red Data Book on the Plants of the Philippines. The Red Data Book on the Plants of the Philippines is a comprehensive reference on rare and endangered plant species of the country. The book contains a list of plants with a short botanical description, assessment of threats, and conservation status for each species. The research involves plant collection, field documentation, and herbarium and literature survey.

- The Philippine Red Data Book: Red List of Threatened Animals. In 1997, the Philippine Red Data Book: Red List of Threatened Animals was published. It is to a large extent adapted directly and modified from the 1994 IUCN Red List of Threatened Animals. To enhance the usefulness of the available data, a more basic information on the species are added including synonym(s), residency status, and distribution, together with brief notes on the species habitat, reproductive data, diet, behavior, social organization, and conservation threats. The book is one of the major contributions of the Wildlife Conservation Society of the Philippines (WCSP) to the Philippine biodiversity research and conservation.

- Red Data Book on Philippine Wildlife. Research and publication on the conservation status of the different species of wildlife is being undertaken by the Wildlife Conservation Society of the Philippines, Inc. This project is supported by the Friends of the Zoo-Australia.

. Conservation of Biological Diversity in the Sierra Madre Mountains of Isabela and Southern Cagayan Province. Philippines. This joint conservation project of the DENR and Birdlife International (Philippines) was developed to survey and assess the biodiversity and habitats found in the Sierra Madre Mountains. The research involved primarily a survey of birds, ethnobiology of the indigenous people, and vegetation and land-use description.

This was accomplished through literature survey, actual field research which included transect survey of birds, bioacoustics, mist-netting of birds, trapping of small mammals, and aerial survey of vegetation and land use.

- Subic Bav Forest Research. Subic Bay Forest Research involves a survey of the flora and fauna, ecology, ethnobotany of the Aetas, and pharmacological and genetic/DNA fingerprinting studies. This multi-institution research is being coordinated by the Philippine Council for Agricultural Resources Research and Development - Department of Science and Technology (PCARRD-DOST).

- Establishment of Long-Term Ecological Research Sites. This project to establish permanent ecological research plots in three different forest types and strategically located areas around the country has been initiated by the Philippine Plant Inventory Staff of the PNM. The plot set-up and research methodology, which was designed following the Missouri Botanical Garden's procedure, aims to compare the diversity of various forest habitats and the wildlife associated with it. Ecological research sites were established at the Irawan Flora and Fauna Reserve in Palawan, Mount Kintanglad in Bukidnon, Mount Guiting-Guiting in Sibuyan Island, and at the Bicol Natural Park in the Bicol Region. Identification of specimens was done at the PNM, Field Museum of Natural History in Chicago, Kew Botanic Gardens and US National Herbarium.

- Book on Plant World of the Philippines. This publication is an illustrated of Visayan plant names with their scientific Tagalog and English equivalents. This book was compiled and edited by Dr. Franz Seidenschwarz and was published by the University of San Carlos - Botany Research Group.

- Conservation and Maintenance of Biological Diversity in Tropical Forests Managed Primarily for Timber Production (Surigao del Sur . Philippines). This project is being conducted by a private entity and is unique in that it deals with a plantation forest. The project includes a component on plant identification and database generation among others.

Several initiatives are underway to inventory and identify the flora and fauna in the Philippines, but little progress has been made in database systems that will ensure broad and transferability of data and interpretation of research results Also. the conservation efforts can be best achieved if biological information and data are not only made available, but also relayed to the interested public in a way it can be understood and appreciated.

The International Center for Living Aquatic Resources Management (ICLARM) addresses the need to consolidate the available knowledge about the aquatic resources through their Aquatic Environments Program (AEP). Two of their significant contributions to current awareness and understanding of global biodiversity are the FishBase and the ReefBase. FishBase is a global database which combines key information on fish with time series data on their occurrence and abundance and their currently recognized status of threat. ReefBase, on the other hand, is a global database of coral reefs, documenting the location, extent and depth zonation of the reefs, and their exploitation and conservation status.

The Biodiversity Information Center aims to provide the general public primary and secondary information on plants and animals by building plant and animal information databases which are

based on the Philippine National Museum's extensive collections of natural history specimens and other relevant information from various field researches. Other activities involve are field researches to gather primary first-hand information on biodiversity-rich areas in the Philippines, synthesizing in layman's language the voluminous biodiversity research, gathering and maintainance of computerized data base on local and foreign publications dealing with plant diversity and conservation techniques, and the publication of researches.

The Philippine Fisheries Information System (PHILFIS) is a fisheries information database system which is the processing center for priority fisheries data/information from the five networked agencies under the Department of Agriculture (DA). These agencies are:

a) Bureau of Fisheries and Aquatic Resources (BFAR) and Fisheries Sector Program (FSP)
b) Philippine Fisheries Development Authority
c) Bureau of Agricultural Statistics
d) Bureau of Agricultural Research
e) Department of Agriculture Computer Service

At present, the PHILFIS has ten sub-systems, namely: a) map information, b) habitat, c) environment, d) fisheries resources, e) research and technology, f) policies, plans and programs, g) marketing and infrastructure, h) support services, i) BFAR library, and j) Systems Administration.

Other government agencies like PAWB, ERDB and PCARRD conduct research studies that have resource inventory components albeit on a very limited scale. These studies are on specific floral and fauna1 species on particular locations. Examples are the study on the diversity of mites in Mount Makiling, air fauna1 survey of CEP sites in Central Visayas, and survey/inventory of wildlife resources in Palawan Experimental forest, among others.

3.2 *In-Situ Conservation Measures*

The centerpiece response of the Philippine government to protect and conserve its biodiversity resources is the establishment of an integrated protected areas system. The legal basis for this policy is embodied in two major legislation passed by the national government, namely:

- Executive Order 192 (series of 1987), creating the Protected Areas and Wildlife Bureau (PAWB), which is mandated to consolidate all government efforts in the conservation of natural biological resources through the establishment of a network of protected areas system.

- Republic Act 7586 (series of 1992), otherwise known as the National Integrated Protected Areas System (NIPAS) Law, which provides for the establishment and management of NIPAS to promote biodiversity conservation and sustainable development.
  Protected Areas (PAs) are among the most important on-site (in-situ) tools for conserving biodiversity. PAs are set aside to conserve species that cannot be preserved off-site (*ex-*situ). They are considered the most cost-effective means for preserving genes, species and habitat, and for maintaining various ecological processes of importance to humanity. Species diversity of PAs are maintained by protecting the range of different habitat types and by allowing for changes in species distribution. It is in this context that the Philippines

has created a comprehensive integrated protected areas system. Its goal is to protect and preserve all the representative ecosystems and habitat types, as well as the species of plants and animals found therein.

The Integrated Protected Area System (IPAS) was initiated in 1986 through a project grant by the World Wide Fund for Nature(WWF) of the United States. The following year, Executive Order 192 was issued creating the Protected Areas and Wildlife Bureau (PAWB) under the Department of Environment and Natural Resources (DENR). The agency is mandated to consolidate all government efforts in the conservation of natural biological resources through the establishment of a network of protected areas.

3.2. *I IPAS Project*

In 1988, the IPAS Project was completed and a report entitled "Development of an Integrated Protected Areas System in the Philippines" was submitted to the DENR and WWF. The report contained a listing and mapping of potential PAs which were classified as terrestrial, wetland and marine, indicating level of priorities for each site.

The IPAS was further pursued in the World Bank's FFarm Study through the IPAS 1 Project of DENR. Funded by the Japanese Government through a grant to the Philippine Government under the administration of World Bank, it was sub-contracted to two NGOs: The University of the Philippines Science Research Foundation, Inc. (UP-SRF) and the Foundation for Sustainable Development, Inc. (FSDI), under the supervision of WWF-Philippine Program.

The main objective of the IPAS 1 Project was to select ten priority PA sites from an indicative NIPAS of 342 potential sites. The other objectives were to prepare a draft legislation for PAs and to conduct a crash training program on PA management for DENR and NGOs.

The ten priority sites were selected based on a set of criteria including:

- Ecosystem Type Considerations. At the very early stages of the project, it was decided that the ten sites should include terrestrial, wetland and marine ecosystems. However, it was finally decided that the ten priority sites should be composed of five terrestrial ecosystems, two wetlands, two marine ecosystems, and one mixed ecosystem;

- Conservation Values. This set of factors includes endemism, biodiversity, endangered species, remaining prestine habitats, size, uniqueness, and scenic values; and

- Other Considerations. This consists of legal, security and financing factors.

The ten priority sites selected were: Subic-Bataan, Northern Sierra Madre, Apo Reef, Mount Canlaon, Mount Kitanglad, Turtle Island and Mount Apo National Parks; Batanes and Siargao Landscapes/Seascapes; and Agusan Marsh Wildlife Sanctuary.

3.2.2 *The NIPAS Law*

In June I, 1992, a law was issued by virtue of Republic Act No. 7586, otherwise known as the National Integrated Protected Areas System (NIPAS) Law. The Law provides for the

establishment and management of a comprehensive system which encompasses outstandingly remarkable areas and biologically important public lands that are habitats of various species of plants and animals. Considered ambitious, the establishment of the System is one distinct strategy for biodiversity conservation and sustainable development.

The specific provisions of the NIPAS Law are: a) identification of protected area categories; b) establishment of standard planning process; c) NIPAS administration by DENR; d) creation of Protected Area Management Board; e) establishment of a trust fund for NIPAS; f) recognition of ancestral rights; and g) institutionalization of environmental impact assessment. Supporting guidelines are enumerated in detail in Table 9. The Protected Areas and Wildlife Bureau (PAWB) of the DENR, as stipulated in the guidelines, is mandated to implement the said law.

There are other special features of the NIPAS Law. These are:

- It provides answers to the serious problems confronting biodiversity conservation by introducing many innovative policies or directions upon which the government can work hand in hand with the public, non-government organizations, local government units, indigenous cultural communities and simple migrants.

- It adopts a decentralized system of PA management. The management of a protected area rests with the Protected Area Management Board (PAMB), which is a multi-sectoral body that consists of representatives from the local government units, national government agencies, NGOs and indigenous cultural communities.

- It requires the development of a standard planning process that will be used by all PA Superintendents and PAMBs in developing site-specific management plans. A General Management Planing Strategy will be used in all areas that comprise the system.

- It establishes the Integrated Protected Areas Fund (IPAF), a trust fund for purpose of promoting the sustained financing of the System. The fund may receive revenues generated within protected areas, donor support and other funds as provided by law, and disburse the same to finance projects of the *NIPAS*.

Upon the passage of the NIPAS Law in 1992, some areas were immediately designated as the initial components of the National Integrated Protected Areas System (NIPAS). These are areas or islands proclaimed or designated pursuant to a law, presidential decree or proclamation, or executive order as national park; game refuge or bird sanctuary; wilderness; mangrove reserve; fish sanctuary; natural and historical landmark; protected and managed landscape/seascape as well as identified virgin forest. There are 203 areas that comprise the initial components of the System, covering an aggregate area of approximately 3.8 million hectares distributed all over the regions and representing 12.8 percent of the total land area of the Philippines. These are comprised of 67 national parks/marine reserves, 8 game refuge and bird sanctuaries, 16 wilderness areas, 85 watershed forest reservations, 27 mangrove swamp forest reserves, and identified old growth forest covering about 8,000 hectares.

Table 9 Supporting guidelines of the National Integrated Protected Areas (NIPAS) Law

NUMBER	DATE OF ISSUANCE	TITLE	ABSTRACT
DENR Memorandum Circular 20 (DMC 20)	10 September 1990	Guidelines on the Restoration of Open and Denuded Areas within National Parks and other Protected Areas for the Enhancement of Biodiversity	The guidelines specify the areas to be restored, including the recommended planting materials to be used and the restoration scheme to be adopted.
DENR Memorandum Order 10 (DMO 10)	04 September 1991	Guidelines on the Conduct of Resources Basic Inventory (RBI) within the Protected Areas	The Order sets forth the guidelines to be followed in the conduct of RBI within protected areas.
DENR Administrative Order 25 (DAO 25)	22 June 1992	NIPAS lmplementing Rules and Regulations	The Order serves as the implementing rules and regulations of Republic Act 7586, otherwise known as the NIPAS Law.
DENR Administrative Order 52 (DAO 52)	9 October 1992	DAO 120, S 1989, otherwise known as "Genera1 Rules and Regulations on the Participation of Non-Government Organizations (NGO) in the DENR Program" as amended	The Order provides the rules and regulations on the participation of the NGOs in the DENR programs.
DENR Memorandum Circular No. 22 (DMC 22)	29 December 1992	Guidelines in the Preparation and Submission of Maps of Areas Covered by the NIPAS	The Circular contains the procedures in the preparation and submission of the maps of areas covered by the NIPAS for submission to Congress and the senate and for public notification.
DENR Administrative Order No. 2 (DAO 2)	5 January 1993	Rules and Regulations for the Identification, Delineation and Recognition of Ancestral Land and Domain Claims	The Order defines the rights and responsibilities of ancestral domain land claimants. It also provides for the preparation of management plans for the same.
Malacanang Memorandum Circular No. 28 (MMC 28)	9 January 1993	Request for Presidential Approval of Administrative Orders, Executive Orders, etc.	The Circular provides the checklist of requirements for the approval of executive orders, administrative orders and other Presidential issuance.
DENR Administrative Order No. 13 (DAO 13)	2 March 1993	Guidelines in the Census and Registration of Protected Area Occupants (CRPAO)	The order provides guidelines and procedures in the conduct of CRPAO to provide DENR management with basic data as basis for establishing management zones and buffer zones, and for the preparation of the management programs including the identification of alternative livelihood opportunities.
DENR Memorandum Circular No. 10 (DMC 10)	05 May 1993	Guidelines on the Implementation of Development Activities for Selected National Parks	The Circular sets forth the guidelines to be followed in the implementation of development activities as provided under RA Nos. 6607, 6463, 3568, 5100, 6148, 6468 and 6429.
DENR Memorandum Circular No. 14 (DMC 14)	10 May 1993	Guidelines and Regulations for Entry and Conduct of Activities Inside Tubbataha Reef National Marine Park (TRNMP)	The Circular sets forth the guidelines and regulations for entry and conduct of activities inside the TRNMP.
DENR Memorandum Circular No. 16 (DMC 16)	13 May 1993	Guidelines on the Establishment and Management of Buffer Zones for Protected Areas	The circular provides guidelines on the establishment and management of Buffer Zone to serve as an added layer of protection to the Protected Areas consistently managed with the management objectives of the respective Protected Areas' management plan.

NUMBER	DATE OF ISSUANCE	TITLE	ABSTRACT
DENR Memorandum Circular No. 17 (DMC 17)	13 May 1993	Guidelines in the Conduct of Protected Area Suitability Assessment (PASA)	The Circular provides the guidelines in the conduct of a rapid assessment on the initial components of NIPAS to determine their suitability or non-suitability for preservation as Protected Areas and inclusion to NIPAS under any of the protected area categories.
DENR Memorandum Circular No. 27 (DMC 27)	21 July 1993	Guidelines in the Management of Protected Areas under the Administrative Jurisdiction of Two Regions	The guidelines clarifies that the Regional Executive Directors of both regions covering a protected area shall be part of the Protected Area Management Board. The Regional Executive Director of the region having a bigger coverage shall be the Chairman of the Board.
DENR Administrative Order No. 47 (DAO 47)	21 July 1993	Revised Rates and Fees to the Use of Facilities Inside the Protected Areas	The guidelines set forth the revised fees and charges for the entrance to and use of facilities inside Protected Areas the same charges shall be temporarily applied to Protected Areas pending the creation of their respective Protected Area Management Boards who will fix the rates to be collected within the protected area.
DENR Administrative Order No. 56 (DAO 56)	20 September 1993	Amending Section 62 of DAO 25, re: Composition of the Integrated Protected Areas Fund (IPAF) Governing Board	The Order amends Section 62 of DAO 2.5 by increasing the number of IPAF Governing Board members from seven (7) to ten (10), to strengthen and rationalize the administration of NIPAS Fund.
DENR Memorandum Circular No. 34 (DMC 34)	28 October 1993	Designation of Heads of Protected Areas Management Board (PAMB) Covered by Two Regions and Placing the Management Jurisdiction Under One Region	The order provides that the Regional Executive Director of the region covering a larger portion of the Protected Area shall head the PAMB, and the management "jurisdiction over" such Protected Area is transferred to the subject region.
DENR Memorandum Circular No. 35 (DMC 35)	17 November 1993	Criteria and Guidelines for the Categorization of Protected Areas under the NIPAS	The Order gives the definition of the different categories of Protected Areas. Likewise, the criteria for determining the appropriate categories of Protected Areas are established and substantiated by the result of the PASA.
DENR Memorandum Circular No. 03 (DMC 03)	03 December 1993	General Outline for the Formulation of Site Specific Management Manual and Management Plan	The Circular provides a working outline for the Regional Offices in the formulation of site specific management manual and management plan for each protected area.
DENR Memorandum Circular No. 04 (DMC 04)	03 December 1993	Guidelines for the Adoption of the General Management Planning Strategy (GMPS)	The guidelines provides for the adoption of the GMPS which mandates the creation of an interdisciplinary team and enumerates the seven processes to be followed in management planning in all protected areas.
DENR Memorandum Circular No. 12 (DMC 12)	17 March 1994	Setting Aside Fund for the Organization of Protected Areas Management Board	The Circular sets forth the allocation of a special and separate fund for the implementation of the activity.
DENR Memorandum Circular No. 14 (DMC 14)	22 April 1994	Revision to Special Order 609 and Creating the Project Coordination Unit (PCU) for all Integrated Protected Areas Project (IPAS) Projects	The Circular renames the IPAS Project Management Office (IPMO) to PCU, and further expands its functions and responsibilities. The organizational structure of the IPAS Foreign Assisted Project is also presented for clearer picture of the organizational set-up of the project.

NUMBER	DATE OF ISSUANCE	TITLE	ABSTRACT
DENR Memorandum Order 18 (DMO 18)	03 August 1994	Authorizing the Regional Executive Director to Designate the Protected Area Superintendent (PASu) and Protected Area Staff	The Circular authorizes the Regional Executive Director to designate the PASu and the PA staff under his administrative jurisdiction, It also reiterates the duties and responsibilities of the PASu and PA staff as stipulated in the NlPAS Law and DAO 25, including its functions as a secretariat to the PAMB.
DENR Special Order No. 1138 (DSO 1138)	08 September 1994	Creating Field NIPAS Coordinating Unit	The order provides for the creation of the NlPAS Coordinating Offices (NICO) and the Provincial NlPAS Coordinating Offices (PNICO) in the Regional offices to strengthen the NlPAS Law implementation with the Kegional Executive Director acting as Chairman of the former and the PENR Officer for the latter.
DENR Memorandum Circular No. 34 (DMC 34)	22 September 1994	General Outline for the Formulation of Initial Protected Area (PA) Plan	The guidelines provides the format in the preparation of initial protected area plan for each PA. This plan shall serve as basis in developing annual work plans for the protected area to serve as guide for the PASu and PAMB.
DENR Memorandum Circular No. 39 (DMC 39)	02 November 1994	Clarification in the designation of Regional Technical Director (RTD) to act as Chairman of the ExeCom and PAMB and his duties in the Protected Areas and Wildlife Division (PAWD)	Reiterates the role of the RTDs, specifically the RTD for the Enviromnental Management and Protected Areas Sector (EMPAS) in the implementation of the NIPAS activities specifically as Chairman of the PAMB Executive Committee.
DENR Memorandum Circular No. 40 (DMC 40)	03 November 1994	Sequential Diagram of NlPAS Law Requirement in the Establishment and Management of Protected Areas	The Circular aims to set a clear uniform theoretical procedure in the establishment and management of protected areas for a better understanding between the NlPAS implementing units and the public.
DENR Administrative Order No. 39 (DAO 39)	08 November 1994	Amending Section 50, Chapter 8 of DAO 25.	The Order clarifies the recognition of rights of the tenured migrants.
DENR Administrative Order No. 4 1 (DAO 41)	11 November 1994	Addendum to DAO 14 Specifying the Role of the Foreign-Assisted Project Office (FASPO) in the IPAS Project	This specifies the role of FASPO in the implementation of IPAS Project specifically M & E of IPAS site-based activities, and in strengthening IPAS coordination and linkages with other foreign-assisted projects and funding agencies
DENR Administrative Order No. 42 (DAO 42)	16 November 1994	Memorandum of Agreements (MOAs) in Protected Areas (PAs)	The Order gives the Secretary the authority to sign all MOAs re: Protected Area management until a final PAMB is formed, and thereafter, gives him the authority to amend existing MOAs.
DENR Administrative Order No. 45 (DAO 45)	21 December 1994	Addendum to DAO 14, Series of 1994	The addendum focuses on the role of PENR-SECAL. Program in the implementation of the CPPA Project with emphasis on the aspect of monitoring and evaluation of site-based implementors.
DENR Memorandum Circular No. 45 (DMC 45)	22 December 1994	Clarification on Some Provisions of RA 7586, DAO 25, Series of 1992 and other Related Guidelines	The Circular clarifies some provisions of RA 7586, DAO 25 and other related guidelines regarding PAMB creation, PA categories, functions of ID team, PENRO, CENRO, PASu, and conduct of public consultations.
DENR Memorandum Circular No. 46 (DMC 46)	22 December 1994	Creation of Protected Areas Management Board (PAMB); Decentralization in the Processing of Documents for PAMB Membership	The Circular provides that the selection of PAMB members and processing of all corresponding documents and certificates shall be processed at the regional level under the supervision of the RTD.

