

The Wetland Biodiversity Component for
Ligawasan Marsh Study

A Project of the Department of Environment and Natural Resources (DENR)
supported with a grant from the Global Environmental Facility (GEF) and the
World Bank, with supervision of the United Nations
Development Programme (UNDP)

**PROPOSED
LIGAWASAN MARSH
PROTECTED AREA**

PROJECT BRIEF

Volume III
The Investment Program in GEF Format

December 2004

PREFACE

The Ligawasan Marsh (LM) Development Master Plan (1999-2025), formulated by Region XII of NEDA in 1998, recommended the inclusion of Ligawasan as a protected area (PA) under the National Integrated Protected Area System (NIPAS). However, there were not enough scientific bases to support the recommendation.

The Government, with the support of the Global Environmental Facility (GEF)-World Bank, has now undertaken two studies: (i) the Protected Area Suitability Assessment (PASA) Study, completed in 2001, and (ii) the Wetland Biodiversity Component for Ligawasan Marsh Study, completed in 2004, which gathered the required scientific information. These studies have also completed the required stakeholder consultations at various levels. There was a strong consensus among the stakeholders that LM should be proclaimed as a PA under the NIPAS Act.

The outputs of the Wetland Biodiversity Study include three volumes:

- Volume I : Long-term Management Plan (the Plan) for the whole LM complex. The Plan, which covers 21 municipalities and one city, is based on the results of PASA and Wetland Biodiversity Study;
- Volume II : Medium-term Investment Program for the LM proper. The Program, which covers 10 priority municipalities located in the LM proper, is basically a five-year time slice of the Plan; and
- Volume III : Project Brief. It is actually the Investment Program transformed into the GEF format.

The Project Brief (Volume III) summarizes the detailed investment activities between 2006 and 2010, which were presented in a format based on GEF Guidelines. The Project Brief contains a description of the project context (environmental, socioeconomic, policy and institutional contexts). It also defined a baseline course of action---based on a business-as-usual situation---and an alternative GEF course of action.

The Project Brief also contains a summary of project implementation and financial arrangements, monitoring and evaluation plan, and lessons learned. It contains an incremental cost analysis justifying the need for GEF financing for conservation purposes and the need for a World Bank loan to support the livelihood and income generating activities to enhance the effectiveness of the proposed conservation efforts. The lack of employment opportunities in Ligawasan Marsh was identified as a major threat to the sustainability of the remaining biodiversity and natural resources of Ligawasan Marsh.

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- The more than 4,200 key stakeholders (farmers, fisherfolks, women groups, youth leaders, traditional leaders, religious leaders, teachers, and businessmen) from ten municipalities in the Ligawasan Marsh Proper; and
- The Honorable Mayors and their Municipal Planning and Development Officers (MPDO) and numerous barangay chairmen and members from these municipalities

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ABBREVIATIONS

AMORE	Alliance for Mindanao Off-Grid Renewable Energy
AFP	Armed Forces of the Philippines
ARMM	Autonomous Region for Muslim Mindanao
CENRO	Community Environment and Natural Resources Officer
CCF	Country Cooperation Framework
DENR	Department of Environment and Natural Resources
DepEd	Department of Education
DIP	Detailed Implementation Plan
FASPO	Foreign Assisted and Special Project Office
FPE	Foundation for Philippine Environment
GEF	Global Environment Facility
GOP	Government of the Philippines
GPS	Global Positioning System
IEC	Information and Education Campaign
IPAF	Integrated Protected Area Fund
IPRAS	Indigenous People's Rights Act
IRA	Internal Revenue Allotment
LGU	Local Government Unit
LMSC	Ligawasan Marsh Steering Committee
LYASDI	Ligawasan Youth Association for Sustainable Development, Incorporated
MENRO	Municipal Environment and Natural Resources Officer
MDFI	Maguindanao Development Foundation, Inc.
MILF	Moro Islamic Liberation Front
NASSA	National Secretariat for Social Action
NBSAP	National Biodiversity Strategy and Action Plan
NEDA	National Economic and Development Authority
NGO	Non-Government Organization
NIPAS	National Integrated Protected Area Systems
NSCB	National Statistics Coordination Board
OSY	Out-of-School-Youth
PA	Protected Area
LMSC	Protected Area Management Board
PASA	Protected Area Suitability Assessment
PASu	Protected Area Superintendent
PAWB	Protected Areas and Wildlife Bureau
PCR	Project Completion Report
PMO	Project Management Office
PMU	Project Management Unit
PO	People's Organization
R & D	Research and Development
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