NUMBER	DATE OF ISSUANCE	TITLE	ABSTRACT
PAWB Special Order No. 174 (PSO 174)	23 December 1994	Revoking PAWB SO 119, Series of 1993 re: PASA (Protected Area Suitability Assessment) and S & R (Survey and Registration of PA Occupants) Review Committee	The Order provides that the review of PASA and the S & R are hereby made an integral part of the regular function/duties of the Biodiversity Division and Protected Areas Community Management (PACMAN) Division, respectively.
DENR Administrative Order No. 47 (DAO 47)	28 December 1994	Amending Section 23 and Section 27 of DAO 25, Series of 1992	The Order provides a clarification regarding the schedule of meeting of PAMB and the Executive Committee. Likewise, it clarifies the grounds for impeachment of members of these administrative bodies.
DENR Administrative Order No. 03 (DAO 03)	03 January 1995	Procedural and/or Documentary Requirements, Guidelines and/or Criteria to be Observed and/or Followed in the Selection of Representatives of Local Government Units (LGU), Non-Government and Public Organizations (NGO/PO) to the PAMB	The Order clarifies the selection process and criteria for the LGU, NGO and PO membership to the PAMB. It, likewise, clarifies the term of ellective officials who are members of the PAMB, i.e., mayors, barangay captains.
DENR Administrative Order No. 05 (DAO 05)	02 February 1995	Guidelines for the Selection of Host Non-Government Organization	A committee shall be formed to facilitate the selection of the host NGOs in the ten pilot areas. This, likewise, enumerates the selection criteria to be followed in choosing the right NGOs/POs.
DENR Administrative Order No. 95-05 (DAO 95-05)	02 February 1995	Guidelines in the Selection Awards, Monitoring and Evaluation of Host NGOs in the CPPAP	The Order sets forth the guidelines in the Selection, Awards, Monitoring and Evaluation of Host NGO in the conservation of priority protected area project.
DENR Administrative Order No. 95-10 (DAO 95-10)	29 March 1995	Amendment of DAO 42, Series of 1994	The order amends paragraph 2 and 3 of DAO 42, Series of 1994, recognizing the authorily of the Interim PAMB to decide / approve matters related to Protected Area management.
DENR Memorandum Order 95-08 (DMO 95-08)	05 April 1995	Clarification on the Provision of the NIPAS Law Regarding Modification of Boundary of Protected Area and its Buffer Zone	The Order provides that in cases where additional public lands are recommended by the people for inclusion in a protected area or its buffer zone, the processing of applications for the proposed use of the land will be held in abeyance pending the establishment of the area as Protected Area through Presidential Proclamation.
DENR Administrative Order No. 95-28 (DAO 95-28)	14 November 1995	Amendment to Sections 22, 25 and 26 of DAO 25, Series of 1992 re: Composition and Authority of FAME? , Composition and the Role of PASu	The Order provides amendment on the provisions re: creation of an Executive Committee (ExeCom), authority of the RTD to delegate PAMB Chairmanship, and the role of the PA staff and PASu.
DENR Memorandum Order 96-02 (DMO 96-02)	23 January 1996	Reiterating the Creation of Field NIPAS Coordinating Office	The Order reiterates the creation of field NIPAS Coordinating (PNICO and NICO) Offices.
DENR Administrative Order No. 96-02 (DAO 96-02)	23 January 1996	Amendment to DAO 95-28 re: Composition and Authority of PAMB , Composition and the Role of PASu	The order amended Sec. 22, 25 and 26 of DAO No. 25, S 1992 re: composition of Executive Committee, authority of the RED to delegate the PAMB Chairmanship and the designation of Secretariat of the PAMB and Executive Committee.

NUMBER	DATE OF ISSUANCE	TITLE	ABSTRACT
DENR Memorandum Order 96-07 (DMO 96-07)	20 March 1996	Clarification on the Preparation of Integrated Protected Areas Plan (IPAP)	The Order clarifies that Resource Protection and Restoration activities for each Protected Area shall form part of the IPAP. Likewise, the regional offices are advised to conduct regular patrolling activities and infonnation, education and communication (IEC) to protect the remaining resources within the protected areas.
DENR Administrative Order No. 96-l 7 (DAO 96-17)	19 April 1996	Creating NlPAS Evaluation Committee (NEC) to Assess the Performance of PASu	The Order provides for the creation of the NlPAS Evaluation Committee and the functions of the same.
DENR Special Order No. 96-540 (DSO 96-540)	27 May 1996	Amending DSO 666, Series of 1993 re: Creating the Integrated Protected Area System (IPAS) Technical Coordinating Committee (ITCC)	The Order amends the composition of the IPAS-ITCC under DENR SO 666 Series of 1993.
DENR Administrative Order No. 96-22 (DAO 96-22)	21 June 1996	Guidelines on the Establishment and Management of IPAF	The Order provides the procedures in the establishment and management of the Central IPAF and the Protected Area Sub-Fund to promote the sustained financing of the NlPAS.
DENR Memorandum Order 96- 15 (DMO 96-15)	11 September 1996	PAMB Membership	The Order provides for the involvement of women in the organization of PAMB for each Protected Area in support of RA 79 12, Women in Development and Nation Building Act.
DENR Administrative Order No. 96-28 (DAO 96-28)	19 September 1996	Requirements for the Deputation of Barangay Volunteer and Member of Tribal Communities as Field Officers within Protected Areas	The Order provides specific requirements for the deputation of barangay volunteers and members of ICCs as field officers within protected areas.
DENR Memorandum Circular No. 96-09 (DMC 96-09)	27 November 1996	Clarification on Leading the lmplementation of NlPAS Activities within Protected Areas under the Administrative Jurisdiction of other Government Instrumentalities	The Circular provides the guidelines in the implementation of NlPAS activities, organization of PAMB, role of the Regional Office and the government instrumentalities with jurisdiction over the area on the preparation of documents necessary for the proclamation of the area under NIPAS.
DENR Administrative Order No. 96-3 1 (DAO 96-3 1)	15 October 1996	Amendment of Section 6 1 of DAO 25, Series of 1992 re: Implementing Rules and Regulations of RA 7586.	The Order provides clarification on the exemption in the organization of PAMBS for Ninoy Aquino Parks and Wildlife Center (NAPWC) and Hinulugang Taktak National Park (HTNP) which are under the management of PAWB to facilitate the administration of protected area fund.
DENR Memorandum Circular No. 97-02 (DMC 97-02)	08 January 1997	Requirements in the Issuance of Proclamation/Reservations	The Circular provides for the additional requirements for Malacanang Circular No. 28 Series of 1993 in the issuance of proclamation/reservations.
DENR Administrative Order No. 97-12 (DAO 97-12)	11 April 1997	Amendment of DAO 56 Series of 1993	The order provides amendments on the inclusion of the Department of Interior and Local Government (DLLG) as member to the of IPAF Governing Board.

Source : PAWB

To be included in the System, areas previously identified as initial components have to undergo Presidential Proclamation and Congressional enactment. The requirements and process for the proclamation are:

a) compilation of maps and technical descriptions of the identified areas
b) initial screening of these areas for their suitability for inclusion in the NIPAS
c) studies and public hearings to build a case for formal establishment of suitable areas in this group as protected areas

The third requirement includes initial consultation with the communities within or near the identified areas, census and registration of the occupants of the identified areas, and the preparation of a land use plan for the area in coordination with the Regional Development Council.

To date, twenty-six PAs have been proclaimed under the NIPAS category with a total area of 1,442,740 hectares (Table 10). Some regional offices of the DENR have identified additional areas including twenty-five old growth/mossy forests, and proposed for its inclusion to the system.

Table 10 List of Proclaimed Protected Areas under NIPAS Category (as of February 1998)

Protected Area	Biogeographic Zone (Location)	Area (hectares)	Proclamation No.	Date of Proclamation
1. Masinloc and Oyon Bays Marine Reserve	Zambales (Masinloc and Oyon, Zambales)	7,568	Proc. No. 23 1	18 August 1993
2. Batanes Landscape/Seascape	Batanes (Batanes)	213,578	Proc. No. 335	28 February 1994
3. Penablanca Protected Landscape	Northern and Southern Luzon (Penablanca, Cagayan)	4,136	Proc. No. 416	29 June 1994
4. Pujada Bay Protected Landscape/Seascape	Mindanao (Mati, Davao Oriental)	21,200	Proc. No. 43 1	3 1 July 1994
5. Palaui Island Marine Reserve	Northern and Southern Luzon (Santa Ana, Cagayan)	7,415	Proc. No. 447	16 August 1994
6. Guiuan Protected Landscape/Seascape	Eastern Visayas (Eastern Samar)	60,448	Proc. No. 469	26 September 1994
7. Mount Matutum Protected Landscape	Mindanao (Tupi, Tampakan, and Palomolok, South Cotabato; and Malungon, Sarangani)	15,600	Proc. No. 552	20 March 1995
8. Sagay Protected Landscape/Seascape	Western Visayas (Sagay, Negros Occidental)	28,300	Proc. No. 592	01 June 1995
9. Mount Guiting-Guiting Natural Park	(Candiocan, Magdiwang, San Fernando and Sibuyan, Romblon)	15,265	Proc. No. 746	20 February 1996
10. Sarangani Bay Protected Seascape	Mindanao (Maitum, Kiamba and Maasim, Sarangani)	215,950	Proc. No. 756	05 March 1996
11. Apo Island Protected Landscape/Seascape	Western Visayas (Zamboangita, Negros Oriental)	691	Proc. No. 438	09 August 1996
12. Apo Reef Natural Park	Mindoro (Sablayan, Occidental Mindoro)	15,792	Proc. No. 868	06 September 1996

Protected Area	Biogeographic Zone (Location)	Area (hectares)	Proclamation No.	Date of Proclamation
13. Mount Kitanglad Natural Park	Mindanao (Talakag, Banagon, Libona, Impasugong, Malaybalay and Lantapan, Bukidnon)	29,716	Proc. No. 896	24 September 1996
14. Mount Apo Natural Park	Mindanao (Kidapawan, Makilala and Magpet, Cotabato; Bansalan, Digos and Sta. Cruz, Davao del Sur; and Davao City)	72,113	Proc. No. 882	24 September 1996
15. Taal Volcano Protected Landscape	Northern and Southern Luzon (Batangas)	62,292	Proc. No. 906	06 October 1996
16. Pamitinan Protected Landscape/Seascape	Northern and Southern Luzon (Rodriguez, Rizal)	600	Proc. No. 901	10 October 1996
17. Siargao Protected Landscape/Seascape	Mindanao (Siargao, Surigao del Norte)	278,914	Proc. No. 902	10 October 1996
18. Agusan Marsh Wildlife Sanctuary	Mindanao (San Francisco, Bunawan, De Ruela. Loreto and La Paz, Agusan del Sur)	14,836	Proc. No. 913	31 October 1996
19. Northern Sierra Madre Natural Park	Northern and Southern Luzon (Palanan, Divilacan, Maconacon, Ilagan, San Mariano, Dinapique and Isabela)	247,861 71,652	Proc. No. 978	10 March 1997
20. Mount Canlaon Natural Park	Western Visayas (Murcia, La Castellana, Bago, La Carlota, Canlaon. San Carlos)	24,557	Proc. No. 1005	08 May 1997
21. Chocolate Hills Natural Monument	Eastern Visayas (Bohol)	14,145	Proc. No. 1037	01 July 1997
22. Calbiga Caves Protected Landscape	Eastern Visayas (Calbiga, Wright and Hinabanga, Samar)	2,968	Proc. No. 1125	04 November 1997
23. Lake Danao Natural Park	Eastern Visayas (Ormoc Leyte)	2,193	Proc. No. 1155	03 February 1998
24. Jicontol Natural Park	Eastern Visayas (Maslog, Dolores Can-Avid. Eastern Samar)	6,483	Proc. No. 1156	03 February 1998
25. Mahagnao Volcano Natural Park	Eastern Visayas (Barauen and La Paz, Leyte)	635	Proc. No. 1157	03 February 1998
26. Calbayog-Pan-as Hayiban Protected Landscape	Eastern Visayas (Calbayog, Samar)	7,832	Proc. No. 1158	03 February 1998
Total		**1,442,740**		

Source : *PAWB*

The implementation of the NIPAS Law have been given local and international support. As a result, more programs and projects focused on the many aspects of biociiversity conservation were implemented as priority activities.

Some of the major in-situ conservation programs being implemented are described below.

- Conservation of Priority Protected Areas Project (CPPAP) funded by the Global Environment Facility (GEF) of the World Bank. The CPPAP is pilot testing the NIPAS law in the first ten priority sites (Table 11) identified in the IPAS Final Report (1992). The project has four major components: a) site development, b) resource management, c) socio-economic management, and d) technical assistance, monitoring, and coordination. Designed to involve local organizations in its implementation, the DENR is executing the project in collaboration with the NIPA, Inc., a consortium of 18 local non-government organizations engaged in development, environment and social preparation activities.

  Two of the ten CPPAP sites (Subic-Bataan National Park and Turtle Island Marine National Park) are still not proclaimed as Protected Areas under NIPAS category.

Table 11 Conservation of Priority Protected Areas Project (CPPAP) funded by the World Bank's Global Environment Facility (GEF)

Protected Area / Site	Biogeographic Zone	Location	Area (hectares)	Proclamation No. / (date) under NIPAS category
1. Batanes Protected Landscape/Seascape	**Batanes**	Batanes	**213,578**	**Proclamation No. 335 28 February 1994**
2. Subic-Bataan National Park	Southern Luzon	Subic, Zambales Hermosa, Orani, Samal, Abucay, Balanga, Pilar and Morong, Bataan	**Subic - 6,332** Bataan-23,688	
3. Northern Sierra Madre Natural Park	Sierra Madre	Palanan, Divilacan, Maconacon, Ilagan, San Mariano, Dinapique and Isabela	(land) 247,861 (water) 7 1,652	Proclamation No. 978 10 March 1997
4. Apo Reef Natural Park	Mindoro	Sablayan, Occidental Mindoro	15,792	Proclamation No. 746 20 February 1996
5. Mount Canlaon Natural Park	Western Visayas	Murcia and La Castellana Bago, La Carlota, Canlaon and San Carlos	24,557	Proclamation No. 1005 01 June 1995
6. Mount Kitanglad Natural Park	Mindanao	Talakag, Banagon, Libona Impasugong, Malaybalay Lantapan, Bukidnon	29,716	Proclamation No. 896 24 September 1996
7. Siargao Protected Landscape/Seascape	Mindanao	Siargao, Surigao del Norte	278,914	Proclamation No. 902 10 October 1996
8. Agusan Marsh Wildlife Sanctuary	Mindanao	San Francisco, Bunawan, de Ruela, Loreto and La Paz, Agusan del Sur	14,835	Proclamation No. 913 3 1 October 1996
9. Mount Apo Natural Park	Liguasan	Kidapawan, Makilala, Magpet, Cotabato Bansalan, Digos, Sta. Cruz, Davao del Sur Davao City	72,113	Proclamation No. 882 24 September 1996

10. Turtle Island Marine National Park	Sulu	Boaan, Langaan, Great Bakkungaan,Lihiman, Taganak and Baguan, Municipality of Turtle Islands, Tawi-tawi	528,452

Source: *PAWB*

- National Integrated Protected Areas Project (NIPAP) funded bv the European Union (EU). The EU-NIPAP is another major initiative implementing the NIPAS Law. The NIPAP approximates the design of the CPPAP but differs in project management strategies. In the NIPAP, a European Co-Project Director and a local Project Director have the full authority to decide on the financial and operational matter, provided that the National Program and Policy Steering Committee (NPPSC) initially approves the Annual Work and Financial Plan.

  The sites selected for the NIPAP-EU are: Mount Guiting-Guiting Natural Park; Mount Pulag, Mount lsarog, Mount Iglit-Baco and Mount Malindang National Parks; Coron Island; Malampaya Sound; and El Nido Marine Reserve (Table 12). Of the eight sites, only Mount Guiting-Guiting Natural Park has a General Management Plan and has been proclaimed as PA under the NIPAS category.

Table 12 National Integrated Protected Areas Project funded by European Union (NIPAP-EU)

Protected Area / Site	Biogeographic Location	Location	Area (hectares)	Proclamation No./ (date) under NIPAS category
1. Mount Isarog National Park	Northern Luzon Southern Luzon	Naga, Calabanga, Tinambac, Goa, Tigaon and Pili, Camarines Sur	10,117	
2. Mount Pulog National Park	Cordillera	Buguias and Kabayan, Benguet Kiangan, Ifugao Kayapa, Nueva Vizcaya	11,500	
3. Mount Iglit-Baco National Park	Mindoro	Sablayan, Occidental Mindoro Bongabon, Oriental Mindoro	273,370	
4. Coron Island	Calamian	Palawan	7,700	
5. Mount Guiting-Guiting Natural Park	Western Visayas	Sibuyan Island, Romblon	46,300	Proclamation No. 746 20 February 1996
6. El Nido Marine Reserve	Palawan	El Nido, Palawan	95,000	
7. Malampaya Sound	Palawan	Palawan	127,000	
8. Mount Malindang National Park	Zamboanga	Oroquieta, Ozamis City Calamba, Bonifacio and Jimenez, Misamis Occidental Zamboanga	53,000	

Source: PA WB, 1988.

3.2.3 *Other Habitat/Ecosystem Protection Efforts*

There are other in-situ conservation efforts which are not necessarily within protected areas. The goals/objectives of these programs/projects are directed towards sound resource management, as well as protection of ecosystem, habitats and maintenance of species. Some of these have been completed, others are still on-going as described below:

- The Master Plan for Forestry Development. The Master Plan, conceived to address the growing problem of forest degradation, has the following general objectives: a) to meet the needs for wood and other forest products by placing all the country's production forest under sustainable management; b) to contribute to the production of food, water, energy, and other needed commodities by properly managing the upland watersheds; c) to protect the land and its resources against degradation and ecological devastation through proper land management systems and practices; d) to conserve the forest ecosystems and their diverse genetic resources; e) to contribute to employment and growth of national and local economies through fully developed forest-based industries; and f) to promote social justice and equity and recognize the rights of indigenous cultural communities (ICCs) in the management, conservation and utilization of forest resources. It provides a framework that will ensure a systematic and coordinate effort at forest resources development and management.

  There are three programs under this project, namely: a) Man and the Environment Programs, which include people-oriented forestry, soil conservation and watershed management, integrated protected areas system and biodiversity conservation, urban forestry, and forest protection; b) Forest Management and Products Development Programs, which include management of the natural dipterocarp forest, management of mangroves, pines and other natural forests, forest plantations and tree farms; wood-based industries, and non-wood forest-based industries, and c) Institutional Development Programs, which include policy and legislation: organization, human resources. infrastructures and facilities; research and development; and education, training and estension.

- Coastal Environment Program (CEP). The Coastal Environment Program of the DENR was established in April 1993 to coordinate ail programs, projects and activities related to the management of coastal ecosystems. The scope of the CEP is not limited to DENR activities but also includes projects jointly undertaken with other government agencies, non-government institutions and international organizations. The Coastal Environment Program Coordinating Office (CEPCO) was created to strengthen and oversee the efficient implementation of the program.

  CEP has five major components, namely: a) coastal habitats and biodiversity, which is mainly concerned with the conservation and management of coastal areas in which humans and other floral and faunal populations **inhabit nnd find sustenance: b) endangered species. which** focuses on the conservation and propagation of endangered species and on the protection and management of their habitats; c) coastal industries and pollution, which includes activities related to understanding and regulating industrial activities and pollution in coastal areas; d) resources inventory and assessment activities which includes the identification and estimate of existing and future stocks of ecologically important coastal species and evaluation of the state of critical ecosystems in coastal environment; and e) research and special projects, which includes activities related to development, testing and application of methodologies to understand coastal environments and their associated resource systems.

  Included in the first component of the program are the activities related to the implementation of the NIPAS in the coastal zones and the rehabilitation and improvement of mangroves, sea grasses and coral reefs. A list of coastal areas proclaimed under NIPAS is shown in Table 13.

Table 13 Coastal Environment Program (CEP) areas under National Protected Areas System (NIPAS)

Name of Protected Area	Biogeographic Zone	Location	Area (ha.)	Proclamation No. I Date
Palaui Island Marine Reserve	Sierra Madre	Santa Ana, Cagayan	7,415	Proclamation No. 416 29 June 1994
Masinloc and Oyon Bays Marine Reserve	Zambales	Masinloc and Oyon, Zambales	7,568	Proclamation No. 231 18 August 1993
Sagay Protected Landscape / Seascape	Calamian	Sagay, Negros Occidental	28,300	Proclamation No. 592 01 June 1995
Apo Island Protected Landscape / Seascape	Calamian	Zamboangita, Negros Oriental	691	Proclamation No. 438 09 August 1996
Guiuan Protected Landscape / Seascape	Eastern Visayas	Eastern Samar	60,448	Proclamation No. 469 26 September 1994
Sarangani Bay Protected Seascape	Mindanao	Maitum, Kiamba and Maasim, Sarangani	215,950	Proclamation No. 756 05 March 1996
Pujada Bay Protected Landscape / Seascape	Liguasan	Mati, Davao Oriental	21,200	Proclamation No. 43 1 3 1 July 1994

Source: PAWB

- The Fisheries Management and Development Plan (FMDP), 1993-1998. The FMDP is focused on the following concerns: a) regeneration, conservation and sustained management of the country's aquatic resources; b) environmental rehabilitation and protection of the coastal zone; c) poverty alleviation and occupational diversification among marginal fisherfolk; d) intensification of aquaculture: and e) optimal exploitation of offshore. deep sea resources The following strategies are being carried out by the Bureau of Fisheries and Aquatic Resources (BFAR) of the Department of Agriculture.

  A. Resource Management Strategies

  a. Regulation of fishing efforts to keep them within sustainable yield levels.
  b. Lnstitution of a new management system for coastal areas.
  c. Institution of coordinated environmental management of land- and marine-based resources.

  Other strategies to be implemented in coastal areas are:

  a. coastal resource management of naturally demarcated bays, gulfs and reefs;
  b. promotion of territorial use rights in fisheries (TURF) for small fisherfolks;

c. conservation of coral reefs, mangroves and seagrasses in good condition; and
d. regeneration of damaged habitats.

B. Supply Enhancing Strategies:

a. Expansion of domestic production only at minimum levels.
b. Increasing exports.
c. Strengthening of the marketing system particularly through continuous implementation of infrastructure projects and expansion of post-harvest services.

C. Socio-economic Strategy

Intensification of extension services on production and post-harvest technologies and facilities as well as credit and establishment of fisherfolk cooperatives.

- Conservation of Wetland Ecosystems. Since its formulation in 1992, many of the proposed activities in the Philippine National Wetlands Action Plan have been accomplished, started, and in progress. The Action Plan, which was approved in 1996, was designed to protect and conserve whatever remains of the biological resources of wetlands, and to lay down in a judicious manner the groundworks for the regeneration of what has been lost.

  One of the efforts which is now in progress is the national wetland inventory to identify major sites for wetland biodiversity. The identification is guided by criteria set by the DENR Memorandum Circular No. 97- 17, Criteria for the Identification of Wetlands Critical to Biodiversity Conservation.

  With the completion of the Management Plan for Olango Island Wildlife Sanctuary, which is designated to the RAMSAR List of Wetland of International Importance, a project on community-based resource management has commenced. Efforts to identify more wetlands of international importance is also underway using the RAMSAR criteria.

- Basin Approach to Lake Management (Laguna de Bay). The Basin Approach to Lake Management is a program for lake biodiversity conservation developed by the Department of Science and Technology (DOST). One of the projects currently being implemented under this program is the Lake Fisheries Productivity and Quality Enhancement. This project specifically aims to integrate current and future researches to stop further deterioration of Laguna de Bay and improve the water quality to enhance the aquatic productivity of the lake.

  There are four interrelated components under the said project, namely: a) Lake Environment Information System (LEIS), b) Lake Environment Monitoring System (LEMS), c) Lake Environment Social Mobilization Program (LESMP), and d) Lake Environment Policy Studies (LEPS).

- Samar Island Biodiversitv. This is a preparatory project to develop a full GEF project for the conservation and sustainable use of biodiversity within the 360,000-hectare rainforest in the mountainous part of Samar Island that has been declared as Forest Reserve under Presidential Proclamation No. 744. The full GEF project is expected to strengthen local capacity to protect and manage the biodiversity within the Samar Forest Reserve. It will complement activities

already being done in the area including those activities that entail socio-economic development within the reserve. It will include activities to improve awareness, education and training on the value of biodiversity; the development of alternative economic livelihoods for local communities that are sustainable; and ensure the active participation of all stakeholders in the decision making process on the management of the Forest Reserve.

- Strategic Environment Plan for Palawan. In 1992, then Philippine President Aquino approved the Strategic Environment Plan (SEP) for Palawan. A legislation to this effect, Republic Act No. 76 11 was passed which provided for the creation of the Palawan Council for Sustainable Development (PCSD) under the Office of the President. The PCSD is seen as a model of national-local government interacting with the non-government and the private sector. It is perceived as a forum of diverse sectors with a unified approach and direction in Palawan's environmental care, protection and management. SEP's philosophy has the following features: ecological viability, social acceptability and integrated approach. The main strategy employed by SEP is anchored in the establishment of a system of environmentally critical areas network (ECAN) to ensure protection of vulnerable areas.

- Assistance from the Netherlands Government for the implementation of NIPAS Law is directed in two specific sites: the El Nido Marine Park and the Palanan Wilderness.

The Philippines was able to establish the first transborder bilateral agreement with the Malaysian Government on the management of marine turtles within the Turtle Island Heritage Park. Another in-situ efforts for the protection on endangered endemic species is the Calauit Project which was turned over to the Palawan Council for Sustainable Development in 1995. Calauit Island Wildlife Sanctuary in Palawan was declared a sanctuary to serve as an outdoor refuge of many exotic and endemic wildlife species in danger of extinction. Some of the endemic species grown in the wild or in captivity are the mousedeer (*Tragulus napu*), Calamian deer (Axis *calamianensis*), bear cat *(Arctictis hinturong),* and Palawan peacock (*Polyplectron emphunum). These* animals live harmoniously with African wildlife species like giraffe, zebra, topi, impala, bushbuck, gazelle, waterbuck, and eland.

The Cave Management and Conservation Program (CMCP) of the DENR-PAWB was conceived to perpetuate the existence of caves and cave resources therein. Under the program, efforts for the sustainable use. protection and developmental management and conservation. are being implemented. The program has nine components, namely: rapid cave resource assessment; biodiversity assessment; geological; paleontological and speleogical resources assessment; cultural and archaeological resources assessment; management of resource utilization; visitor management; information, education and communition; human resource development; and research development.

The NGOs have also been very active in ecosystems/habitat protection and conservation. Their efforts have significantly complemented those of the government in this undertaking. Table 14 shows a partial listing of NGOs involved specifically in protected areas management.

Finally, the Foundation for the Philippine Environment, an NGO-fund mechanism, has provided support to projects directly or indirectly related to biodiversity conservation employing habitat/ecosystem protection strategies.

Table 14 Partial list of non-government organizations Involved In Protected Areas Management

Organization	Protected Area
Bataan NGO Consortium	Bataan National Park
Batanes Development Foundation, Inc.	Batanes Protected Landscape/Seascape
Bicol National Park Foundation, Inc.	Bicol National Park
Conservation International (Philippines)	Palanan Wilderness
	Mount Kitanglad Natural Park
Haribon Foundation	Mount Isarog National Park
	Saint Paul National Park
	El Nido Marine Reserve
	Mount Pulag National Park
	Mount Malindang
International Council for Bird Preservation (or Birdlife International)	Mount Pulag NationalPark
	Sierra Madre Natural Park
	Palanan Wilderness
	Tubbataha Reef National Marine Park
Jaime V. Ongpin Foundation	Mount Pulag National Park
Karaga Biodiversity Linkages (KABILIN)	Agusan Marsh Wildlife Sanctuary
Kitanglad Integrated NGO	Mount Kitanglad Natural Park
Likas, Inc.	Mount Lake Bulusan National Park
Luntiang Alyansa ng Bundok Banahaw	Mount Banahaw National Park
Mahintana Foundation, Inc.	Mount Matutum
Marine Turtle Foundation, Inc.	El Nido Marine Reserve
Multi-Sectoral Alliance for Development in Negros	Mount Canlaon Natural Park
NIPA Inc.:	CPPAP Sites:
Association of foundations	Agusan Marsh Wildlife Sanctuary
Center for Alternative Development Initiatives	Apo Reef Natural Park
Community Extension and Research for Development	Batanes Protected Landscape/Seascape
	Mount Apo Natural Park
Convergence for Community Centered Area Development	Mount Canlaon Natural Park
	Mount Kitanglad Natural Park
Cooperative Foundation of the Philippines. Inc.	Northern Sierra Madre Natural Park
Earth Savers - Philippines, Inc.	Siargao Protected Landscape/Seascape
Green Forum - Philippines, Inc.	Subic-Bataan National Park
Haribon Foundation for the Conservation of Natural Resources	Turtle Island Marine National Park
Mindanao Environment Forum	
Nature Crusaders of the Philippines Foundation	
Philippine Business for Social Progress	
Philippine Federation for Environmental Concern	
Philippine Institute of Alternative Futures	
Philippine Rural Reconstruction Movement	
South East Asian Institute of Culture and Environment	
Tambuyog Development Center	
Tribal Communities Association of the Philippines	
Women's Action Network for Development	
Pipuli Foundation, Inc.	Mount Malindang

Organization	Protected Area
Philippine Business for Social Progress	Mount Pulag National Park
Philippine Eagle Foundation, Inc.	Mount Kitanglad Natural Park
Philippine Ecumenical Action for Community Empowerment Foundation, Inc.	Apo Reef Natural Park
Tubbataha Foundation and Conservation International	Tubbataha Reef National Marine Park

Sources: *1990-1991 Phil. Program Budgets of DFNS-Haribon (2nd Tranche)*
Tubbataha Foundation and Conservation *International*
ICBP Danish Ornithologist Society
Brcol National Park Foundation, Inc.
Philippine Biodiversity: An Assessment and Action Plan

3.2.4 Buffer- Zone Management

To stabilize protected area boundaries, the NIPAS Law requires the designation of an added layer of protection to the area by establishing buffer zones. Following its promulgation and the issuance of its implementing rules and regulations, PAWB developed specific guidelines for the establishment of buffer zones for PAs as a DENR policy document. These guidelines intend to operationalize buffer zones as part of the protected area planning and management strategy.

A Technical Assistance (TA) for Biodiversity Conservation and Buffer Zone Establishment, funded by the Asian Development Bank, has just been completed. This project pilot tested the buffer zone policy in two sites: Mount Iglit-Baco and Bicol National Parks. The TA has come up with major policy documents in the form of guidelines for further consideration by the DENR, specifically on a) establishment and management of protected area buffer zones; b) recognition of the rights and ancestral domains of indigenous peoples with respect to protected areas; and c) recognizing tenure of tenured migrants in protected areas.

3.2.5 *Ecosystems Rehabilitation and Restoration*

The DENR issued Memorandum Circular No. 20 (series of 1990) to hasten the restoration of degraded or disturbed natural habitats within the national parks and other protected areas. It sets the guidelines on the restoration activities for the enhancement of biological diversity of protected areas.

The Forest Management Bureau (FMB) has reported to have an average reforestation of 64,000 hectares per year from 1986 to 1996, and an area of 46,604 hectares for 1997. As shown in Table 15, there is no consistent pattern in the number of hectares annually reforested. Reforestation areas include **mangrove** reforestation of the CEP. Generally, the government accounts for a greater percentage of the reforestation efforts. However, in 1993, about 67% of the reforestation was done by the private sector, mainly by timber licensees (NBSAP, 1997). Timber licenses are privileges granted by the state to person or group of persons to utilize forest resources, timber and non-timber, within a forest land with the corresponding responsibility to develop, protect and rehabilitate the same land.

A Community-Based Forestry Program (CFP), a government program, was conceived to address the problems of the logging concession workers when Timber Licensing Agreements (TLAs) cease to operate or are cancelled. It aims to study and provide alternative livelihood program for these

workers. Its activities include the identification of CFP sites and the implementing NGOs; the formation of a Training and Research Consortium, Technical Advisory Group and Technical Working Group in the DENR; and the designing of the CFP. The project adopts strategies of community organizing, capability building, policy development and advocacy, and linkaging and complementation framework. The Foundation for the Philippine Environment (FPE), the John D. and Catherine T. MacArthur Foundation and the DENR are undertaking projects under this program.

Table 15 Annual reforestation, 1986-l 996 (in hectares)

Year	Government Sector DENR	Other Agencies	Private Sector Timber Licensees	Others	Total
1986	22,495	1,931	6,572	2,000	32,998
1987	27,558	1,285	7,956	3,012	39,811
1988	30,890	336	23,126	9,831	64,183
1989	82,966	6,486	32,087	9,865	131,404
1990	146,718	7,231	33,443	4,271	191,663
1991	72,238	1,364	18,089	1,348	93,039
1992	24,304		11,683	4,606	40,593
1993	6,347		12,692	172	19,211
1994	18,032		9,468	22,051	49,551
1995	7,840	14,001	30,380	13,012	65,233
1996	18,869		20,005	7,222	46,096

Source: ***Philippine Biodiversity: An Assessment and Action Plan***
1996 Philippine Forestry Statistics

In 1990, the Philippine Department of Agriculture (DA) implemented the Fisheries Sector Program (FSP) with support from the Asian Development Bank (ADB) and the Overseas Economic Cooperation Fund (OECF) of Japan. The overall goal of FSP was to introduce a new regime of sustainable fisheries management into the fisheries sector through a package of policy and institutional reforms and strategic interventions aimed at rationalizing the utilization of fisheries resources. More specifically, the program had the following objectives:

a) the regeneration, conservation and sustainable management of aquatic resources with emphasis on balancing fishing effort with maximum sustainable yield, the rehabilitation and protection of the marine environment, and poverty alleviation among municipal fisheries;

b) the inducement of commercial fishing away from the overfished shallow water fishing grounds and into the underexploited areas in the country's exclusive economic zone (EEZ); and,

c) the improvement of productivity within the limits required to maintain ecological balance.

FSP was conceived as a multi-sectoral effort with DA as the lead agency. To achieve the objectives, DA committed to undertake policy and institutional reforms and implemented six program components: a) Fisheries Resource and Related Ecological Assessments, b) Coastal Resources Management, c) Research and Extension, d) Law Enforcement, e) Credit, and

f) Infrastructure. Among the six, Coastal Resources Management is considered as the centerpiece and all other components may be considered supportive to it. The program focused its efforts in twelve of the country's twenty-six fishing areas for its coastal resource management initiatives - on six selected regions for aquaculture development, and on selected offshore areas for commercial fisheries development.

The most significant achievement of the FSP was its success in initiating a difficult process of "reforming" the Philippine fisheries sector. Granting fishing permits within sustainable yield level has been officially adopted as government policy and has been incorporated into the new Fisheries Code. The FSP also laid down an institutional groundwork for fisheries resource management by raising the awareness of the resource depletion problems among stakeholder groups, motivating active participation of municipal fisherfolk in coastal resource management (CRM) activities, and establishing Bay Management Councils in eleven FSP bays. Community-based law enforcement and various CRM activities were also initiated under FSP with active participation of municipal fisher-folk. As the first project in the Philippines that focused on fisheries resource management and rehabilitation, the FSP provided rich experience and lessons that could be incorporated in future fisheries projects.

3.2.6 *Introduction of Exotic Species*

Stipulated in the guidelines on the restoration of denuded areas within National Parks and Protected Areas for the enhancement of biodiversity is the emphasis on which plant species should be planted. DENR Memorandum Circular No. 20, series of 1990 encourages the use of indigenous forest species, including endemic fruit bearing trees and flowering plants, to form part of the food source of wildlife.

The introduction of exotic species in the Philippine wetlands has already caused a decrease in native fish stocks in some areas as a result of predation or competition between introduced species and native ones, To prevent further losses, the Philippine Fisheries Code of 1998 (Republic Act No. 8550) prohibits the introduction of foreign aquatic species in the Philippine waters (in-land and marine) without a sound ecological, biological and environmental justification based on scientific studies. The Department of Agriculture reserves the right to approve the introduction of foreign aquatic species for scientific/research purposes.

3.2.7 *Indigenous Knowledge and Practices*

A unique added component to the protected area system is the recognition of the customary rights of indigenous peoples (IPs) to their ancestral domains, and the perpetuation of their culture, indigenous practices and traditions.

IPs and lowland farmers who have practiced traditional multi-crop agriculture have contributed, by and large, to the conservation of biological diversity. Unfortunately, some state laws and policies issued in the past have prevented the IPs from claiming private communal rights to their traditional territories, and thus severely undermined this capability.

The 1987 Philippine Constitution already has some provisions relevant to the indigenous cultural communities (ICCs)/IPs, two of which are: Section 11, Article II, which recognizes and promotes the rights of indigenous cultural communities within the framework of national unity and

development; and Section 5, Article XII which protects, subject to the provisions of the Constitution and national development policies and programs, the rights of indigenous cultural communities to their ancestral lands to ensure their economic, social, and natural well-being. These provisions are meant to support the struggles of IPs for their rights to self-determination, i.e., their right to take control of the direction of their development as distinct cultural communities, or as peoples. However, the Congress failed to enact the enabling laws to fully implement the constitutional mandate.

Meanwhile, the executive department, through the DENR, by virtue of DENR Administrative Order No. 2, series of 1993, identified and delineated ancestral domains being claimed by a growing number of ICCs/IPs by granting them Certificates of Ancestral Domain Claim (CADC). CADC have been awarded to ICCs in Cordillera, Zambales, and the islands of Bohol, Mindoro and Mindanao. The Claim, however, is inadequate to protect the rights of the IPs to their ancestral domain.

One of the provisions of the NIPAS is to recognize ancestral rights, and the inclusion of the policy of community sustainability with the concern for the development of the socio-economic and political fibers of the communities that directly use the resources. The habitat management approach highlights the involvement of people in the management of protected areas with the recognition of indigenous cultural communities and tenured migrant communities. The latter refers to communities within protected areas which have actually and continuously occupied such areas for five years prior to designation of the same as a protected area.

However, the recognition by the state of indigenous peoples' rights to their ancestral domains does not guarantee the conservation of diversity. Because of the intensifying exposure of IPs to the various forces and agents of environmentally unsustainable economic growth, their organizational capability to deal with the numerous threats to their land and to biodiversity need strengthening by incorporating inputs from outside.

In October 1997, the Philippine Congress finally enacted the Indigenous People's Rights Act (IPRA). The law is the embodiment of the long struggle for the recognition of the rights of the IPs to their ancestral domain as well as their cultural identity. Under IPRA, "the State shall recognize, respect and protect the rights of Indigenous Peoples to preserve and develop their cultures, traditions and institutions. It shall consider these rights in the formulation of national laws and policies. The rights protected include the right to claim ancestral domains which covers not only the physical environment but also the spiritual and cultural bonds associated with it (Section 4 of IPRA). In return, the IPs are charged with the responsibility of maintaining ecological balance and restoring damaged areas (Section 9 of IPRA).

The law also protects the right of the IPs to exclude others in exploiting natural resources within their ancestral domain. Free and prior informed consent of the community, obtained in accordance with customary laws, is required before any person may be allowed access to these resources. The protection even extends to indigenous knowledge associated with the resources. The regulations governing bioprospecting (EO 247) further requires that benefits derived from the utilization of biological and genetic resources shall be shared fairly and equitably with the community.

The IPRA is a wide departure from the long held view maintained by the State that all lands and natural resources belong to the State. This concept, otherwise known as the Regalian Doctrine, was carried-over from the Philippines' colonial past. Many see the doctrine as the root cause of

conflicts which result in the displacement of the IPs. IPRA formally recognizes that the indigenous communities have valid claims over their lands and resources that predate the Constitution and the laws that proclaim such resources as belonging to the State. IPRA also recognizes that the IPs have their own traditional concept of ownership or rights which most often do not conform with the established system.

While IPRA is a big leap forward in the protection of indigenous rights, it mostly sets policy statements and general guidelines. The real challenge of concretizing these rights is vested in the National Commission on Indigenous Peoples (NCIP) which is primarily responsible for the implementation of the law. At this time, the NCIP has yet to be convened.

Meanwhile, efforts to document and consolidate information on indigenous knowledge system are underway. A Symposium Workshop on Indigenous Knowledge in Biodiversity and Utilization was held in March 4-6, 1998.

3.2.8 *Legislation for Protection of Threatened Species*

Following are some international agreements and conventions for the protection of threatened species to which the Philippines is a signatory:

- Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES). The Philippines acceded to the Convention in 1981 and became an active member of CITES in 1983. In accordance with the provisions of the Convention, there are two management authorities in the country to grant permits and certificates, and two scientific authorities to provide advice on the trade of particular species in terms of their survival and sustainable use. The management authorities are the Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR) for terrestrial flora and fauna, and the Bureau of Fisheries and Aquatic Resources (BFAR) of the Department of Agriculture (DA) for aquatic/marine species. The scientific authorities are the Ecosystems Research and Development Bureau (ERDB) of DENR for terrestrial plants and animals, and BFAR for aquatic/marine species.

  Pursuant to the provisions of the treaty, the Philippines has a list of Appendix I, II, and III species. Those listed under Appendix I whose trade is strictly prohibited include 20 animals and 2 plants. Under Appendix II, there are 77 animals listed that are strictly regulated in terms of trade. Monitoring teams at international ports and airports is monitoring the trade on wildlife. All illegally traded species that are confiscated are brought to the wildlife rescue centers at the different regions in the country. In Metro Manila, the Wildlife Rescue Center of PAWB is the depository of all confiscated animals.

  The BFAR is the sole CITES Permit Issuing Authority for aquatic species by virtue of DA Special Order No. 462 dated August 11, 1995. According to BFAR, there are eight aquatic species listed in CITES Appendix I; fifty aquatic species listed in Appendix II; and three aquatic species listed in Appendix III. A BFAR CITES Committee was created to effectively implement and enforce the Convention. To strengthen capacity of local law enforcers, a National Training Workshop on CITES Implementation was held in 1996 with participants from BFAR, PAWB, Philippine National Police (PNP), Philippine Coast Guard (PCG), and the Bureau of Customs (BC).

- General Agreement on Tariffs and Trade (GATT). GATT requires all member countries to adopt an intellectual property rights system under the Trade Related Aspects of Intellectual Property Rights (TRIPS) accord. This agreement provides the option to patent plant varieties or to adopt an effective special form of protection. In line with this, the Philippines has enacted laws and repealed existing legislation to comply with the TRIPS Agreement.

- Bonn Convention. The BOM Convention in 1979 is concerned with the conservation and protection of migratory species of wild animals. Parties to the convention are enjoined to prohibit the taking of animals that are covered by the Global Treaty on Migratory Species except in meritorious cases. It also stipulates the restoration of important habitats in order to prevent, reduce or control those factors that are likely to endanger affected species. This was ratified by the Philippines in 1993.

- ASEAN Declaration on Heritage Parks and Reserves and Declaration on Environment. The ASEAN Declaration on the Environment pushed for more forest protection and resources. The agreement declared Mount Iglit-Baco and Mount Apo Natural Parks as ASEAN Heritage Parks to conserve the habitats of two endangered species, the Philippine tamaraw and the Philippine eagle, respectively. This strengthened the protected area status of these natural parks and additional measures for the conservation of endangered species, such as breeding in captivity, were implemented. The declaration was signed in 1984.

- Ramsar Convention. The Ramsar Convention in 197 1 encourages the formulation of a wetland action plan and the identification of internationally significant wetland areas. The Philippines became the 82nd contracting party to the Convention on 08 November 1994 upon submission of its Instrument of Accession. Various programs and activities for wetland management has been undertaken in consonance with the government's commitments as contracting party of the Convention.

- Convention on Biological Diversity. The 1992 Convention on Biological Diversity seeks to conserve and enhance the biodiversity resources of the world. A country study on biological diversity and a strategy and action plan on biodiversity conservation are the initial outputs expected from the ratifying countries. The Philippines ratified this convention in 1993. The National Biodiversity Strategy and Action Plan (NBSAP) of the Philippines was approved by the President in 1996.

The Philippine government, on their part, has issued regulations relative to the protection of threatened species. The DENR, in consonance to its policy to protect the endangered , rare and threatened Philippine wildlife, issued Administrative Order No. 90 (series of 1988) setting the allowable quota for certain wildlife species that can be collected from the wild under a wildlife permit for commercial purposes.

Issued in the same year, DAO 96 establishes the policy and guidelines on the allocation of wildlife quota. It requires the gradual phasing out of the collection and exportation of fauna from the wild, and the Environment Impact Assessment (EIA) Certificate from the Environment and Management Bureau (EMB) of the DENR to all applications for wildlife collectors and breeders.

Recognizing the importance of wetlands for biodiversity conservation, the DENR Memorandum Circular No. 97-l 7 was issued to protect the habitats of endemic, rare, vulnerable and endangered wetland species. A national wetland inventory is conducted to identify major sites for wetland biodiversity using the criteria provided by the said memorandum.

The Department of Agriculture (DA) also takes conservation and rehabilitation measures for rare, threatened and endangered aquatic species through the recently enacted Philippine Fisheries Code of 1998 (Republic Act No. 85.50). The code prohibits the fishing of these species including the taking of their eggs/offsprings from the Philippine waters. It further requires all government agencies, as well as private firms and entities who intends to undertake activities or projects which will affect the habitats of these species to prepare a detailed Environmental Impact Statement (EIS) that shall be submitted to the DENR for review and evaluation.