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PROJECT BRIEF

1. IDENTIFIERS:

PROJECT NUMBER	: xxxxxxxxxxxx
PROJECT NAME	: Philippines: Ligawasan Marsh Wetland Biodiversity Conservation Project
DURATION	: 10 years, divided into two 5-year investment programs
IMPLEMENTING AGENCY	: United Nations Development Programme
EXECUTING AGENCY	: Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENTS	: DENR Region-XII and DENR-ARMM in collaboration with 10 LGUs
REQUESTING COUNTRY	: Philippines
ELIGIBILITY	: xxxxxxxxxxxx
GEF FOCAL AREA	: Biodiversity
GEF PROGRAMMING FRAMEWORK	: xxxxxxxxxxxx

2. SUMMARY:

The Ligawasan Marsh is one of the largest wetlands comprising about 10% of the Mindanao River Basin. It is a conglomeration of three marshes, namely, the Ligawasan Marsh proper, the Libungan Marsh, and the Ebpanan Marsh. The Ligawasan Marsh complex supports a variety of wild flora and fauna and has been identified as a distinct and unique region among the 15 biogeographic regions of the Philippines due to the presence of significant varieties of flora and fauna. It is known to support species of endemic threatened birds and is identified as an important wetland site because of its relatively expansive swamp forests.

Due to the ecological significance of the Ligawasan Marsh, the Ligawasan Marsh Master Plan for 1999-2025 recommended its inclusion under the National Integrated Protected Areas System (NIPAS). To support the establishment of the Ligawasan Marsh as part of the NIPAS, a Protected Area Suitability Assessment (PASA) was commissioned by the DENR IN 2000. Results of the PASA confirmed the need to accord protection status to the Ligawasan Marsh under RA 7586 under the category of a Natural Biotic Area in order to protect the natural resources therein as well as conserve the biological and cultural diversity of the area. Under the Natural Biotic Area, the protected area is set aside to allow the way of life of societies living in harmony with the environment to adapt to modern technology at their pace. The PASA results have also identified priority areas for conservation and management divided into five (5) core zones. Needing immediate conservation and management interventions are Zones 1 and 2, which cover the Ligawasan Marsh proper.

An investment program that would lead to the conservation and management of the Ligawasan Marsh and its eventual conversion into a protected area is required. The overall objective of this investment program is to conserve the biodiversity of the marsh on a sustainable basis while uplifting the socioeconomic condition of the

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people. Habitat restoration and ecosystem management interventions will be introduced by the project to address the environmental threats obtaining therein. The proposed investment program is premised on the fact that biodiversity conservation in settled and highly populated areas will be more successful if supplemented with socioeconomic enhancement activities. The project will, thus, support environment-friendly livelihood activities to eliminate or, if not, lessen, the dependence of the household settlers on the natural resources of the marsh. Small rural infrastructure support will also be provided to complement with habitat restoration and livelihood interventions. All these project interventions are underpinned by strong social preparation activities in order to ensure support from the stakeholders. Implementation of this project will be in collaboration with local government units (LGUs) with funding assistance coming from the World Bank, GEF, GOP and LGU.