3.2.9 Regulations on activities adverse to biodiversity conservation

- NIPAS Law identifies protected areas as portions of land and water set aside by reason of their unique physical and biological significance, managed to enhance biological diversity and protected against destructive human exploitation.

- Proclamation No 2 146 identifies protected areas as environmentally critical and within the scope of the EIS System established under Presidential Decree No. 1586. Thus, all projects within the protected areas will be subjected to environmental impact assessment. DENR Administrative Order No. 2 1 was issued amending the previous policies on the system, and among others, to decentralize the issuance of Environmental Compliance Certificates (ECCs) for projects within environmentally critical areas. Further amendment (DAO 96-37) was issued to include provisions for public participation and social acceptability, the creation of multi-partite monitoring teams, and the accreditation of EIA preparers.

. The Philippine Fisheries Code of 1998 (Republic Act No. 8550) requires all government agencies, as well as private firms and entities who intends to undertake activities or projects which will affect the habitats of the rare, threatened and endangered aquatic species to prepare a detailed EIS that shall be submitted to the DENR for review and evaluation.

- Executive Order No. 247 regulates the prospecting of biological and genetic resources. It is further stipulated in the Order that the resources are to be protected and conserved, developed and put to sustainable use and benefit of the national interest.

3.3 Ex-Situ Conservation Measures

To complement in-situ conservation efforts, there are programs and projects aimed at conserving species out of its original location or habitat. Most of these initiatives employ seed storage, tissue culture, collection for plants and captive breeding for animals.

There are already a number of policy issuances with their attendant rules and regulations relative to ex-situ conservation. Most of these regulations have something to do with the government's compliance to international treaties such as the CITES. Some of these regulations are described below:

- DENR Special Order No. 1044, Series of 199 1 ,issued on 13 November 199 1, amends DENR Special Order No. 60, Series of 1989 Creating an Inter-Agency Committee to Evaluate Wildlife Permit Applications and Allocation of Quota. The Committee shall be composed of representatives from various government and non-government organizations and institutions, with the Assistant Director of PAWB acting as chairperson. The Committee is tasked to monitor the issuance of CITES Permits to ensure strict implementation of the CITES Treaty with respect to export licensing.

- DENR Administrative Order No. 30, Series of 1993, Providing Incentives for the Wildlife Breeding Industry. Issued on 13 May 1993, in pursuant to Executive Order 192 and the government policy towards the sustainable management and conservation of economically important wild fauna species with similar habitat requirements and in order to encourage the expansion of technical and financial investments in wildlife breeding, incentives are provided to the wildlife breeding industry. Incentives include the establishment of an express processing system for the issuance of CITES Permit and Wildlife Certification at PAWB, and the limiting of the issuance of Wildlife Farm Permit (particularly in the case of monkey species) to Primate Exporters and Breeders Association of the Philippines (PEBAP) members. All applications for permit of a non-PEBAP member or other parties interested in the breeding of other wild fauna species will be evaluated by the Committee. The conservation commitment required by the DENR as embodied under the terms and conditions of the permits are either be undertaken individually by each PEBAP member or collectively as an association.

- Subsequently, the DENR, being the lead agency in the implementation of the Executive Order 247, issued on June 2 1, 1996, Department Administrative Order (DAO) NO. 96-20 which is the implementing Rules and Regulations of EO 247. Since then, the Inter-Agency Committee on Biological and Genetic Resources (IACBGR) has conducted several workshop and orientation-seminars to clarify certain issues on the said order and to disseminate its provisions to general public and ensure its effective implementation. A manual entitled "Regulating Access to Biological and Genetic Resources in the Philippines" has been published and distributed to serve as guide to prospective collectors/researchers/users of the country's biological and genetic resources on the processes involved in bioprospecting.

- DENR Administrative Order No. 95-22, issued on 30 June 1995, provides for guidelines on the accreditation and registration of zoos and wildlife facilities of private collector(s), including wildlife maintained thereat. Accreditation and registration are issued by the PAWB Director. The Order also provides, at the same time, incentives for duly accredited and registered zoos and wildlife collectors.

- DENR Administrative Order No. 97-33 sets the guidelines on the issuance of permit for the collection and the transport of biological specimens from protected areas for use by DENR biodiversity conservation programs/projects. This was issued on 24 November 1997 pursuant to the provisions of NIPAS Law and in consonance with the Bioprospecting Law of the country. The issuance of permit to collect and transport biological specimens is delegated to the Director of PAWB with the prior clearance/endorsement of the concerned PAMB/RED. In all cases, endorsement shall be obtained from the concerned local communities/IPs in case the collection site encompasses areas of such communities. Monitoring of the compliance is jointly undertaken by the PAWB, PAMB and the concerned DENR Regional/Provincial or

Community Office; which may further involves the assistance of various institutions and organizations in the country.

Described below are some of the ex-situ conservation efforts in the Philippines:

a) Botanical Gardens

Botanical gardens of note are the Makiling Botanic Garden, UP Quezon Land Grant Botanic Garden, and the Living Museum of Philippine Medicinal Plants. Makiling Botanic Garden has an arboretum, a nursery, recreational areas and is home to several indigenous and exotic species.

b) Gene Bank/s

The Ecosystems Research and Development Bureau (ERDB) of the DENR maintains several Rattan gene banks, the Bamusetum and the Palmetum. These gene banks were established to serve as off-site conservation areas and sources of germplasm for reintroduction to original or new habitats.

c) Seed Bank

International Rice Research Institute (IRRI) Germplasm Center in Los Banos, Laguna is the largest rice seed bank in the world. It has seeds from all rice-growing countries in the world systematically stored in specially built rooms kept at sub-zero temperatures that can be readily available for research. The Center is maintained by the International Rice Research Institute.

d) Zoological Gardens

Established in the 1940s, the Manila Zoological and Botanical Garden, is now run by the City of Manila. At present, the Zoo needs rehabilitation and infrastructure upgrading.

e) Wildlife Sanctuary

The Calauit Wildlife Sanctuary in Palawan was declared a sanctuary to serve as an outdoor refuge of many exotic and endemic wildlife species in danger of extinction. Some of the endemic species grown in the wild or in captivity are the mousedeer (*Tragulus napu*), Calamian deer (Axis *calamianensis*), bear cat (*Arctictis binturong*), and Palawan peacock (*Polyplectron emphanum*). *These* animals live harmoniously with African wildlife species like giraffe, zebra, topi, impala, bushbuck, gazelle, waterbuck, and eland.

f) Rescue Centers

The DENR has established three Wildlife Rescue Centers, namely:

- PAWB-Wildlife Rescue Center at Ninoy Aquino Parks and Wildlife Nature Center in Diliman, Quezon City;
- CFI Wildlife Rescue Center in Irawan, Puerto Princesa, Palawan; and
- Center for Philippine Raptors in Laguna.

BFAR Tanay Freshwater Experimental Station has two rescue centers: one for freshwater species and another for brackishwater/marine species.

Three private establishment are designated by the DENR as rescue centers for various kinds of wildlife, namely: Octagon Farm in Iloilo, Emerald Farm in Albay, and La Union Botanical Gardens in La Union.

g) Various Captive Breeding Programs

Efforts to save several Philippine endangered species from extinction outside of their natural habitats have been recently launched by the government and proven to be successful. Reintroduction into their natural habitat, the final phase to complete the ex-situ objectives, have yet to be undertaken.

- Philippine Eagle. *Pithecophaga jefferyi. The* Philippine Raptors Conservation Project primarily aims to propagate the Philippine Eagle, *Pithecophaga jefferyi* and other endangered Philippine fauna1 species in captivity. Philippine Eagle Conservion Program and the Philippine Eagle Foundation, Inc. has been successfully breeding the Philippine Eagle in captivity in a farm in Davao, Mindanao.

- Philippine Crocodile_ C. *mindorensis* and C. *porosus. The* conservation of these two endangered species of crocodile in the Philippines: Philippine freshwater crocodile *(Crocodylus mindorensis)* and saltwater crocodile *(Crocodylus porosus),* is the main objective of the Crocodile Farm Institute (CFI). This DENR project with the assistance from the Japan International Cooperating Agency (JICA), is located in Puerta Princesa, Palawan. CFI also aims to establish sanctuaries in known crocodiles habitats.

- Visayan spotted deer. *Cervus alfredi.* This endangered species has disappeared in its original forest habitats in Cebu, Bohol, Siquijor, Masbate and Guimaras. This can be because of over-hunting and/or extensive degradation of their habitat. Only small scattered populations now remain. An agreement was forged in 1987 between the DENR and the Mulhouse Zoo in France for the conservation of the deer. Founder stocks of the deer are now bred in the Mulhouse Zoo. Local breeding facilities have also been established in Bitu Farm in Barangay Gutao. Iloilo and in Silliman University.

- Visayan warty pigs. *Sus cebifrons.* A similar ex-situ conservation program is being undertaken for the Visayan warty pigs *(Sus cebifrons), with* the Visayan spotted deer *(Cervus alfredi),* at the Melbourne Zoo in France. Forged through a Memorandum of Agreement signed by the DENR with Silliman University, the program falls under the Zoo's conservation and research activities under the International Recovery Program. Other institutions involved are the West Visayas State University, the Negros Ecological Foundation and the Flora and Fauna Preservation Society.

- Long-Tailed Macaque. *Macaca fascicularis. The* long-tailed macaque *(Macaca fascicularis* is bred in captivity for international trade. Due to the restrictions in the trade of the species, a local private company engaged in the export business established the Simian Conservation Breeding and Research Center (SICONBREC), which became the world's largest breeding

farm for captive monkeys for the export trade. There are other companies engaged in the business, namely, Del Mundo Trading, Amo Farm, and Scientific Primates Filipmas, Inc.

- Philippine cockatoo. *Cacatua haematuropvgia. The* conservation program for the Philippine cockatoo, *Cacatua haematuropygia, was* initiated in 1992. The program, which was under the European Endangered Species Breeding Program (EEP), includes laboratory research activities such as karyotyping, genetic and hematological studies (Boussekey, 1995).

Other captive breeding projects in the Philippines include the Tamaraw Conservation Program under the PAWB, and the Biological Study of Asiatic Pangolin in its Natural Habitat and in Captivity under the ERDB.

Below is a partial list of Institutions with Captive Breeding Facilities:

- Ecosystems Research and Development Bureau, DENR, Laguna
- Protected Areas and Wildlife Bureau, Quezon City
- Silliman University, Negros Oriental
- Philippine Eagle Conservation Center, Davao
- Philippine Raptor Research and Conservation Center, UP-Los Banos
- Calaiut Wildlife Sanctuary, Palawan
- Crocodile Farming Institute, Palawan
- Bird International, Inc., Quezon City
- Simian Conservation Breeding Research Center
- Scientific Primates Filipinas, Inc.
- Del Mundo Trading
- Amo Farm
- Flora Farm

3.3. *1 Financial and other Support for Ex-situ Conservation*

Financial support to ex-situ conservation is more evident in captive breeding, wildlife refuge and rescue centers for few selected animals and in seed/gene storage and tissue culture collections for plants. There's a limited number of privately operated captive breeding facilities and zoological parks. While government conservation programs started as early as 1969. the financial support remained limited over the years.

The 1997 government budget provided for the following ex-situ conservation programs/projects:

Philippine Eagle Conservation Project	Phil. P 8,982,000
Pawikan Conservation Project	4,8 14,000
Tamaraw Conservation Project	5,000,000
Operation and Maintenance of Crocodile Farm	13,118,000
Pilot plantation establishment of selected forest species	23,696,000
National Seed Industry Council	2,437,000
Production of seeds and plant materials	10,991,000
Seed quality control services	19,392,000
Management of plant pest disease	9,56 1,000
Development of aquatic resources	50,38 1,000

Development of livestock sector (Poultry/cattle/small ruminants)	51,119,000
Total	P 199,491,000

3.4 Impact Assessment and Minimizing Adverse Effects

The Philippine Environmental Impact Assessment (EIA) System was mandated in 1978 with the enactment of the 'Philippine Environment Policy' under Presidential Decree No. 115 1. This law stipulates that all activities or projects, which significantly affect the quality of the environment, should undertake environmental impact assessment in order to determine their adverse effects and present alternatives to these proposed activities or projects in order to avoid or mitigate such effects.

A companion law, the 'Philippine Environment Code' that was enacted through Presidential Decree No. 1152, complemented the Philippine Environment Policy. This law established specific environmental management policies and guidelines prescribing environmental quality standards for the management of vital resources such as air, water, land and natural resources. The Code further provides for the administrative mechanisms for implementing these policies and guidelines. It also emphasizes the importance of public participation in environmental management and protection.

The establishment of the EIS System was further refined through the issuance of Presidential Decree No. 15 86 that institutes the process and the mechanisms for its administration and monitoring. It specifies the scope of the system and categorizes projects, activities, and areas that are environmentally critical. Those areas that have been considered environmentally critical include national parks, wildlife habitats, domains of IPs, prime agricultural lands, aquifer recharge areas, mangroves and coral reefs.

Since its establishment in 1978, the EIA System has been strengthened with the issuance of subsequent policies that further enhanced its implementation. The Department of Environment and Natural Resources (DENR) is presently the implementing agency for the EL4 System, and in 1992, the Department issued DENR Administrative Order (DAO) No. 2 1 which amended the previous policies on the system. Among others, the order decentralized the issuance of Environmental Compliance Certificates (ECCs) for projects that are to be located in environmentally critical areas. This Order was further amended by DAO 96-37 issued in December of 1996, to include provisions for public participation and social acceptability, the creation of multi-partite monitoring teams, and the accreditation of EL4 preparers.

Among the innovative features of the system include the following:

- The stipulation for an Environmental Guarantee Fund (EGF) for environmental damages, and the provision of funds for regular monitoring.
- The guarantee for social acceptability through a process of consultation with stakeholders and affected communities.
- The establishment of a multi-sectoral monitoring team which provides for community participation.
- The provision of funds for livelihood, training, and amenities for affected communities.

- The stipulation of restoration of damaged ecosystems, habitats and other resources affected by projects or activities.
- the establishment of the EIA Review Committee which is an independent body of experts and professionals of known probity, whose main task is to evaluate the EIA done for the projects and submit appropriate recommendations.
- The formulation of an Environment Management Plan, as part of the EIA process, that details the prevention, mitigation, compensation, contingency and monitoring measures to enhance the positive impacts and minimize the negative impacts of a project.
- The inclusion of an Environmental Risk Assessment to define the probability and magnitude of potentially adverse effects which can result from exposure to hazardous materials or situations.

Since its inception, around 3,000 EIA documents have been submitted for various projects, and about 80% of these involve projects in environmentally critical areas. Out of all the EIA documents submitted, about 2,000 projects have been issued Environmental Compliance Certificates (ECC).

3.5 *Incentive Measures*

Economic incentives have not been fully utilized as strategy for biodiversity conservation in the Philippines. Two of the strategies employed are mentioned below:

- Communitv-Based Forest Management Program. In July 1995, President Fidel V. Ramos issued Executive Order 263 made the Community-Based Forest Management (CBFM) Program as the national strategy to ensure the sustainable development of the country's forests while promoting people empowerment and social justice. It acknowledges the important role played by local communities in the protection, rehabilitation, development and management of forest resources. The strategy presumes that fully capacitated local communities given responsibility over forestlands develop a stake in the resource and become responsible stewards.

  As responsible stewards, communities are granted the right to use sustainably the forest products in the area through the Community Based Forest Management Agreement (CBFMA). In accordance with the Forestry Master Plan, 1.5 million hectares of logged-over areas of residual forests are targeted to be covered by CBFM, benefiting some 1,000 communities or 300,000 families.

- Certificate of Ancestral Domain Claim (CADC). The Constitution of the Philippines guarantees the rights of indigenous peoples to their ancestral lands, and recently, Republic Act No. 8371 or the Indigenous Peoples Rights Act of 1997 has been approved by the Philippine Congress. Prior to the passage of this law, the Department of Environment and Natural Resources recognized the rights of indigenous peoples to their ancestral lands. The Department issued Administrative Order No. 2 series of 1993 providing guidelines for the issuance of Certificates of Ancestral Domains (CADC). These certificates provide rights to the indigenous peoples to manage and utilize the resources found within their domains in accordance with existing laws, to plan their own future and to gain access to adequate basic services.

As of December 1996, 75 CADCs have been issued, which cover a total area of 1.05 million hectares.

3.6 *Technical and Scientific Cooperation*

In order to promote international and scientific cooperation the Philippines has entered into several agreements with academic and research institutions, zoological and botanical gardens, and non-government organizations. both in the country and abroad. Some of the projects being implemented by the Department of Environment and Natural Resources in cooperation with its partners include:

- Biodiversity Inventory Project in Central Sierra Madre, Quezon and Aurora Provinces, in partnership with the University of the Philippines
- Philippine Tarsier Conservation Program, with the Philippine Tarsier Foundation Inc., an NGO
- Important Bird Areas of the Philippines Project, with Haribon and BirdLife International, both NGOs
- Philippine Cockatoo Conservation Program, with the Espace Zoologique of France
- International Collaborative Program for the Conservation of Philippine Crocodiles, with Silliman University and the Royal Melbourne Zoological Gardens of Australia
- Philippine Spotted Deer Conservation Program, with Melbourne Zoo, Australia
- Calamian Deer Conservation Program, with the Zoological Society of San Diego, California, USA
- Visayan Warty Pig Conservation Program, with the Zoological Society of San Diego, California, USA
- Philippine Eagle Conservation Project, with the Philippine Eagle Foundation Inc. a local NGO
- Assessment of Philippine Macaque and its Habitats in the Philippines, with Japan Wildlife Research Center
- Crocodile Farm Institute, with Japan International Cooperation Agency
- Field Inventory and Conservation of Philippine Land Vertebrates; Training and Resource Development and Research Project, with the Field Museum of Natural History, USA
- Conservation Research of Philippine Birds and Mammals, with the Ruhr Universitat of Germany
- Philippine Fruit Bats Conservation and Research Program, with Siliman University and the Lubee Foundation of Florida, USA

At the ASEAN regional level, the Governments of the Philippines and Malaysia both entered into a Memorandum of Agreement (MOA) for the establishment of the Turtle Island Heritage Protected Area. The MOA includes among others the implementation of an integrated joint management plan for the area, the establishment of a centralized database and information network, implementation of trainings and ecotourism projects, and a joint research program.

In July 1997, the Philippines, in behalf of the Association of Southeast Asian Nations (ASEAN), and the European Union (EU) signed an Agreement for the creation of the ASEAN Regional Center for Biodiversity Conservation (ARCBC) to be located in the Philippines. The center hopes to develop a network of institutional links among ASEAN Member Countries and EU partner organizations. The goal is to promote biodiversity conservation through improved cooperation in a comprehensive regional context. The center will assist member countries in developing and enhancing technical and institutional approaches for managing biodiversity conservation.

The ARCBC has four major components: network and institution building, training, research, and database establishment and information dissemination. Under the first component, National Biodiversity Reference Units in each member country will be identified as focal points for biodiversity. There will be exchange of experts and researchers in order to promote transfer of knowledge and exchange of experiences. The training component will be acting at three levels. First are those trainings to be facilitated by the center, such as short-term workshops, conferences and seminars. Second is the development of training models and packages for subsequent implementation by member countries. The third level will involve the upgrading of curricula of academic institutions in member countries.

The research component will consist of five phases, starting from an assessment of research priorities to the formulation of a regional prospectus/agenda which will be approved by a Regional Research Committee. The ARCBC will finance the approved research proposals. The database component will help facilitate the flow of information among scientists and other users by creating and enhancing electronic databanks in the ASEAN.

The ARCBC will be implemented by the Department of Environment and Natural Resources through the Protected Areas and Wildlife Bureau. The building to house the center has already been completed and launching of ARCBC is scheduled for June 5, 1998.

3.6. I *Clearing house mechanism*

The National Focal Point for the Clearing House Mechanism (CHM) for the Convention on Biological Diversity in the Philippines is the Protected Areas and Wildlife Bureau. The CHM is currently being designed under a grant from the Global Environment Facility (GEF) and it is expected that the CHM will be in place by June 1998. The CHM will be structured in accordance with the Articles of the CBD, and will contain information on the following: Country Profile, the NBSAP, National legislations and policies on or related to biodiversity, International Agreements, scientific information on the components of biodiversity, technological information, research results, services and help desk. Thematic focal points will also be identified for special topics such as those identified by the CBD such as Agricultural Biodiversity, IPR, etc.

A National Biodiversity Center is also being established in the Protected Areas and Wildlife Bureau with funding assistance from IUCN. This center will also serve as the National Brodiversity Reference Unit (NBRU) which will be linked to the ASEAN Regional Center for Biodiversity Conservation.

4.0 *Implementing National Access and Benefit-Sharing Regimes in Relation to Articles 15, 16 & 19 of the Convention on Biological Diversity*

4.1 Access to Genetic Resources

4. I. 1 Facilitate access to other parties

In response to the call of the Convention on Biological Diversity (CBD), and more significantly to remedy the heightening biopiracy problem, the country's large and active community of non-government organizations (NGOs) pushed for a comprehensive policy, legal and administrative regulatory framework which aims to regulate bioprospecting in the Philippines.

The seminal role was played by the scientific community, which spearheaded the formulation of national and international guidelines for the-ethical and sustainable use of biological resources. In particular, the Seventh Asian Symposium on Medicinal Plants, Spices and Other Natural Products (ASOMPS VII), held in Manila in February 1992, came up with the "Manila Declaration concerning the Ethical Utilization of Asian Biological Resources" and its appended "Code of Ethics for Foreign Collectors of Biological Samples and Contract Guidelines". Picking up from The Manila Declaration, the Philippine Network for the Chemistry of Natural Products took the initiative to draft the national policy on bioprospecting. As a result, Executive Order (EO) No. 247 was signed by the President in 1995, and its corresponding implementing rules and regulations were issued by the Department of Environment and Natural Resources (DENR) through Department Administrative Order No. 20, series of 1996 (DAO 96-20).

EO 247 entitled "Prescribing Guidelines and Establishing a Regulatory Framework for the Prospecting of Biological and Genetic Resources, Their By-products and Derivatives, for Scientific and Commercial Purposes and For Other Purposes" was formulated on the basis of the CBD and the 1987 Philippine Constitution. Under Section 16, Article II and Section 2, Article XII of the Philippine Constitution, the State has the ultimate responsibility of preserving and protecting the environment. The State owns, among others, wildlife, flora and fauna, and has full control and supervision over the disposition, development and utilization thereof.

In its policy statement, the EO provides that it is "the policy of the State to regulate the prospecting of biological and genetic resources to the end that these resources are protected and conserved, are developed and put to the sustainable use and benefit of the national interest. Further, it shall promote the development of local capability in science and technology to achieve technological self-reliance in selected areas."

"Bioprospecting" is defined in the law as "the research, collection and utilization of biological and genetic resources, for the purpose of applying the knowledge derived therefrom for scientific and/or commercial purposes." Pursuant to its provisions, the law regulates all bioprospecting in the public domain, including natural growths in private lands, and even within protected areas,

ancestral lands and domain, whether intended to be utilized by foreign or local prospectors. Traditional uses of the resources are, however, exempt from the coverage of the regulation.

Access by other parties to Philippine biological and genetic resources is facilitated by the setting up of clear and uniform rules for the use of the resource, as embodied in EO 247. In the past, there were no clear rules. Collectors had to deal with the regulations of the numerous government agencies that had responsibility for the protection of particular resources. With EO 247, the system of gaining access to local resources has been centralized and simplified.

4. I. 2 *Prior Informed Consent*

Both international and national laws recognize that access to genetic resources shall be subject to prior informed consent (PIC). Section 5 of Article 15 of the CBD specifically states that "access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party". At the national level, both EO 247 and the recently enacted Republic Act (RA) No. 837 1 or the Indigenous People's Rights Act (IPRA) of 1997 clearly extend the authority to give PIC beyond the State, by requiring that consent be secured from the community and not just the State. Section 2 of EO 247 declares that prospecting of biological and genetic resources shall only be allowed with the PIC of concerned local and indigenous cultural communities, obtained in accordance with their customary laws.

Under Section 35 of the IPRA, access to biological and genetic resources and the indigenous knowledge related to their use, preservation and promotion, may be allowed in ancestral lands and domains. This may be so provided that free and prior informed consent (FPIC) of the concerned community is secured in accordance with their customary laws. In this case, free and prior informed consent signifies community consensus arrived at through customary law, free from external manipulation or interference. The process should involve disclosure of intention and extent of the activity in a transparent manner and in understandable language.

The implementing rules and regulations that will provide details in the implementation of the IPRA, however, are yet to be issued by the National Committee on Indigenous People in consultation with the Committees on National Cultural Communities of the House of Representatives and the Senate.

Under EO 247, PIC refers to the consent obtained by the applicant from the indigenous people, local community, Protected Area Management Board (PAMB) or private landowner concerned, after fully disclosing the intent and scope of the bioprospecting activity, in a language and process understandable to the community. This requirement is the essence of EO 247 and is an important component of the application process. The policy establishes a procedure for assessing, obtaining, and verifying the PIC. Such process includes public notification or sector consultation or both, or in ancestral lands and domains, conformity with the customary traditions, practices and mores of the community. The PIC Certificates are only issued after due deliberation by the involved stakeholders.

In the implementation of the EO, the process in securing the PIC has become a major issue. The 60-day requirement for a PIC is considered especially burdensome for academic researchers who are often bound by time and fund limitations. There is also the concern that the PIC might serve as basis for host communities to demand for immediate benefits from the proponent that may not even be provided for in the research agreement. EO 247 does not and should not prohibit communities

from negotiating for benefits. Another issue raised is the full disclosure requirement in the PIC particularly in view of the industry concern over confidentiality of information and patent rights.

The EO provision on prior informed consent from the local or indigenous community remains an important component. This is non-negotiable as far as NGOs and POs are concerned. This is also true for the IPRA wherein through the PIC process, the capacities and efforts of indigenous peoples and local communities to protect conserve and manage the natural resources within their ancestral domain and local community are acknowledged and supported. It also provides them the leverage to negotiate the terms and conditions for the use of the resource and the benefits arising therefrom.

4.1.3 *Co-operative scientific research promotion*

One major condition embodied in EO 247 is that all bioprospecting researches, including technological development of a product derived from the collected resources, by any foreign individual, institution or entity must be conducted in collaboration with Filipino scientists under mutually agreed terms and conditions. The collector is also encouraged to avail of the services of Philippine universities and academic institutions and donate some of the equipment used in the conduct of the research to the government agency, institution, or university concerned.

Properly labelled holotypes and voucher specimens should be deposited at the Philippine National Museum or a duly designated entity. Likewise, a complete set of all living specimens collected must be deposited in mutually agreed and duly designated depositories.

4.1.4 Legislative, administrative policy measures for access

Salient features **of the Executive Order**

Under the system established by E.O. 247, no bioprospecting activity shall be allowed unless a research agreement has been executed between the Philippine government and the prospector. A research agreement may either be an Academic Research Agreement (ARA) or a Commercial Research Agreement (CRA). Both agreements require the prospector to satisfy certain requirements and to undergo an application process.

Duly recognized Philippine academic and research institutions, and government agencies are eligible for an ARA, which is more flexible and allows them to exercise greater self-regulation. On the other hand, all research and collection directly or indirectly intended for commercial uses may only take place under a CRA. All private persons and commercial firms, whether foreign or local, are deemed to have commercial applications and must obtain a CRA, unless private individuals qualify as affiliates of a Philippine university, academic, domestic governmental or inter-governmental institutions. In the case of the latter, the affiliate need not apply for a research agreement but may work under an existing ARA of the institution. Said institution, however, is held responsible for ensuring that all of its affiliates comply with the terms and conditions of the agreement. An ARA is effective for a period of 5 years while a CRA is valid for 3 years.

The important difference between the two types of agreement is the extent of government control over their research activities. Through the use of the ARA, the EO allows them to exercise greater self-regulation and flexibility in order to exempt them from the additional requirements of the CRA process. In this way, the regulatory body has ample time to monitor private commercial parties.

Nevertheless, the implementors of the law are aware that foreign commercial collectors of biodiversity often employ local academic collectors as suppliers and prospectors for their own commercial interests. Eventually, this differential regulatory attention may soon be replaced by a stringent monitoring scheme even for academic bioprospectors.

E.O. 247 provides for contracts as the mode of regulation. The research agreement is a bilateral contract between the Philippine government, represented by the government agency concerned depending upon the nature and character of the undertaking, and the prospector. Unlike a permit system or an intellectual property rights regime, this agreement is more flexible. The parties to the research agreement may stipulate anything provided that the minimum requirements of the law and its implementing rules and regulations are met. Furthermore, the stipulations should not be against law, public order and public policy. They can agree on terms and conditions such as rates, kinds of benefit sharing arrangement, and the like.

The minimum terms and conditions that must be complied with by the proponents are given in the EO and its implementing rules and regulations. These may be divided into five major concerns, namely: a) ownership, transfer and use of resources; b) subsequent transfers; c) benefits sharing; d) terms of collaboration; and e) prior informed consent. The first two are discussed as follows while last three categories are discussed elsewhere in this report.

- Ownership and utilization of resources

  Under the terms and conditions of the E.O., ownership of the resources remains with the State. Before actual bioprospecting is conducted the prospector must pay a bioprospecting fee. A commercial bioprospector is also required to deposit performance, compensation, and ecological rehabilitation bond. The submission of a list of depositories that have used or are currently using Philippine species and their database is a must for all bioprospectors. Also, all specimens deposited abroad must be made accessible to Filipino citizens and the Philippine government, and all collections made must be reported to the Inter-Agency Committee on Biological and Genetic Resources (IACBGR). The EO allows collection of species only in accordance with what has been approved in the research agreement.

- Subsequent transfer of materials

  In order to ensure control over the materials, the research agreements require that subsequent transfers to third party recipients must be accompanied with Materials Transfer Agreements. The latter include provisions on, among others, confidentiality, restricted use, responsibility of the original collector to enforce compliance with the terms and conditions of the law and the research agreement by third party recipients. The parties to the research agreement may agree upon other benefit sharing options. These could include employment opportunities for residents of the collection site; training and scholarships; seminars; donation of equipment; performance of rituals; among others.

Administrative Mechanism

E.O. 247 is the concern of several government agencies such as the Department of Environment and Natural Resources (DENR), the Department of Health (DOH), Department of Science and

Technology (DOST), Department of Agriculture (DA) and Department of Foreign Affairs (DFA). These agencies meet as a group under the umbrella of the IACBGR. The IACBGR is the regulatory body tasked to enforce and implement the provisions of the EO and its implementing rules and regulations. It is chaired by the DENR and its membership includes representatives of the member-agencies. It is supported by an inter-agency Technical Secretariat.

One of the functions of the IACBGR is to process applications for research agreements. Upon evaluation, the body endorses the proposal to the Secretary of the government agency concerned for approval. IACBGR also ensures that the conditions of the research agreements are strictly observed.

EO 247 requires the participation of various government agencies and all other stakeholders by means of mandating the prior informed consent of local communities, indigenous peoples, Protected Areas Management Board and private landowners concerned.

In order to guarantee proper and effective implementation of the research agreements, the law mandates that monitoring shall be conducted by the respective member agencies using a standard monitoring scheme. The IACBGR Monitoring Team is tasked to establish a mechanism, which will ensure the integration and dissemination of the information generated from bioprospecting activities, and monitor the progress of research, utilization and commercialization done within and outside the Philippines. At present, the IACBGR through the Technical Secretariat conducts information dissemination on the EO and its implementing rules and regulations.

The Philippines is known to be the first country to formulate and implement specific framework legislation on access to genetic resources. Other countries have benefited from the Philippine experience in implementing Article 15 and have considerably learned from its successes and failures.

4.2 *Access to and Transfer of Technology, including Biotechnology and Handling and Distribution of Benefits*

There is an immense potential for the beneficial use of biotechnology for the development of new products for food. pharmaceuticals, cosmetics, bioremediation and other applications in agriculture and industry. Biotechnology has dramatically increased the present and potential value of biological resources but its contribution to the loss of biodiversity through genetic erosion and its negative impact directly or indirectly to the environment should not be underestimated. Biotechnology should be realized in a manner that is complementary to and protective of biodiversity.

4.2.*1* *Legislative, administrative and policy measures*

Biotechnology Sectoral Plan (19952000)

In the Philippines, biotechnology is considered one of the banner programs under Philippines 2000 and a flagship program under STAND 2000 (Science and Technology Agenda 2000). Research programs involving biotechnology have become part of the national effort to address problems concerning the industry, environment, agriculture, food security and health. A Biotechnology

Action and Implementation Plan (19952000) has been drafted by the Science and Technology Coordinating Council (STCC) Technical Panel in consultation with different interest groups (industry, food, health, agriculture, fisheries, forestry and environment) to project the role of biotechnology in national development while advocating the protection and conservation of environment and biodiversity. The main programs are currently focused on capability building (acquisition of new technologies and human resource development), public education and advocacy, and research and development (R&D) in such priority areas as industry, food, health, agriculture, fisheries, forestry and environment.

The current developments in biotechnology research and development call for a strategic social marketing of biotechnology products and services for public awareness and acceptance. The National Institute of Molecular Biology and Biotechnology (UPLB-BIOTECH) has recently completed a project to introduce the concept of biotechnology and popularize biotechnology products.

National Biotechnology Research and Development (R&D) Program for Agriculture, Forestry and Environment (1998-2000)

A National Biotechnology R & D Program was prepared by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development - Department of Science and Technology (PCARRD-DOST) as a response by the scientific community to pole-vault the economy into the 2 1st century using biotechnology as the rallying point. It identifies a package of biotechnology proposals aimed at improvement of present yields of selected crops, trees and livestock; improvement of quality of products, bioremediation of the environment and policies, social marketing and technology transfer. It also aims to adopt specific strategies to shortcut the research and development activities by purchasing genes from commercial sources or through negotiated material transfer agreements, if available.

4.2.2 *Fair and equitable access*

The Philippine access regulation (EO 247) treats both foreign and local collectors equally in terms of requirements and opportunities for access, except for requirements that encourage technology transfer from the foreign collector to the local collaborators.

In the aspect of benefit-sharing, EO 247 provides that all discoveries derived from Philippine materials be made available to the Philippine government and local communities concerned. When discoveries from Philippine endemic species are made, the prospector shall make available to the Philippine government the use of such discovery, commercially and locally without paying royalty to the inventor/discoverer; however, other agreements, where appropriate, may be negotiated by the parties. For inventions derived from the Philippine material, a separate agreement shall be made for the transfer of royalty, benefits and technology. The parties to the agreement may also include a stipulation on profit sharing. This provision, however, has yet to be fully clarified.

Other benefit-sharing options being explored include:

- Up-front payments for samples collected and/or cash payments pegged at milestone achievements.

- Provisions may be made to transfer technology, so that the source community/ country may bring added value to the commodity.
- There should be a comprehensive program to build technical capability. Parts of the program may then be incorporated in the benefit-sharing agreements with collectors. In this way, the cost of capacity-building is not solely borne by the source country. Provisions may be made for funds to be allocated for the conservation of genetic resources. This also assures the collector that future supply is secure.
- Partnerships may be forged in the form of joint ventures in product development; co-ownership of patents and other intellectual property rights.

The Convention also recognizes that intellectual property rights (IPRs) affect the implementation of the Convention. There is some debate as to what Article 16.5 really means. Gollin (1993) suggests that the provision represents an agreement to disagree on whether particular IPRs are to be strengthened or weakened consistent with the Convention. Some sectors argue that the subsection 5, together with subsection 2, would allow countries to ignore IPRs in order to have unrestrained access to technology via compulsory licensing and other preferential terms. However, a narrow reading of Article 16 would also subject Article 15 to a parallel narrow interpretation that access to genetic resources may be involuntary. Gollin further suggests that subsection 5 should be interpreted as promoting non-compulsory mechanisms to encourage private companies to transfer technology.

In the Philippines, EO 247 encourages transfer of technology by requiring collectors to actively involve local scientists in their researches. The nature and degree of participation of local scientists are subject to negotiation between the collaborators. EO 247 also requires that collectors engage the services of local universities and that some equipment used in the researches be donated to Philippine institutions or agencies.

At present, there are no clear rules on how intellectual property rights issues are to be treated. The emerging thinking is that local counterparts only share in IPRs if they have actual participation in the innovations developed. While the benefit sharing provisions of EO 247 mandates the payment of royalties, it does not require that IPRs have to be shared. In this sense, the regulation merely requires sharing a portion of the proceeds (e.g. licensing fees).

One controversial provision in EO 247 is that the technology developed from the use of endemic species shall be made available to a designated Philippine institution for use commercially and locally without paying royalties to the innovators. This provision has yet to be threshed out and is subject to further study.

4.2.3 *Biosafety protocol*

After the creation of the National Committee on Biosafety of the Philippines (NCBP) pursuant to Executive Order No. 430, the first edition of the Philippine Biosafety Guidelines was released by the NCBP in 199 1. The guidelines cover all work involving genetic engineering and the importation, introduction, field release and breeding of organisms that are potentially harmful to people and environment even though these are not genetically modified. The Philippines was one of the first countries in Asia to formulate biosafety guidelines.

The guidelines are being revised and updated in view of the experience in its implementation and available information on living modified organisms (LMOs) obtained in recent years in the Philippines and several countries. The second edition of the Philippine Biosafety Guidelines will consist of at least three monographs depending on the scale of work involved, i.e. a) small scale, b) large scale including greenhouse trials, and c) planned release.

Since 1990, a total of 84 project proposals involving genetic engineering conducted under contained conditions have been assessed by the NCBP. To date, no planned release of LMOs has been allowed by NCBP pending finalization and adoption of the revised guidelines.

In the Philippines, there is still a need to adequately inform the public of the benefits and disadvantages of genetic engineering, and train stakeholders to undertake challenges in biotechnology, including the ability to evaluate and assess the risks and benefits of new technology and its safety application. There is also a need to review policy issues such as intellectual property rights in the context of the economics and technology requirements of bioprospecting, the promotion of cooperation between research and development institutions and private enterprises, and the establishment of a regional information network.

5.0 Improving National Capacity for Biodiversity Conservation/Management

The success of efforts in conserving biological resources is highly dependent on the institutional and individual capacity for implementing identified programmes and projects. Experience also show that the potential for success can be realized when policies, activities, investments, and public and political actions promote these ends. Capacity, in turn, is enhanced by the availability and type of skills, technology and information access.

5.1 Human Capacity

One of the more significant impacts of the Rio Summit in 1992 was the increased awareness of people on the concept of sustainable development. As a consequence, national policies supporting the agreements made in the Earth Summit called for institutional arrangements to adapt and respond to evolving knowledge, environmental conditions, policies and opportunities. This scenario encouraged streamlining of functions, establishment of joint cooperative activities, and even shifts in mandates and structures in some institutions. These factors contributed to the demand for skilled workers and managers in resources management.

Biodiversity management covers a wide range of concerns. A typical biodiversity management programme requires a wide range of fields and training. It cuts across fields such as basic to applied sciences, policymaking and administration to community organization and extension. Human resource development for biodiversity management can be attained through different means. Academic preparation may take place at universities and other formal means. Specialized training programmes on the other hand could be given through courses at different levels.

Environmental education has been identified as one of the ten strategies under the Philippine Strategy for Sustainable Development. It has two main objectives: 1) to enable citizens to understand and appreciate the complex nature of the environment and 2) to develop local knowledge base about local environment and natural resources. It also aims to develop and promote tertiary graduate courses in ecology, environmental science, resource management and resource economics and espouses the promotion of research and development.

The Philippine Agenda 2 1 (PA2 1) recognizes that the pursuit of sustainable development involves a paradigm shift that requires a re-orientation in the fundamental values of society. It considers comprehensive information, education and communication advocacy as an indispensable component of the efforts to mainstream the principles of PA 2 1 in the various development efforts of all stakeholders in the SD process.

Article 12 of the CBD specifically states that Contracting Parties ...shall "establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological diversity and its components and provide support for such

education and training for the specific needs of developing countries." The foregoing discussion describes some of the national initiatives related to that provision.

5.1.1 Formal Courses

A post-UNCED study reviewed the status of environmental education in selected countries within the Asian region including the Philippines. Trends indicate that the incorporation of environmental education within the formal system, although advancing, is still relatively underdeveloped and is far from achieving its holistic and interdisciplinary objectives (Padgham, 1995).

In the Philippines, formal courses relevant to biodiversity conservation are still limited to few schools. The trend is that there is already an increase in courses and the number of institutions offering them. New courses being offered include Molecular Biology and Biotechnology (BS), Environmental Planning (BS), Environmental Science/Studies (BS, MS and PHD), Environmental Education (MS, PhD), and Environmental Management (MS). About 66 schools offer the traditional BS Biology course which is usually (but not necessarily) the jump-off course to more specialized fields like taxonomy, genetics, pharmacology, microbiology, agronomy, entomology, cropscience, and plant breeding among others. It is expected that as demand for these skills increase, universities and colleges would evaluate their courses in view of responding to this need.

5.1.2 *Non-Formal Courses*

Non-formal technical courses on specific concerns offer opportunities for human development in biodiversity conservation. Although the ideal is to have formal training, in most cases, these technical training courses are useful especially for retooling and fine tuning of existing staff who will be assigned new duties related to resource management. There are numerous opportunities for training in this field, however, most of them are being conducted in relation to on-going projects of institutions. Further, there is no mechanism in place to keep track of these training courses that would have been useful in determining capacity enhancement in the field of biodiversity conservation. Along with time constraint, this is one of the reasons, why the discussion that follows will be limited to those programs or training courses with readily available information.

The Protected Areas and Wildlife Bureau conducts training courses on topics supportive of their thrusts and programmed activities. The courses cover a wide range of topics including implementation of commitments to CITES, community organizing, Biodiversity Conservation and NIPAS, cave management, workshop on buffer zones, and orientation workshops for new projects. In particular, the PAWB conducted extensive training workshops on the NIPAS Law and its Implementing Rules and Regulations in order that the legislation be better understood by all concerned.

With the enactment of the NIPAS Law, there became a felt need to have park managers trained for the demands brought about by this new Law. One of the initiatives in response to this was the conduct of a Biodiversity Conservation Training for Managers and Technical Staff of Protected Areas. Two sessions were conducted by the Foundation for Sustainable Development (FSDI) in cooperation with the World Wide Fund for Nature (WWF) at the Subic Bay Conservation Training Center (Subic Bay, Philippines). The intensive, three-week course aims to equip the participants with the skills of park management including ethical, biotic, ecological, social, legal and administrative aspects of protected area planning and management in the Philippines.

The Plants Unit of the Biodiversity Information Center (Philippine National Museum) conducts training programs to assist various government and non-government organizations to implement their various biodiversity conservation programs. The courses are focused on the enhancement of skills of the technical personnel on plant inventory, identification and quantitative assessment of plant diversity in protected areas and botanically rich sites.

Included in the week-long training are lectures on plant diversity in the Philippines and plant conservation principles. Practical exercises such as proper collection of specimens in the field and processing of specimens in the laboratory, identification of plants using spot characters and taxonomic keys, and recording of plant data. Below are enumerated some of these training courses:

- Field Training Course on Basic Techniques on Plant Diversity Inventory, Monitoring and Documentation
- Participatory Training Course on Basic Techniques on Plant Diversity Inventory (for Iraya Mangyans)
- Participatory Training Course on Ethnomedicinal Plants Inventory and Documentation (for Iraya Mangyans)
- Training Course on Biodiversity Assessment (Flora/Vegetation) for Management Planning of Priority Protected Areas: The Batanes Seascape and Landscape

The PCAMRD in collaboration with five other organizations has implemented the National Course on lntegrated Coastal Management (NCICM). One of the priority thrusts of coastal management projects in the Philippines is to build human resources capability in coastal management planning and implementation. The need for trained human resources became acute with the implementation of the Fisheries Sector Programme (FSP) of the Department of Agriculture (DA) and the Coastal Environment Programme (CEP) of the DENR (PCAMRD, 1997). Both programs worked with local government units (LGUs) whose ranks were unprepared for the responsibility of managing their coastal resources as provided by the Local Government Code of 199 1. It is in this context that six organizations involved in coastal management programs in the Philippines, the DA, the DENR the PCAMRD, the Haribon Foundation, the IIRR and the ICLARM collaborated to implement the NCIC. The main objectives of the NCICM are to develop a pool of coastal managers in each region of the country who have the same basic understanding of integrated coastal management, and to develop a training package that could be widely used in the local and regional scene.