3. COSTS AND FINANCING:

		Amount
GEF	-Project	US \$ 5.5 million
	Subtotal GEF	US \$ 5.5 million
CO-FINANCING	-World Bank	US \$ 5.8 million
	-GOP	US \$ 2.2 million
	LGUs	US \$ 0.8 million
	NGO	US \$ 1.1 million
	Subtotal Co-Financing	US \$ 9.9 million
TOTAL PROJECT COST		US \$15.4 million

4. **ASSOCIATED FINANCING:** Baseline funding is estimated at US\$ 9.9 million covering five (5) years of project implementation.

5. OPERATIONAL FOCAL POINT ENDORSEMENT:

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PROJECT CONTEXT:

1. **Environmental Context:** The Ligawasan Marsh is one of the largest wetlands in the Philippines comprising about 10% of the Mindanao River Basin. It is a conglomeration of three (3) marshes, namely, Ligawasan, Libungan, and Ebpanan which spreads over the provinces of Maguindanao, North Cotabato, and Sultan Kudarat. Basically a flood plain within the wetland ecosystem, Ligawasan Marsh is important as a natural flood control, natural filter, wildlife sanctuary, aid to precipitation, and natural seepage. A large part of the Ligawasan Marsh area falls on a 0-3% slope which is level to nearly level terrain.

2. The Mindanao River is the principal drainage system of the Cotabato River Basin which traverses the three marshes comprising the Ligawasan Marsh complex. It is formed by the confluence of three major tributaries, namely, Pulangi River which originates from the Province of Bukidnon, the Ala-a River which is situated in the south, and the Buluan River which is located in the southeastern part of the Ligawasan Marsh proper and is the main outlet of water spilling over from Lake Buluan. Aside from being the catch basin and drainage system of the aforementioned river system, high yearly precipitation in the area is able to maintain the water level in the marsh. Total annual precipitation in the area is between 2,120 mm and 2,501 mm.

3. Using the Ramsar Convention definition of wetlands as basis, the Ligawasan Marsh maybe classified into three major wetland habitats, namely, the marsh habitats, artificial habitats, and open water habitats. The marsh habitats are naturally occurring habitat types in wetlands characterized by the presence of an assemblage of obligate and facultative hydrophytes. There are three types of marsh habitats, namely, (1) the freshwater swamp forest habitat which is regularly inundated forest formation with mineral-rich freshwaters from rivers and streams; (2) herbaceous swamp habitat which forms transitional vegetation composed mostly of herbaceous life form categorized either as rooted [grasses, sedges, graminoids, and others], emergent [water lily, lotus, etc.], and floaters [water hyacinth and its close relative *Monocharia vaginalis*, *Pistia stratioides*, and *Lemna pauciflora*]; and (3) shrub swamp habitat which is a transitional stage in the ecological succession of swamps that is formed through siltation and subsequently colonized by shrubby plant species like *Sesbania cannabina*.

4. Artificial habitats are those areas subjected to and maintained as part of human activities (i.e., agriculture, built-up areas, etc.). There are two artificial habitats observed in Ligawasan Marsh, namely, (1) ricefield habitat which could be either with bunds located adjacent to the herbaceous swamp and freshwater forest swamp habitats or without bunds in the interior of the marsh which are planted to lowland rice as flood water recedes and (2) dryland agriculture habitat which are areas that have been exposed after floodwaters receded thus freeing vast tracts of lands for the cultivation of corn, upland rice, and cassava. The third major wetland habitat in Ligawasan Marsh is the open water habitat which could be either (1) still open water habitat or (2) running open water habitat. The still open water habitat, scattered floaters such as *Pistia stratioides* and *Eichhornia crassipes* are found and is used by local human communities for fishing and transportation. Running open water habitat are the bodies of water that persist during summer to connect different portions of the marsh downstream that include rivers and tributaries that are not necessarily inundated by floodwaters.