To improve the implementation and enforcement of CITES in the Philippines. the PAWB and BFAR in cooperation with the US Fish and Wildlife Services conducted a training for personnel involved in CITES administration. This was further echoed by BFAR trainors in subsequent Regional Training Workshops on CITES Implementation and Taxonomy of CITES and non-CITES Aquatic species in areas with strategically located airports and seaports. The participants included law enforcers and wildlife inspectors representing eleven agencies. The regional workshops provided practical training on the provisions of CITES, law enforcement procedures and techniques regarding requirements for handling confiscated wildlife, and taxonomic identification of CITES-listed and non-CITES aquatic species banned and regulated under the national laws. The trainees were provided CITES manuals, handbooks on law enforcement and relevant laws and guides to the identification of species in trade.

The Foundation for the Philippine Environment (FPE) has funded the establishment of Training Grants to support skills Training on Agroforestry. It has also funded a number of paralegal training courses conducted by NGOs.

In 1995, the EMB completed a UNDP-funded project called Human Resources Development in Environmental Planning and Management for Sustainable Development. The project was conceived to address the lack/inadequacy of trained manpower base able to creditably undertake effective land-use and resource management planning. The training modules developed and used include topics relevant to biodiversity conservation such as Management of Protected Areas and Conservation of Endangered and Threatened Species, Regional Sustainable Natural Resources Management Planning, Integrated Watershed Management and Integrated Coastal Zone Management.

5.1.3 *Education and Training Support*

To be able to establish and maintain educational and training programs needed to implement the national biodiversity conservation programs, it is not just the identification of human resources needed that is crucial. Equally important is the institutional, infrastructure and funding support.

While the Philippine NBSAP has given some indications on which fields of expertise are lacking and at the same time crucial to the implementation of the conservation plan, it was not able to quantify or at least estimate how many taxonomists, for example, would be needed in the next five years. Unfortunately, there is also no consolidated information that would give an idea of the current institutional, infrastructure, and funding capability of organizations implementing biodiversity conservation in the country. This information along with the NBSAP would have been useful in determining investment that would be needed to address such problem.

5.2 ***Research***

5.2.1 *Research Policy*

National policies with respect to biological diversity research are largely embodied or assumed under general conservation policies. Under Executive Order 192, the law which reorganized the DENR, the Ecosystems Research and Development Bureau was created primarily to "formulate and recommend an integrated research program relating to Philippine ecosystems and natural resources...as holistic and interdisciplinary fields of inquiry".

The first clear-cut national policy on biodiversity research issued is EO 247 which was discussed extensively in the preceding chapter. This legislation, however, covers only biotechnology and bioprospecting and not the whole spectrum covered by biodiversity research. Thus, a major national policy for biodiversity research in general has yet to be formulated in order to integrate the fragmented research efforts being done by the different public and private institutions currently doing research in the natural resources sector.

5.2.2 *Role of key players in biodiversity research in the Philippines*

The present situation is that there is no clear institutional structure and mechanism that would rationalize

agenda setting, oversee implementation and monitor biodiversity researches in the country. Given the varied concerns of biological diversity management, it is easy to see how it cuts across many different fields of concerns involving an assortment of people and institutions. Being both a multi- and inter-disciplinary concern, the challenge is to bring together these key players to work together towards a common goal through a structure and mechanism set by stakeholders. The rationalization of research efforts would reduce if not eliminate duplication of efforts. This would also effectively promote efficient use of available resources for research and foster cooperation. This section presents some of the key players in biodiversity research in the country.

a) Government

The Department of Environment and Natural Resources is the national agency charged with the management of the country's natural resources. Pursuant to EO 192, three Bureaus under the DENR are directly concerned with biodiversity research. These are the Protected Areas and Wildlife Bureau (PAWB), the Forestry Management Bureau (FMB) and the Ecosystems Research and Development Bureau (ERDB). Among these, the ERDB is the primary agency under the DENR charged with biodiversity research.

The ERDB is primarily tasked to:

- "formulate and recommend an integrated research program relating to Philippine ecosystems and natural resources such as minerals, lands, forest, as holistic and interdisciplinary fields of inquiry"
- "generate technologies and provide scientific assistance in the research and development of technologies relevant to the sustainable use of Philippine ecosystems and natural resources" and,
- "to provide technical assistance in the implementation and monitoring of aforementioned research programs."

The Research and Development Program (R and D) of the ERDB is largely guided by the Science and Technology Agenda (STAND 2000), the Medium Term Philippine Development Plan (MTPDP), and the DENR thrusts. The ERDB has made significant contribution in the field of mangrove and grassland ecosystems research. However, the thrusts of the MTPDP which are conservation oriented still has to be further translated to research programs that would be helpful in the management of ecosystems including biodiversity and its components.

Under the Department of Science and Technology (DOST), there are three agencies with mandates relevant to biodiversity research. These are the Philippine Council for Agriculture and Forestry Research and Development (PCARRD), and the Philippine Council for Marine and Aquatic Resources (PCAMRD) and the Science and Technology and the Science and Technology Coordinating Council (STCC).

PCARRD is charged with monitoring and evaluation of researches dealing with agriculture and forestry resources. It also ensures that no duplication in these research field occurs. The PCARRD prepared a National Biotechnology Research and Development Program which identifies a package of biodiversity proposals. It is aimed at improving present yields of selected crops, trees and livestock; improvement of quality of products, bioremediation in the environment, social marketing and technology transfer. It likewise aims to adopt a specific strategies to shortcut the research and

development activities by purchasing genes from commercial sources through negotiated material transfer agreements, if available. Since this thrust is new and implementation is still at its infancy, biodiversity research being done at the PCARRD is small components of various commodity related studies.

The PCAMRD, on the other hand, sets the direction for Philippine fisheries and aquatic research. It monitors and evaluates researches done on aquatic resources management, coastal resources management, and on oceanography in general. Specifically, it is concerned with researches on inland fisheries, marine invertebrates, post-harvest technology and socio-economic aspects.

The Science and Technology Coordinating Council (STCC) has formulated a Biotechnology Action and Implementation Plan for 1995-2000 in consultation with different interest groups. The main programs are currently focused on capability building including acquisition of technologies and human resources development, public education and advocacy, and research and development. R and D priority areas are industry, food, health, agriculture, fisheries, forestry and environment.

Both PCARRD, PCAMRD and STCC's research thrusts are supportive of the goals of STAND 2000. Since STAND 2000 is oriented towards research and development of the so-called 'export winners (coconut, fruit crops, fibre crops, and wood products and the priority forest species, like rattan, hardwoods and reforestation species for PCARRD and tuna, shrimps, crabs, and seaweeds, and for -the basic domestic needs, like small pelagics, milkfish and tilapia for PCAMRD) researches along these lines are commodity-oriented and are geared more towards utilization and production.

At the Department of Agriculture (DA), it is the Bureau of Fisheries and Aquatic Resources (BFAR) which is responsible for the development, improvement, management and conservation of the country's fisheries and aquatic resources. The BFAR have been recently strengthened through a new provision in the Fishery Code of 1998 making it a line Bureau of the DA. The new legislation, which is also known as Republic Act No. 8550, provided for the creation of a National Fisheries Research and Development Institute. It is expected that with the policy of sustainable development embedded in the new legislation, biodiversity will be included in the Institute's research agenda since as it is, focus is also on resource utilization and production.

Another key player in the government arena on biodiversity research is the Philippine National Museum (PNM). The PNM is tasked with the collection of Philippine National Heritage, which covers all aspects of biodiversitv. including plants. mammals. insects. algae. corals etc. The collections are preserved in the museum building which serves as the center for research, preservation, information and training.

b) Academic and other Research Institutions

Some of the colleges/institutes under the University of the Philippines System have on-going biodiversity-related researches. These include the Institute of Biology and the Marine Science Institute in Diliman, the College of Forestry in Los Banos among others. These studies however have weak links to each other. (RAW00 Study, 1996). Other universities that have made substantial contribution to biodiversity research that have likewise defined their specific thrusts are the University of San Carlos in Cebu City, Silliman University in Dumaguete City and the Central Luzon State University in Nueva Ecija, among others.

The SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA) is one of the 11 regional centers of the Southeast Asian Ministers of Education Organization. The SEAMEO is an intergovernmental body founded in 1965 to foster cooperation among the Southeast Asian nations through activities in education, science, and culture. SEARCA's mission is to be an effective and efficient regional center in coordinating and facilitating human resource development, research, and extension in sustainable agriculture and resource management.

SEARCA's research and development overall goals is to promote sustainable agriculture and agro-industrial development in Southeast Asia through a well-coordinated research, transfer of appropriate technologies, and effective application of development methodologies and strategies.

The newly established ASEAN Regional Center for Biodiversity Conservation (ARCBC) is mandated to coordinate all initiatives and enhance the capacity of the ASEAN on biodiversity conservation. One of its planned activities is the setting of biodiversity research agenda for the region. The ARCBC presents an opportunity at the national level for the setting up of a mechanism for coordinating biodiversity research.

c) Non-Government Organizations

The role of the NGO community in biodiversity research should not be underestimated. Although at present. researches done by these groups are few and small in scale: it should be noted that they could be effective partners in research being usually located on-site. They are also one of the most important potential users of research data being partners in biodiversity management. To date, there are only a. few NGOs with the technical capability to undertake research notably Tambuyog, Philippine Eagle Foundation, SEARICE, KKP, SIBAT, Philippine Rural Reconstruction Movement and MASIPAG. Other international NGO with local presence which have also done biodiversity research are the World Wide Fund for Nature and Conservation International. Aside from the aforementioned, researches among NGOS are largely incidental or project-based. Most of the significant projects are done in partnership with researchers from the academe. (RAW00 Study, 1996).

5.2.3 *Current State of Biodiversity Research in the Philippines*

According to Sajise (1997), research efforts on biodiversity in the Philippines in the past and in the present can be generally described as inadequate, fragmented, uncoordinated, reactive and donor-driven. This section attempts to scan biodiversity research in the Philippines. The following discussion is by no means comprehensive rather it is a sampling of research activities done since 1992. Additionally, this section could also give a glimpse of the status of research capability in the country.

- The most glaring gap in biodiversity management as identified in the NBSAP is the lack of basic information on biodiversity at the sites, and knowledge on its economic and social dimensions. The capacity to conduct these types of research at the ERDB is weak and insufficient. ERDB's strength in the areas of mangrove forests and grassland ecosystems research. Also notable are researches aimed at the conservation of wild faunal species and the generation of technologies for reforestation and forest plantation management.

- PAWB has also done some research in the area of cave management, field status surveys of selected species such as the Balabac mouse deer (*Tragulus napu nigricans)*, the Palawan bearded pig (*Sus barbatus ahoenobarbus*) on Balabac and associated islands in South Palawan; the

Philippine spotted deer and warty pig in Masbate Island; and on the ecology of fruit bats to name a few.

- The CFI conducts crocodile breeding and rearing activities, information management and training;, and research on the ecology and biology of crocodiles. Its breeding program includes the propagation of both species through captive breeding, and the maintenance of existing stocks. It also conducts studies on how to improve breeding performance and growth rate of crocodiles. The studies and researches that have been done have contributed to the increase in crocodile population and survival rate, and the development of farming technology for the sustainable utilization of saltwater crocodile. From an initial stock of 533 heads, the current population of crocodiles at CFI is 2,523 heads of C. *porosus* and 828 heads of C. *mindorensis.*

  Two other components of the project include the establishment of crocodile sanctuaries in known habitats of crocodiles, and the pilot rearing program for large-scale and community-based crocodile rearing.

- A project called "Conservation of Biological Diversity in the Sierra Madre Mountains of Isabela and Southern Cagayan Province" is currently being implemented jointly by the DENR and Birdlife International Philippines. Its objectives are to survey and assess the biodiversity and habitats found in the Sierra Madre Mountains. It has a research component which involves the ethno-biology of the indigenous people, and vegetation and land use description and survey of birds. Aside from the latter, all other attributes will be done through literature survey. The bird survey part will be from actual field research employing transect survey, bio-acoustics, mist-netting of birds, trapping of small mammals, aerial survey of vegetation and land use.

- PCARRD acts as coordinating institution in one of the initiatives concerning forest biodiversity. The Subic Bay Forest Research Project is a multi-institution research on the forest of Subic Bay involving the survey of the flora and fauna. ethnobotany of the Aetas, and pharmacological and genetic/DNA fingerprinting studies. The institutions involved in this undertaking are the PCARRD, UP Diliman and Los Banos. Ateneo de Manila University, and the University of Santo Tomas Science Research Center.

- The Philippine National Museum is staffed by full-time scientists, researchers, and technicians tasked with the collection, identification and curation of biological specimens. Being the largest depository of plant and animal collections in the Philippines. the institution can provide basic mformation on the forest diversity resources of the country. It implements special projects on biodiversity inventory and conservation. The Biodiversity Information Center, which is newly established under PNM's auspices, is engaged in field research involving gathering primary information on biodiversity rich areas in the country for databanking and information dissemination purposes.

  A project called "The Establishment of Long-Term Ecological Research Sites" is an initiative of the Philippine Plant Inventory staff of the PNM. The project aims to establish permanent ecological research plots in three different forest types in strategically located areas around the country. The plot set-up and research methodology which was designed following the Missouri Botanical Garden's procedure, aims to compare the diversity in various forest habitats and the widlife associated with it. The sites selected are in Irawan, Palawan, Mt. Kitanglad in Bukidnon, Mt. Guiting-Guiting in Sibuyan Island and at the Bicol National Park.

- At the University of the Philippines College of Forestry and the Institute of Environmental Science and Management (now SESAM), research in biodiversity includes a resource inventory and biodiversity assessment of the Subic Bay Forest Reserve (SBMA). This project looks at the potential of ecotourism as a tool for biodiversity conservation. Activities within the project includes biodiversity assessment and a botanical exploration of Philippine indigenous plants in the area. Other projects co-supported by the DENR and UP Los Banos are an inventory of flora including mycorrhizae in old growth and residual forest; the Philippine raptor (eagle) conservation project; the Tamaraw conservation project and an inventory of mammals and birds in old growth and residual forests, using a multidisciplinary approach. There are also individual research efforts done by students that have contributed to the growing knowledge on biodiversity conservation.

  The School for Environmental Science and Management (formerly IESAM) completed in 1996 the implementation of a 5-year program called the Environmental Resources Management Program funded by the Canadian Institute for Development (CIDA). Biodiversity was an important component of this program. Among its outputs were the publication of several studies including a study of biodiversity indicators in Mount Makiling (UP Los Banos is situated at the foothills of Mount Makiling in Los Banos, Laguna).

  The SESAM had been co-funding the Southeast Asian Universities Agroecosystem Network (SUAN) with McArthur Foundation since 1982. The SUAN conducts research with the goal of helping the region's governments to forge policies to support biodiversity maintenance by supporting conditions responsible for its maintenance, linkages between rural reality, researchers and policy makers.

- SEARCA has embarked on a new four-year project funded by the John D. and Catherine T. MacArthur Foundation called the "Institutional Context of Biodiversity Conservation in Southeast Asia: Transnational, Cross-sectoral, and Interdisciplinary Approaches. It aims to increase the likelihood of success in biodiversity conservation by studying cross-country, cross-discipline, and cross-sectoral discontinuities that are responsible for many of the failures in biodiversity conservation. It is being conducted in collaboration with the Program on Environment of the East-West Center in Hawaii, USA, and focuses on five thematic areas.

  For the period 1996-1997, SEARCA embarked on a total of 10 new research and development projects including seven on uplands and coastal resources management, with a number focusing on biodiversity issues. Community-based approaches and interventions with special attention to methodology development have become a hallmark of SEARCA's R & D projects in the uplands and coastal areas. (SEARCA, 1997)

- Other initiatives of note is the US-AID funded study on the regeneration of forests from grasslands by the Isabela State University (ISU). At the Ateneo de Manila University, there is work on the twin objectives of biodiversity conservation with the indigenous tribes and economic benefits from biodiversity. The project site for this is in Pantaron, Bukidnon. On the other hand, the Visayas State College of Agriculture maintains an ex-situ genebank which are extensively used in the Center's breeding programs. However, these efforts are mostly directed towards commodity promotion meaning germplasm maintenance is just incidental.

- Conservation International has been cooperating with UP Diliman implement the latter's Biodiversity Conservation Program. The Program has just started to compile an annotated

Biodiversity Conservation Program. The Program has just started to compile an annotated bibliography/literature review of plants in the Cordillera and the Visayas. Among other concerns of the project are: community-based resource management of protected areas, specifically in Coron Island in Palawan, one of the EU-funded priority protected areas and a taxonomic survey to reassess the 'hotspots'.

- At the PCAMRD, there are some initiatives at the commodity level that brings biodiversity dimension to research activities. However, the scenario here is more optimistic considering that a substantial portion of the budget (about 46 percent) was earmarked for environmental projects. (PCAMRD Annual Report, 1996). The focus of these projects were on environmental protection, rehabilitation and enhancement including conservation and management of the country's fishery resources. Projects along these line include the Bantayan Island Integrated Seapark Development Programme and their involvement in the Coastal Environment Programme of the DENR and the Fisheries Sector Programme of the DA. Although these initiatives are mostly habitat protection oriented, its impact will ultimately redound to benefit biodiversity in the country.

  The PCAMRD is also involved in the Basin Approach to Lake Management. The general objective of the program is to enhance water quality in the Laguna de Bay to support multiple uses. One of the projects currently being implemented under this program is Lake Fishery Productivity and Quality Enhancement. This project specifically aims to integrate current and future researches to stop further deterioration of Laguna de Bay and improve the water quality to enhance the productivity of the lake. There are four interrelated components under the said project, namely: 1) Lake Environment Information System (LEIS), 2) Lake Environment Monitoring System (LEMS), 3) Lake Environment Social Mobilization Program (LEMSP) and 4) Lake Environment Policy Studies.

  Additionally, the PCAMRD has granted research funds to the Marine Science Institute (MSI) of UP Diliman for the inventory and assessment of natural stocks of *Sargassum* and *Gracilaria* in selected areas in the Philippines and for the development of germling productions and culture technology of *Surgussum*. *The* Institute is also doing research on the integrated management of watershed and coastal and marine environments; ecosystems response to deforestation-derived siltation in Southeast Asia-Philippine Component; and, an Assessment of Bacuit Bay for sustainable tourism.

- The Marine Science Institute (MSI) is a unit within the College of Science of the University of the Philippines at Diliman. The UP-MSI is the National Center for Excellence in Marine Science (NBSAP, 1997). Its mandate is primarily to generate basic information necessary for the optimal and sustained utilization, management, and conservation of the marine environment and its resources; provide graduate level training and extension services to develop manpower requirements in marine science; and develop appropriate and environmentally sound technologies for industrial and economic development in the marine ecosystem.

  Coral reef research in the Philippines has advanced considerable from what was almost purely a taxonomic work to the present breadth and quality which is almost at par with that in the most advanced scientific institutions worldwide (Gomez, et. al, 1994). The initiatives to detect coral reef structures using reef monitoring techniques is largely being done by the UP-MSI and the Silliman University are still on-going.

. Significant contributions to the field of marine science have been made by other academic and non-academic institutions including those departments or units within private univarsitites and research laboratories. These are specifically along the areas of collection and identification, coastal resources ecology and management, and marine environmental protection in general. Foremost among them are Silliman University in Negros Oriental and University of San Carlos in Cebu and Marawi State University in Marawi City.

. The International Centre for Living Aquatic Resources Management (ICLARM), an autonomous non-government scientific research center has engaged in a variety of marine studies that has provided analytical methodology and training to boost efforts in the regional and even at the global level. It conducts, stimulates, and accelerates research on the development and management of living aquatic resources to assist developing countries meet their nutritive, economic and social needs. It has three research programs related to marine biodiversity conservation. These are the Coastal Resource System Program, the Coral Reef Management Programme, and the National_ Research Support Programme. Some of their current initiatives are the following: Germplasm Enhancement and Breeding Program, Aquatic Environment Program, Fisheries Resources Assessment and Management Programme, Integrated Aquaculture-Agriculture Program and Policy Research and Impact Assessment Program.

. Biodiversity reseach among the NGOs are few and small in scale. However, significant contributions from a few NGOs in the country, mostly with foreign assistance, are worthy to note. Below are some of these:

Institution	Title/Description of Project
Philippine Eagle Foundation	Mapping of eagle habitats in various Mindanao provinces using rapid site assessment, global positioning system and geographic information system; investigation of the habitat's diversity richness and biological resources in an area
Kinaiyahan Foundation, Inc.	Impact assessment and documentation e.g. like human impacts of pesticide use in banana plantations, investigation of flash floods in Lake Maughan, impact of geothermal plant on the slopes of Mt. Apo
Kaanib Foundation	Location-specific research on sustainable agriculture
TACDRUP	Adaptability tests of traditional varieties of rice; pest management under organic farming conditions; balancing ecology and economics; organic rice farming and assessment of indigenous rice varieties for this method
SEARICE	Integrated pest management and community seed banking; policy research
MASIPAG	In-situ conservation of rice together with farmers; participatory research for crop improvement programs and soil conservation nutrient cycling; and validation of indigenous knowledge
Tambuyog	Understanding and analysis of fishermen's practice and common property rights on fishing grounds; participatory rural appraisal and technical research as an input to integrated site management
World Wide Fund for Nature	Satellite tracking of marine fauna through Global Positioning System; biodiversity surveys with para-taxonomists

Legal Rights and Natural Resources Center	Policy and legal research; compilation of legislation related to biodiversity
PHILDHRRA	Process documentation of tripartite partnership in resource development
PIAF	Mapping of biodiversity in the Phils.

5.2.4 *Research gaps and other needs*

An initial effort to identify research gaps on biodiversity was done by the Biodiversity Country Study. This was followed in 1996 by a study conducted by a team of consultants commissioned by the Dutch government. The main objective of the Dutch-funded study was to explore the possibilities of formulating a collaborative research programme in the field of biodiversity and sustainable development. This study attempted to look into the biodiversity research scenario in the Philippines. Aside from scanning the policy environment and the initiatives in the country, it also identified some of the gaps and other needs. These are enumerated below:

Research gaps:

benchmark information (taxonomy, inventory)
seed technology studies including tree breeding for indigenous tree species
indicators to measure biodiversity
studies for both conservation and economic benefits
policy researches
conservation of plant genetic resources
habitat requirement for species maintenance
role of indigenous knowledge in the selection and assessment of long term sustainability of biodiversity
in situ conservation of wild crop relatives
buffer zone management

The study also identified other needs that have to be addressed to strengthen biodiversity research. These are human resources development, physical infrastructure, and information. On human resources development, there is a need to develop experts in the following: taxonomists, botanists, entomologists, wildlife identification and inventory. species rescue. breeding and reintroduction technology among others. On infrastructure, the need is for more facilities for research including equipment and laboratories. It was also mentioned that there is need to educate almost all sectors, especially the local government units on biodiversity conservation in order that they may have a better appreciation and understanding of the subject. These would entail a comprehensive information and education campaign.

Again, because of there is still no national agenda for biodiversity research, the needed capacity to undertake such activities cannot be determined.

5.2.5 *Opportunities for biodiversity conservation: Addressing gaps and needs*

Research has been play a major role in biodiversity conservation. Research provides factual information on the extent and value of biodiversity which are tools for problem-solving, policy-making, developmental

intervention and decision-making in general. It is evident that the government is aware of the issues confronting biodiversity conservation in the Philippines, however, there is no comprehensive research agenda in place that would address these priorities and concerns. In general, the government strategy had been biased towards action programs without providing for adequate and appropriate implementing mechanism and research support. For example, the programs/projects identified in the NBSAP largely addresses specific concerns and needs to be integrated into an overall framework.

The need to formulate a National Biodiversity Research Agenda based on a participatory, multi-sectoral and multidisciplinary consultation process was reiterated after a Philippine mission in 1996 conducted by the Advisory Council for Scientific Research in Development Problems (RAWOO) of the Netherlands. From the period July to September 1997, consultations were conducted at different levels that resulted in a draft Biodiversity Research Agenda for the Philippines. The output of this initiative by SEARCA and RAW00 seem to be the only legitimate multi-sectoral and multidisciplinary prioritization of critical research supports required for the advancement of biodiversity conservation in the Philippines to date. The said draft Agenda identified key biodiversity research areas based on a four-fold criteria (urgency, policy support/implications, potential benefits and strategic in nature). It also ventured to propose an organizational structure for the management of the Biodiversity Research Program.

With the SEARCA and RAW00 study, preliminary work had been done in this area. Follow-up activities on this should emphasize that successful implementation of the research activities is highly dependent on many inter-related factors. This again brings to the fore the importance of an institutional structure and mechanism that would ensure a coordinated agenda setting, prioritization of the projects, implementation, and evaluation and monitoring.

5.3 *Public Education and Awareness/Information Exchange*

Specific provisions in the CBD concerning education, increasing public awareness and information exchange underscore their importance in biodiversity conservation. These strategies promote and encourage understanding of the importance of biodiversity conservation as well as the measures required to achieve this end.

There are already numerous activities directed towards the goal of public education and awareness on the conservation of biological awareness in the country. However. these initiatives have to be rationalized to create an overall lasting impact in the national consciousness. This section is divided into four parts. The first part presents some of the activities promoting biodiversity conservation. This is followed by a discussion on efforts to propagate the same through media. The third section is on the integration of these topics in educational programs and finally, a fourth section deals with the modes of information exchange.

5.3. I *Activities Promoting Biodiversity Conservation*

- *Dalaw-Turo* Program (Visit and Teach). This is a Nature Conservancy Education Strategy employed by PAWB as a component of its Information, Education and Communication (IEC) outreach program. Dalaw-Turo is a non-traditional, educational, participatory design of teaching. It employs multi-media schemes such as street theaters, environmental games, ecological tours, creative workshops, video showing, lectures, and exhibits. These are especially developed to become a medium in educating students and other sectors of society on the principles of biological diversity conservation and

sustainable development in general. School visitations are concentrated within the immediate vicinities of protected areas. Several schools near cities were visited as well to serve as control areas for purposes of comparing awareness level of youth near protected areas sites with those residing in urban areas.

Salin-Turo Trainor's Training is an integral part of the Dalaw-Turo Program. This is designed to transfer the Dalaw-Turo Training approach to their regional counterparts in the Protected Areas and Wildlife Sector. During the Trainor's Training, the participants are expected to develop IEC concepts and materials for an intensive IEC campaign for the respective protected areas in the regions. Problems besetting the park are identified and used as subject matter in the preparation of a lesson plan for their school and community visits. Further, a final Dalaw-Turo Action Plan will be formulated by the participants for implementation in their respective regions.

- "Onlv in the Philippines.. ." Conservation Posters. Initiated in 199 1, this series of posters was produced in three languages and have been distributed to relevant government agencies, public places, schools, and NGOs. This series which published an initial 5,000 copies has been continued with two new posters every year featuring 11 different threatened species or groups of species endemic to the Philippines. The printing of most of these posters have been been sponsored by a variety of local and international entities. As of 1996, a total of 45,000 posters have been produced and distributed featuring the spotted deer, wild pigs, Calamian deer, tamaraw, fruit bats, cockatoo, hombills, fruit pigeons and doves,

- Coastal Environment Program IEC Campaign. The CEP conducted massive information and education capaigns among coastal communities in the different project sites. This is aimed to increase/sustain awareness and foster cooperation with target communities in the rehabilitation, conservation and preservation of coastal resources in the project site. IEC activities employed community dialogues/public hearings, fora, information caravans, and the use of multi-media communication such as flyers, brochures, billboards, press releases, exhibits, audio visual materials and radio programs.

- Protection and Awareness Campaign for the Conservation of Tubbataha Reef National Park. The Tubbataha Reef National Marine Park was declared in 1988 as the First National Marine Park in the Philippines. In 1993, the Tubbataha Reef was inscribed in UNESCO's list of World Heritage sites because of its exceptionally pristine condition and universal value as a natural site, whose management and protection is intended for the benefit of humanity. An immediate and effective IEC for Tubbataha is imperative to enlighten stakeholders on the importance of keeping the resource intact and productive. It is within this premise that this IEC campaign was conceptualized and implemented. The IEC campaign was conducted for one year and employed dialogues, publication and printing of brochures, posters, calendars, news briefs, and production of radio and tv plugs which will be discussed in detail in another section in this Report.

- Youth Environmental Awareness Program.This youth environmental awareness trainings project is cognizant of the need to conserve the coutry's rainforests and to abate the natural resources degradation in the Ifugao province, Done on two levels for elementary and high school, the program emphasizes their rich cultural heritage and natural resources heritage of Ifugao whose biodiversity has been preserved for centuries. It employs film showing, field trips, group dynamics, workshops and lectures. Due to the training's perceived success, the DECS in the province of Ifugao has formally adopted the

training modules as part of the science curriculum. It established as an action program a Forest Nursery Gene Bank.

There were numerous seminars, symposia, workshops, and fora held that focus on biodiversity. These activities are intricately imbedded as components of projects thus it is difficult to strictly categorize activities as just IEC or training. Nevertheless, these are important venues for promoting strategies, for exchange of ideas, sharing of experiences, and transfer of know-how on biodiversity conservation. Of note is the Second ASEAN Regional Conference on Environmental Education held in May 4-6, 1995 with the theme "The Role of Environmental Education in Biodiversity Conservation and Sustainable Development."

Finally, the United Nations Development Programme-Global Environment Facility/Small Grants Programme (UNDP-GEF/SGP) funded initiatives at the local level on education, awareness building and information dissemination.

5.3.2 *Efforts to Use the Media in IEC*

Aside from the print media which periodically feature environmentally related articles, mostly to mark important occassions such as World Environment Day, the use of media to propagate the concepts of biodiversity conservation has not been filly tapped.

A component of the IEC Campaign on the Tubbataha Reefs is a media tour. This was organized to help increase understanding and awareness among the media on the importance of coral reefs and the significance of Tubbataha as a marine park and world heritage site. It was also an attempt to encourage them to participate more actively in its conservation. After the tour, the various media outfits published articles and television plugs/shows on the Tubbataha Reef.

At the local level, the use of radio in promoting the principles of biodiversity conservation has been extensively used. In the CEP, the project participants are informed and educated on the different aspects of coastal protection, technology tips, and resource management, including alternative livelihood via radio broadcasts. These were broadcasted in ten regions. Samples of radio programs aired are Baybayanihan at DYPR, Puerto Princesa City, Mga Heredero sa Kinaiyahan at DYAC, Baybay, Leyte; Water Data-based Program at DWPE Radyo ng Bayan, Tuguegarao, Cagayan.

5.3.3 *Integration of Biodiversity Conservation in Educational Programs*

Education can be effective in helping people view their relationship with nature. It is a means through which society prepares its citizens to carry out their responsibilities. With this as a premise, education should necessarily incorporate the concepts of sustainable development if societies are expected to speed up cultural change and value systems towards developing a new environmental and natural resources attitude.

A major effort to incorporate environment and natural resources conservation concerns in the formal and non-formal education sectors is the ADB Technical Assistance on Environmental Education (EE). This was initiated in 1991 and was just completed in 1997. In the review phase, it revealed that as early as 199 1, many government and non-government organizations are doing environmental education-related activities across the country. However, these activities were neither sustainable or cohesive, lacked directions and oftentimes are overlapping. At the formal level, many environmental concepts and issues were found to be already infused into the curricula or elementary, secondary and higher education. However, the focus is still on understanding the environment and appreciation of its natural resources,

rather than on helping students develop skills to solve environmental problems. The review also emphasized that training programs had been conducted to enhance capabilities in creating awareness but were short in duration and far between. (ADB-TA, 1997).

The above concerns were given attention in 1992 during the formulation of the National Environmental Education Action Plan (NEEAP). The NEEAP has three objectives: improve mass-based action towards the protection and improvement of the environment, improve the delivery of EE across sectors, and increase environmental manpower needed for the next century. Specific action programs were identified covering eight major areas: curriculum development, training, research and development, scholarships, equipment upgrading and lending program, information, education and advocacy program and policy reforms. (ADB-TA, 1997)

The priority projects involved in the NEEAP are: the development of an EE framework that will be used nationally to promote EE more intensively at all levels and across sectors; the preparation of exemplar instructional materials for basic education, technical and vocational and higher education, and non-formal sectors; the development of support print and non-print instructional materials for basic education such as posters, storybooks, and video tapes; and the design of a training program for techers of basic education to ensure effective teaching/learning process. It should be mentioned here that biodiversity conservation is considered as a major concern that has been given attention in the abovementioned priority projects and thus is included as themes for both formal and non-formal modes.

5.3.4 *Modes of Information Exchange*

a) Data Generation and Organization of Information

Data/Information on biodiversity are generated from various sources such as government agencies, academic and other research institutions, NGOs and even private individuals. In order that information exchange could become an important catalyst in espousing biodiversity conservation, it is imperative that these data/information first be organized systematically. This means that data/information should be available and ready for dissemination or exchange in a form that can be understood by the user. These underscore the importance of databanking, in whatever form appropriate, electronic based or not.

There are currently several efforts to organize information on biodiversity. Some of them have been mentioned in Section 3.1.4 such as ICLARM's FishBase and ReefBase, BFAR's PHILFIS, and PNM's Biodiversity Information **Network. and many others.** Below **are additional activities that attempt to** organize these data.

. SEARCA's Information Resources Development Prom-am. The Program serves as a regional information resource center for agriculture and related fields. It developed a database system design for R & D's current thrusts, namely: agro-industry, natural resources, sustainable agriculture, and gender. The design is for bibliographic databases as well as directories of training courses, projects, and experts in these subject areas.

. The Science and Technology Resource Collection Center (STRCC). STRCC is an information center containing a specialized collection on sustainable agriculture and appropriate technology. It aims to promote basic awareness on sustainable agriculture and appropriate technology thorugh information access, exchange and dissemination. The STRCC is being maintained by SIBAT.

b) Information Exchange

Different international information or research networks of international universities are active in the Philippines related to biodiversity and sustainable development. These are important agents for information exchange, especially in sharing research results. Some are based on a tripartite cooperation between Universities, Government and NGO's.

- Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA). SEARCA recently established networks in agricultural extension, acid soil research, and coastal/fishery research which all have major IEC components. SEARCA carries out its mandate of information dissemination through publications, the mass media(newspaper, radio, television) and the Internet.

- Upland NGO Assistance Committee (UNAC). A variety of networks and programs are dealing with the uplands. The Upland Development Program aims at assisting DENR in developing effective approach for organizing uplanders to protect and manage upland resources. Established by eight NGO's and academic organizations with extensive upland experience, it actively assist NGO's and PO's in agroforestry, land tenure and marketing in the uplands.

- Environmental Education Nehvork of the Philippines (EENP). This is a network of around 37 universities, research institutions and some NGO who have grouped together to link and disseminate whatever environmental projects and information they may have in their respective institutions. The Secretariat for the Network is based at the School of Environmental Science and Management at UP Los Banos. In 199.5, EENP hosted the Regional Conference on Environmental Education with Biodiversity Conservation as a theme.

- Philippine Association of Tertiary Level of Institutions for Environmental Protection and Management (PATLEPAM). This is a group of around 600 public and private colleges and universities. Organized by the Environmental Management Bureau of the Department of Environment and Natural Resources, it advocates the teaching of the principles of environmental protection and management to all member schools. It is funded by external donors to DENR. It sponsors training and conducts conferences relevant to the topics on environmental protection and management. Its Secretariat is based at the Environmental Education and Information Division of the Environmental Management Bureau of the DENR.

- SEARICE. The SEARICE, established in 198 1, addresses issues of sustainable agriculture and environment together with grassroot level organizations, farmers, and indigenous people in Indonesia, Malaysia, Philippines, Singapore and Thailand. Today, SEARICE does a lot of policy research and is plays an important role in issues related to Plant Genetic Resources (PGR) and Intellectual Property Rights (IPR) at national, regional and international level.

  SEARICE has three main programs namely: SEEDS of Survival Program, Community Biodiversity Conservation and Development Program, and the Anti-Biopiracy Program. Communication Program, and the Community Organization Program. The main core of its grassroot activities is in community based programs on the conservation and development of plant genetic resources (PGR). It coordinates the global Community Biodiversity Development and Conservation (CBCD) program in Southeast Asia, and has an ongoing technical assistance collaboration in this program with DLO-CPRO in the: Netherlands.

- The Biodiversity Conservation Network (BCN). BCN operates in 10 sites all over the world, among which four (4) sites in the Philippines, 2 in Palawan, 1 in Nueva Vizcaya and 1 in Bukidnon. BCN works closely with local NGO's.

- Conservation International (CI). CI is an international USA based NGO which has started the compilation of an annotated bibliography/literature review of plants in the Cordillera and the Visayas, among its other concerns is a project on: community-based resource management of protected areas, specifically in Coron Island in Palawan. This is one of the EU-funded priority protected areas. It also conducts a taxonomic surveys to reassess the biodiversity "hotspots".

With the advent of the Internet in the Philippines in 1994, the scientific community as well as the government and non-government organizations have had the benefit of computer-mediated communication. The electronic infrastructure in the country has grown to reach almost all cities with telecommunication facilities. This has benefited the sustainable development community immensely especially in terms of data exchange and communication, not to mention the easy accessibility of on-line information on the Web.

The Philippine Sustainable Development Network (PSDN) Foundation is one of the pioneers in electronic information nehvorking in the country that focused on sustainable development issues, notably on biodiversity conservation. The PSDN is part of the UNDP Sustainable Development Networking Program which was conceived to facilitate access to information so that people will become more active participants in the development process. Its membership comes from the government, non-government organizations, academic and research institutions, and the private sector.

The PSDN is more than an Internet Service Provider (ISP). Aside from the regular ISP services it conducts regular on-line forum/round table discussions on selected environmental topics. It developed and is currently hosting the PAWB Home Page, the NBSAP Home Page and other Web Sites relevant to biodiversity conservation. It also catalyzes discussion on relevant environmental related topics by conducting regular networking fora. The PSDN's thrust for 1998 is to strengthen its capacity for providing content on-line.

Other networks serving the NGO community are CODE-ONE and the Email Center.

With the two important Web Site currently on the Internet (PAWB Home Page, NBSAP Home Page) basic information about biodiversity in the Philippines could now be accessed. The Home Page of PAWB (http://www.psdn.org.ph/pawb.htm) contains information about the organizations, programs, projects, activities, policy initiatives and basic facts and figures.

The NBSAP Home Page (http://www.psdn.org.ph/nbsap/main.html) contains summarized information on Biodiversity Inventory organized by ecosystems, problems and threats, strategies and action plans and other basic information on the biological resource of the country.

6.0 Financial Resources

6.1 Financial support and incentives for biodiversiiy conservation activities

For a few years now, there have been several sources of financial support for biodiversity conservation in the country. While the government started fimding specific conservation programs as early as three decades ago, the amounts have been limited relative to what should be undertaken. The government however undertakes development programs that contribute to biodiversity conservation in more ways than just alleviating poverty. As a developing country, the Philippines has adopted the "clean up as we grow" approach to development. This policy is reflected in the budget of expenditures over the last few years.

Some international and local non-government organizations (NGOs) also provide funds for biodiversity conservation. The World Wide Fund for Nature (WWF), was the first international NGO to provide substantial support for conservation programs and draw attention to biodiversity. Innovative funding mechanism such as the debt-for-nature swap paved the way for the participation of the local NGOs in conservation programs in 1989. The debt-for nature swap program was the first partnership between the government and the NGOs (WWF, Haribon, other local NGOs and some academic institutions). The favorable experience of the NGO participation in the debt-swap-program led to the establishment of a US $25 million endowment fund under the US AID Natural Resources Management Program (NRMP). The fund is being managed by a local NGO, the Foundation for Philippine Environment (FPE) which was established in 1990. FPE provides funding to local NGOs for biodiversity conservation programs all over the country. Local NGOs also get funding support from international NGOs/funding institutions such as Mac Arthur Foundation, WWF, Conservation International, Novib, etc. Development funds that support community management of resources as a means of alleviating poverty and fostering development also contribute to the conservation of biodiversity.

There are also multi- and bi-lateral agreements for the management of particular protected areas and for the protection and management of specific ecosystems or habitats such as forest, agricultural, coastal and wetlands. The more substantial support for biodiversity conservation come from these sources.

The local private participation in biodiversity conservation is present mostly in ex-situ conservation, such as the private zoos and botanical gardens. The government has provided limited incentives for private investments in biodiversity conservation.

6. I. I Government support

The Philippine government supports a number of specific biodiversity conservation programs, some on its own and some others with foreign funding. However, conservation of biodiversity is an objective that is invariably achieved through programs and projects that manage, protect and/or rehabilitate the different ecosystems. Programs such as integrated area development or

community-based resource like the watershed, coastal and forest management projects while primarily aimed at development contribute to biodiversity through habitat rehabilitation or protection. It is, therefore, difficult to come up with an exact figure of the support provided to biodiversity conservation. Nevertheless, a good estimate of the level of government support may be glimpsed from the 1997 appropriations for the following operational activities, programs and projects:

A. Under the Department of Environment and Natural Resources, which has a total appropriation of (Phil Pesos) P 4,761,084,000, about 56% of the programs and projects are related to biodiversity conservation:

Coastal environmental program	P 114,252,000
Conservation of priority protected areas project (Local Counterpart)	18,300,000
Conservation, protection and development of caves and caves resources	6,101,000
Development and rehabilitation of Hinulugang Taktak National Park	5,852,000
Development and rehabilitation of the Mt. Apo National Park	3,500,000
ENR Sector Adjustment Loan Project - Local Counterpart	51,219,000
Forest management services	810,973,000
Forest protection & development of Camp John Hay Reservation	2,107,000
Forest Protection	118,818,000
Integration of environment management for sustainable development (Local Counterpart)	2,166,000
Lon-oy watershed development project (Region 1)	11,838,000
Maasim watershed project (Region VI)	6,266,000
Natural Resources Management Program (Local Counterpart)	16,5 16,000
Ninoy Aquino Park and Wildlife Nature Center operation & maintenance	17,226,000
Operation and maintenance of Crocodile Farm Institute in Irawan, Palawan	13,118,000
Pasig river rehabilitation project (Local Counterpart)	4,305,000
Pawikan conservation project	4,814,000
People-oriented forestry program	290,76 1,000
Philippine eagle conservation project	8,982,000
Pilot plantation establishment of selected forest species	23,696,000
Plantation establishment and maintenance	255,347,000
Production and dissemination of technical and popular materials on conservation & development of natural resources	41,633,000
Protected areas and wildlife resources development	235,543,000
Reforestation/greening projects	30,000,000
Rehabilitation of riverbanks and lakeshore project	1,090,000
Soil conservation and watershed management	458,883,000
Survey and delineation of ancestral lands	96,677,000
Tamaraw conservation project	5,000,000
Total	**P2,654,983,000**

B. Under the Department of Agriculture, biodiversity conservation related programs are focused on activities to better utilize biological resources for food, crop or raw material production. The Department has a total budget of P1,852,084,000 and about 52% are related to biodiversity conservation:

Development of crop sector (Support & Operations)	P 501,360,000
Development of fisheries sector (Support & Operations)	186,192,000
Development of livestock sector (Support & Operations)	271,684,000
Total	**P 959,236,000**

Attached to the Department of Agriculture are offices which undertake research and development programs on certain biological resources; they are:

Cotton Research and Development Institute	P 27,406,000
Fiber Industry Development Authority	110,156,000
Livestock Development Council	9,668,000
National Stud Farm	9,072,000
Philippine Carabao Center	22,525,000
Total	**P 178,827,000**

C. Under the Department of Science and Technology are programs and offices/agencies concerned with research and development of the forest, agriculture, natural, marine and aquatic resources. They are the following:

Forest products and research and industries development	40,501,000
Operation and maintenance of National Committee on Biosafety of the Philippines	431,000
Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (including P4M counterpart fund for foreign assisted projects)	142,646,000
Philippine Council for Aquatic and Marine Research and Development	27,542,000
Total	**P 211,120,000**

D. Integrated Area Development are undertaken with loan and/or grant support and they require local counterpart. The following are IAD programs with components that include activities related to biodiversity conservation:

Aurora Integrated Area Development Project (peso requirement)	P 9,660,000
Bondoc Development Program (with 10M counterpart fund)	30,203,000
Total	**P 39,863,000**

Total amount appropriated for the above programs is P 4,044,029,000 or about 9% of the total appropriations for 1997. The list is in no way complete nor exact as to the amount allocated for biodiversity conservation. It is however, as mentioned earlier, a good indication of the level of support the government provides for conservation.

6.1.2 Sources of *Funds for Local NGOs' Biodiversity Conservation*

Local NGOs are active partners of the government in conservation programs, particularly, in the management of the protected areas under the GEF-Funded (thru the World Bank) Conservation of Priority Protected Areas Project with a funding of US $ 22 million. About 80% of the grant amount is managed by the NGOs for Integrated Protected Areas, Inc. or NIPA, a consortium of 18 development NGOs set up for the purpose. The Project involves the establishment, management and development of ten priority sites over a seven-year period.

The FPE has provided funding to local NGOs for biodiversity conservation since 1992. Below are the grants provided by FPE to the local NGOs:

Table 16 FPE Grants to local non-government organizations

Type of	1992-1993		1994		1995		1996	
Grant	no	Pesos	no	Pesos	no	Pesos	no	Pesos
Proactive	8	10,467,709	5	8,096,984	13	6,906,713	12	19,572,619
Responsive	30	33,713,078	24	24,236,003	7	1,265,804	4	4,214,771
Action	34	3,109,985	32	2543,000	54	4,13 1,500	98	8,512,958
Site-Focused			6	9,159,125	11	12,317,520	14	27,375,304
Total	72	**47,290,772**	67	**44,035,112**	85	**24,621,537**	128	**59,675,652**

The UNDP- GEF Small Grants Programme for the Philippine is also providing funding support to NGOs. The Programme focuses in the following major areas of assistance: a) Conservation and Restoration of Philippine Biodiversity; b) Community-based Resource Development and Management; and, c) Alternative Energy Development and Management. From 1992 to date, the Programme approved 35 projects with funding grants amounting to Philippine P 18 M.

The Biodiversity Conservation Network (BCN) provided funds for three major projects focused on sustainable ultilization of biodiversity resources. The recipients of these grants are: Manila Observatory (US$ 426,798), World Wide Fund for Nature - Philippine Program (US$ 627,698), and Kalahan Educational Foundation (US$ 321,190) (BCN, 1996).

Local NGOs are also beneficiaries of support from international NGOs such as Mac Arthur Foundation, WWF, etc. Presented below are the approved grants of Mac Arthur Foundation in 1996.

Kabang Kalikasan ng Pilipinas or the WWF- Philippines undertakes programs and projects on a) marine and small islands ecosystems conservation; b) conservation science research extension; c) community and resource management and entrepreneurship; d) public information and education. KKP operates on a budget of US $ 1,687,164 for 1998 it's budget for US $1,116,600 for 1997.

Table 17 MacArthur Foundation authorized grants, 1996

Fund for Nature of the Philippines (FNP) or KKP, Quezon City, Philippines	$110,000 in support of a program to improve the management of protected areas in the Philippines (over three years).
Haribon Foundation for the Conservation of Natural Resources (HFCNR) San Juan, Philippines	$70,000 in support of a biodiversity conservation program in southern Luzon (over two years).
Haribon Palawan (HP) Puerto Princesa City, Philippines	$60,000 in support of an integrated sustainable development program in Palawan (over two years).
Legal Rights and Natural Resources Center (LRNRC) Quezon City, Philippines	$65,000 for legal and policy research programs and activities to uphold the traditional land claims of indigenous peoples (over two years).
Mindanao State University (MSU) Iligan City, Philippines	$70,000 in support of a biodiversity field research and training program (over two years).
National Museum of the Philippines (NMP) Manila, Philippines	$135,000 in support of biodiversity conservation programs (over three years).
Palawan Council for Sustainable Development (PCSD) Puerto Princesa City, Philippines	$150,000 in support of plant inventory and database development programs (over two years).
Philippine Eagle Conservation Foundation (PECF) Davao City, Philippines	$90,000 in support of community development, wildlife management, and environmental education programs in Mindanao (over two years).
Tambuyog Development Center (TDC) Quezon City, Philippines	$70,000 in support of training for local leaders in a sustainable coastal area development program (over two years).
Total	$820,000

6.2 *Developed-country support to Philippine biodiversity conservation initiatives vis-a-vis CBD implementation*

Most of the support from developed countries on Philippines biodiversity conservation initiatives vis-a-vis CBD implementation come via the GEF either through UNDP/UNEP or World Bank and through the regional channels. The following grants are for biodiversity conservation programs/projects particularly in protected areas and to assist the country implement the CBD:

Table 18 Support for implementation of biodiversity conservation

Program/Project Title	Funding Agency	Duration	Total cost (US $000)
Technical assistance on biodiversity conservation and National Integrated Protected Areas System (NIPAS)	ADB	**1996-1997**	**600**
Conservation of Priority Protected Areas Project	GEF Thru World Bank Part of ENR Sectoral Adjustment Loan	1994-200 1	**22,870**
National Integrated Protected Areas Project (NIPAP)	EU	1996-2000	12.700
Philippine Biodiversity Country Study	UNEP	1995-96	**264**
Support for CBD Report/CHM	UNDP	1998	**36**
Total			**36,470**

6.3 Bilateral/Multi-Lateral Support to Biodiversity Conservation

The following are bi-multilateral support, grant and/or loan to biodiversity conservation related programs and projects presented by source:

Table 19 Bilateral/Multilateral support to biodiversity conservation

Grant Loan	Program/Project Title	Duration	Cost US $ 000
Asian Development Bank (ADB)			
Loan	Forestry Sector Program	1988-1993	118,254
Loan	Fisheries Sector Program	1989-1995	**52,400**
Loan	Palawan Integrated Area Development Project II (DENR Component)	1991-1998	2,752
Loan	Low Income Upland Communities Project	1990-1999	**36,353**
Loan	Forestry Sector Project Loan II	1992-1998	**227,000**
Loan	Cordillera Highland Agricultural Resources Management Project (DENR)	1996-2002	**33.313**
Loan	Fisheries Resources Management Program (DA)	1998-2003	**56,494**
Grant	Environmental Evaluation of Swamps and Marshlands	1995-1996	**100**
	Total		**526,666**
Australia Agency for International Development (AusAID/EFIC)			
Grant	Coastal Zone Environmental & Resources Management Project (NAMRIA)	1995-1999	**100**

Grant / Loan	Program/Project Title	Duration	Cost US $ 000
Canad:	**Canada International Development Agency (CIDA)/IDRC**		
Grant	ASEAN Forest Tree Seed Ctr Project -Seed Prod. Production	1989-1996	14,500
Grant	ASEAN Institute of Forest Management- DENR Integrated Forest Management Project	1993-199s	62
	Total		14,562
	Danish International Development Agency (DANIDA)		
Grant	Improvement of the Environment	1993-1995	2,3 14
Grant	Pasig River Rehabilitation Project II	1996-1999	6,323
	Total		8,637
	European **Economic Community (EEC)/European Union (EI**		
Grant	Western Samar Agricultural Resource Development Programme	1994-1999	16,866
Grant	Small Island Agricultural Support Services Program	1994-1999	22,488
Grant	Southern Mindanao Agricultural Programme	1990-1997	17.954
Grant	Ecosystem Response to Deforestation -Derived Siltation in South East Asia - Philippine Component	1995-1997	123
Grant	National Protected Areas Project	1995-1999	14,332
Grant	Central Cordillera Agriculture Programme	1996-2003	27,566
Grant	Palawan Tropical Forestry Protection Programme	1995-1999	22.150
Grant	Aurora Integrated Area Project	1995-1999	15.089
	Total		136.568
	FRG/Deutsche Gesellschaft Fur Technische Zusammeravbeit (GTZ)		
Grant	RP-FRG Fann Integrated Animal Health and Production II	1991-1998	x.403
Grant	Cebu Upland Project	1986-1998	5.021
Grant	Integrated Rainforest Management	198X-1995	6.100
Grant	Biological Plant Protection Project	1989-1993	2.800
Grant	Fruit Tree Research and Development Project	1994-1997	I.900
Grant	Community Forestry Project, Quirino	1992-200 1	9.605
Grant	VISCA-GTZ Ecology Project/Applied Tropical Ecology Program **111**	199 1 -open	1.440
	Total		35,269
	Republic of Germany Thru International Union for the Conservation of Nature (IUCN)		
Grant	Establishment of a National Biodiversity Center in the Philippines	1997-1999	29'
	International Development Agency (IDA)		
Loan	Environment and Natural Resources	1991-1998	65,802

Grant I Loan	Program/Project **Title**	Duration	**Cost US$ 000**
Japan			
Loan	Environment and Natural Resources Sector Adjustment Program (thru World Bank)	1991-1993	98,262
Grant	JICA-PhilRice Technical Cooperation Project	1992-1998	3,000
Grant	Improvement of Seed Production, distribution and appropriate Seed Storage System		9,700
Loan	Forestry Sector Program	19881993	119
Loan	Fisheries Sector Program	1991-1993	78,152
Loan	Forestry Sector Project	1993-199s	83,168
	Total		272,401
New Zealand			
Grant	Bukidnon Industrial Plantation	1989-1998	4,116
Grant	PNOC Social Forestry Project	1989-1995	804
	Total		4,916
World Bank - International Bank **for Reconstruction and Development**			
Loan	Small Coconut Farms Development Project	1991-1998	121,800
Loan	Environment and Natural Resources-Sector Adjustment Loan Project	1991-1999	346,130
	Total		467,930
United Nations Development Programme (UNDP/UNEP/UNESCO/UNCH/ UNICEF/FAO)			
Grant	Bamboo Research Development Project	1986-1995	843
Grant	Development of Sericulture as Rural Agro-based Industry in the Philippines (FAO)	1990-1995	1.073
Grant	Integrated Environmental Management for Sustainable Development (IEMSD)	1997	20
Grant	Monitoring of Land Use and & Land Cover Using Remote Sensing and GIS	1995-1996	124
Grant	Prevention and Management of Marine Pollution in East Asian Seas Project (GEF)	1994- 1996	8,000
Grant	Protection and Awarcness Campaign for the Conservation of Tubbataha Reef National Marine Park	1997	20
Grant	CITES Coral Project- Survey of the Status of Corals in the Philippines -for Sustainable Use	1995-1997	120
Grant	Integrated Management of Watershed and Coastal and Marine Environment (UNEP)	1996-1998	
Grant	Samar Island Biodiversity Project	1998	350
	Total		10,592

Grant / Loan	Program/Project Title	Duration	cost us $ 000
United States Agency For International Development (USAID) - Economic Support Fund (ESF)			
Grant	Natural **Resources** Management Program	1990-1992	121,663
Grant	Coastal Resource Management	1997-1998	
Grant	Natural Resources Management Program	1993-1998	125,000
	Total		246,663
	Total Grants		507,088
	Total Loans		1,3 19,999
	Grand Total (Identified Loans and Grants to Philippine Government on Biodiversity Conservation Related Programs)		1,827,087

Postscript: ***Future Directions***

The Convention on Biological Diversity has been in force since December 1993 and it has given direction to the implementation of the country's biodiversity conservation programs. It has provided the impetus for the Philippine Government to realize some of its conservation strategies such as the integration of environmental considerations, in this case the conservation of biodiversity, into its national and local sectoral plans. It has also exhorted the national leadership to formulate long-needed policies such as those on bioprospecting, biosafety, biotechnology, marine biodiversity, equitable access, indigenous knowledge, and many more.

The formulation of the National Biodiversity Strategy and Action Plan (NBSAP) provides the blueprint for the country's biodiversity agenda, and going by it, a lot more has to be done. The NBSAP is intended to be a dynamic set of strategies and policies and in the months to come, further planning consultations will be done to provide details. There is further need to define its implementation mechanisms and funding requirements. Nevertheless, the national policymakers have been made aware of the importance of biodiversity conservation, and it is now a pervading theme for consideration in sectoral policy decisions.

As indicated in parts of this report, while there seem to be various activities that individually address aspects of biodiversity conservation, an important future consideration should be the integration of these various activities in order to complement the overall goals of the NBSAP. It is necessary to orchestrate the research activities on biodiversity through the formulation of an overall research agenda within the framework of the NBSAP. It is equally important to push for training programs to build and to enhance capability of individuals and institutions.

The tremendous tasks ahead for the conservation of biodiversity need resources and partnerships with international and agencies and non-governmental organizations should help the country accomplish some of these activities. One of the aspects that will be highlighted is the fostering of these alliances to mutually supplement the necessary resources. A vigorous information, education and communication program shall have to be implemented to heighten awareness of decision-makers and citizens alike on biodiversity conservation, and the goals and objectives of the NBSAP. The active participation of all sectors should be the underlying goal of biodiversity conservation and the NBSAP.

The country endeavors the conservation and sustainable use of biodiversity in accordance with the objectives of the Convention, true to our commitment to CBD, and in order to accomplish the nation's own conservation goals and objectives. With this current review of the extent of the country's activities in biodiversity conservation, an immediate responsibility is the integration of all these efforts, and the formulation of a unified approach. The NBSAP provides the framework for such unified approach, and the task ahead is to sit down with concerned planners and stakeholders and begin working with each other.

References

Balcita, J. 1995. *Biotechnology in the Philippines: Bright or Blight.* UP Newsletter. 19(6):4-5

Baltazar, C.R. 1990. *An Inventory of Philippine Insects I. Orders Neuroptera, Strepsiptera, Siphonaptera, Trichoptera, and Diptera.* College of Agriculture, University of the Philippines - Los Banos, and the National Academy of Science and Technology. Philippines

Boussekey, M. 1995. *A Conservation Program for the Philippine Cockatoo: In-Situ and Ex-Situ Aspects.* A paper presented at the Fourth Annual Sumposium of Philippine Wildlife, Wildlife Conservation Society of the Philippines, April 5-8, 1995, Bahay Kalinaw, UP-Diliman, Quezon City, Philippines

Cacha, M.D.M. and Caldecott, J. 1996. *Philippines.* In: Decentralization and Biodiversity Conservation. Lutz, E. and Caldecott, J. (eds.). The World Bank, Washington DC, USA

Compilation of Environment and Natural Resources Policy Issuances CY 1994. (undated). Planning and Policy Studies Office, Department of Environment and Natural Resources. Philippines

Compilation of Policy Issuances 1987-1993. (undated). Protected Areas and Wildlife Bureau, Department of Environment and Natural Resources. Philippines

Cox, R. 1988, *The Conservation Status of Biological Resources in the Philippines.* IUCN. Gland, Switzerland

de la Cruz, R. 1998. *Genetic Engineering Research in the Philippines.* Paper presented during the Forum on Genetic Engineering and Biosafety in the Philippines: The Question of Field Testing of Genetically Modified Organisms, 10 February 1998, Ateneo de Manila University. Philippines

del Rosario, R. 1986. *Endemic Mosses.* p *29 l-363. In:* Guide to Philippine Flora and Fauna Volume I. Natural Resources Management Project, Ministry of Natural Resources, and University of the Philippines. Quezon City, Philippines

DENR 1996 Annual Report. Department of Environment and Natural Resources. Philippines

Directory of Environmental Legislations. (undated). Environmental Management Bureau, Department of Environment and Natural Resources. Philippines

DOST. 1991. *Philippine Biosafety Guidelines.* Department of Science and Technology. 152 pp. Philippines

EMB. 1996. *Philippine Environmental Quality Report 1990-1995.* Environmental Management Bureau, Department of Environment and Natural Resources. Philippines

ERDB 1996 Annual Report. Ecosystems Research and Development Bureau, Department of Environment and Natural Resources. Philippines

Espiritu-Afuang, L.M. 1995. *State of the Art Report on Philippine Amphibians.* A Paper presented at the Fouth Annual Symposium on Philippine Wildlife, Wildlife Conservation Society of the Philippines, and University of the Philippines - Center for Integrative and Development Studies, April 5-8, 1995, Balay Kalinaw, UP-Diliman, Quezon City, Philippines

Faustino,L. 1928. *Summary of Philippine Marine and Freshwater Mollusks.* Monograph 25, Monograph of the Bureau of Science, Bureau of Printing, Manila, Philippines

FishBase Program. 1997. International Center for Living Aquatic Resources Management. Makati, Philippines

GBA *(Global Biodiversity Assessment).* **1995.** United Nations Environment Programme (UNEP) Heywood, V.H. (ed.). p 1140. Cambridge University Press, Great Britain

Gollin, Michael. 1993. The Convention on Biological Diversity and Intellectual Property Rights. In: Biodiversity Prospecting, Water Resources Institute.

Heaney. L.R. 1986. *Biogeography of Mammals in Southeast Asia: Estimates of Rates of Colonization. Extinction, and Speciation.* Biological Journal of the Linnean Society 28: 127-165

ICLARM Annual Report 1996.1997. International Center for Aquatic Living Resources Management, Makati, Philippines. 94 p

IUCN. 1992. *IUCN Red Data Book.* IUCN, Gland, Switzerland

IUCN. 1994. *Red List of Threatened Animals.* IUCN, Gland, Switzerland

LLDA 1 996 Annual Report. Laguna Lake Development Authority. Department of Environment and Natural Resources. Philippines

La Vina, A.G.M., M.J. Caleda and ML Baylon. 1997. *Regulating access to biological and genetic resources in the Philippines: A Manual on the Implementation of Executive Order No. 247.* Foundation for the Philippine Environment and World Resources Institute. 63 pp. Philippines

La Vina, A.G.M. and M.J. Caleds. 1998. *The Philippine Executive Order (EO) 247: Emerging Issues and Problems.* Paper presented in the South and Southeast Asia Regional Workshop on Access to Genetic Resources and Traditional Knowledge, Madras, India, 22-25 February 1998

LLDA 1996 Annual Report. Laguna Lake Development Authority, Department of Environment and Natural Resources. Philippines

McManus, Liana T. 1997. *Aquatic Biodiversity in the Philippines: Status, Directions and Imperatives.* Paper presented during the National Workshop on Agenda Setting for Biodiversity Research in the Philippines. , 2-4 July 1997, SEARCA, Los Banos, Laguna, Philippines

NBS' (National Biodiversity Strategy and Action Plan)/Philippine Biodiversity: An Assessment and Action Plan. 1997. Department of Environment and Natural Resources(DENR) and United Nations Environment Programme (UNEP). 298 pp. Bookmark, Inc. Makati, Philippines

National Wetland Action Plan for the Republic of the Philippines. (undated). Protected Areas and Wildlife Bureau (PAWB), Department of Environment and Natural Resources, Wetlands International - Asia Pacific

NIPAP I997 Annual Report. Programme Management Unit, National Integrated Protected Areas Programme, Department of Environment and Natural Resources. Philippines

Padgham, J. 1995. *The Provisions for and Needs by Environmental Education in Asia.* Proceedings of the Second ASEAN Regional Conference on Environmental Education, 4-6 May 1995. University of Bradford, England

Pagulayan, R.C. 1995. *Studies on the Biodiversity of the Molluscan Fauna of Lake Taal, Batangas.* Terminal Report, Office of the Research Coordination, University of the Philippines, Quezon City, Philippines

PCAMRD 1996 Annual Report. Philippine Council for Aquatic and Marine Research and Development, Department of Science and Technology. Philippines

PCARRD Corporate Plan, 1990-2000. 1990. Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, Department of Science and Technology. Philippines

PCCARD 1996 Annual Report. Philippine Council for Agriculture, Forestry and Natural Resources Research and Development. Department of Science and Technology. Philippines

PCSD 1995 *Annual Report.* Palawan Council for Sustainable Development, Office of the President. Philippines

Philippine Agenda 21: A National Agenda for Sustainable Development. Philippine Council for Sustainable Development. Philippines

PCARRD. 1993. *Conservation of Biological Diversity in the Philippines.* (Book Ser. No. 132. Philippine Council for Agriculture, Forestry and Natural Resources Research and Development Los Banos, Laguna:, 73p. Philippines

Philippine Forestry Statistics, 1996. Forest Management Bureau. Department of Environment and Natural Resources. Republic of the Philippines

Philippine Red Data Book: Red List of Threatened Animals. 1997. Wildlife Conservation Society of the Philippines, Inc. Bookmark, Inc., Makati City, Philippines. 262 p

PAWB-NBU. 1996. *Philippine Biodiversity Country Study.* Philippine Biodiversity Country Study Project. Protected Areas and Wildlife Bureau - National Biodiversity Unit, Department of Environment and Natural Resources. UNEP-DENR

RAWOO. 1996. Consultant Report (unpublished). *Biodiversity and Sustainable Development in the Philippines: Research Environment, Key Actors and Research Needs.* Advisory Council for Scientific Research in Development Problems

Sajise, Percy E. 1995. *Conceptual Frameworks for Studying Biodiversity,* pl l-18. **Pei Shengji and** Percy Sajise (Eds.). Regional Study on Biodiversity: Concepts, Frameworks and Methods. Yunnan University Press. 295 p.

Sajise, Percy E. 1997. *Biodiversity in the Philippine Terrestrial Uplands: Status. Issues and Research Agenda.* Paper presented during the National Workshop on Agenda Setting for Biodiversity Research in the Philippines, 2-4 July 1997, SEARCA, Los Banos, Laguna, Philippines

SEARCA. 1997. *National Biodiversity Research Agenda for the Philippines.* SEAMEO Regional Center for Graduate Study and Research in Agriculture. Philippines

Sinha, C. 1991. *Primer on CITES.* Department of Environment and Natural Resources and World Wide Fund for Nature - Philippines

Tabaranza, B.R. and Mallari, N.A.D. 1995. *State of the Art Report on Philippine Birds.* A Paper presented at the Fourth Annual Symposium on Philippine Wildlife, Wildlife Conservation Society of the Philippines, and the UP Center for the Integrative and Development Studies. April 5-8, 1995, UP-Diliman, Quezon City. Philippines

Tapay, L.M. and R. dela Cruz. 1997. *Microbial Genetic Resources in the Philippines.* Paper presented during the Regional Workshop on Sustainable Utilization of Genetic Resources in Southeast Asia and the Pacific, July 7-l 1, 1997, Davao City, Philippines.

Wood, D. 1993. *Agrobiodiversity in Global Conservation Policy.* Biopolicy International Series. Kenya

Wang, Y.M. 1950. *The Myriopods of the Philippine Islands.* --

WRI. 1992. *World Resources 1992-l 993: Toward Sustainable Development.* World Resources Institute, Washington DC.

Zamora, P.M. and Co, L. 1986. *Philippine Endemic Ferns. In:* Guide to Philippine Flora and Fauna. Volume II. NMRC-UP, Quezon City, Philippines