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5. Ligawasan Marsh has been identified as a distinct and unique region among the 15 bio-geographic regions of the Philippines due to the presence of significant varieties of flora and fauna. Results of the wetland biodiversity study on the flora composition of Ligawasan Marsh revealed that there are 201 plant species belonging to 159 genera in 68 families. Using the 2001 IUCN Red Data enumeration for plants, there are no species listed in any conservation status category. There are also no endangered, threatened, rare or vulnerable species in the area, and species that are of immediate conservation concern. It was, however, observed by the research team that *Terminalia copelandii*, an endemic and once an abundant species in the swamp forests of the country, is now subjected to pressures that could lead to its local extinction. There is relatively low endemism of plants in the study area. Twelve species out of the 201 (6%) listed are endemic to the Philippines. There are neither species nor genera that are local endemics (i.e., confined to the Ligawasan Marsh area). Most of the 12 species are upland species that were included in the sample to represent associated upland vegetation.

6. The faunal composition of Ligawasan Marsh consists of birds, mammals, amphibians, reptiles, fish and other aquatic species. The fauna survey reported 206 terrestrial vertebrate species, under the classes Aves, Mammalia, Reptilia and Amphibia, which were recorded from 16 locations. The birds surveyed consist of 170 species from 47 families and accounted for an increase of 75 species from the previous list of 95 species. The number of endemic birds recorded was 39 species, a great majority of which are forest-dependent species, recorded from patches of swamp forests. These forests were not accessible during the PASA study in 2001. The significant number of endemic species, which are forest-dependent highlights the importance of the remaining swamp forest habitats for the biodiversity of Ligawasan marsh. Table 1 of Annex C lists some endemic species with their habitat preferences.

7. A total of 37 migratory species was recorded. Ten of these species have resident populations in the Philippines. The migratory species recorded in Ligawasan marsh and vicinities can be classified into three groups: (1) species that are forest dependent, (2) species that favor open field or swamp, and (3) the species that utilize the forest for roosting but feed in the adjacent field or swamp. Most of the resident bird species are common in the open swamp habitats or marshy grasslands. These species have both resident and migrant populations. Table 2 of Annex C shows the migratory species and their associated habitats. A total of 13 threatened bird species was recorded, e.g. *Gorsachius goisagi* Japanese Night Heron (vulnerable), the endemics like *Anas luzonica* (vulnerable), *Spizaetus philippensis* (vulnerable), the *Gallicolumba criniger* (endangered), *Alcedo argentata* (vulnerable), *Ceyx melanurus* (vulnerable), *Ficedula basilanica* (vulnerable), etc.

8. The mammals with 14 species accounted for four additional species from the previous ten species. Three are endemic species, i.e., *Ptenochirus minor* Lesser Musky Fruit Bat, *Ptenochirus jagori* Musky Fruit Bat and *Sus philippensis* Philippine Warty Pig. Nine species are volant species comprising the fruit bats (Megachiropterans) e.g. *P. jagori*, *P. minor*, *Cynopterus brachyotis*, *Rousettus amplexicaudatus*, *Macroglossus minimus*, *Eonycteris spalaea*, and the insectivorous bats (Microchiropterans) e.g. *Hipposideros diadema* and *Myotis sp.*

9. There are 13 species of reptiles accounted, with one threatened endemic, i.e. the Philippine Crocodile *Crocodylus mindorensis*. The Ligawasan Marsh is considered as one of the last strongholds of this endemic crocodile in the country, where the more widespread and a larger species *Crocodylus porosus* is also known to occur.

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10. Nine species of Amphibians, including one endemic species *Kaloula conjuncta*, were recorded from Ligawasan. The marsh is also considered as one of the most important habitats for the Philippine amphibians. When the peace and order situation of the area would allow it, the survey on amphibians should be a priority activity.

11. Of the 31 species collected from the three sites, 20 or 65% of them are native and 11 or 35% are introduced. Libungan Marsh has the most number of species, of the 27 species noted, five species are marine forms known to be able to enter a few kilometers upstream of the river mouth. Of the 22 collected and noted from Ebpanan Marsh, three are predominantly marine forms. Only 18 species were collected from Ligawasan Marsh, all of which are known to live in freshwater habitats only.

12. Fourteen (14) species of mollusks were collected during the study. The thiarids are the most diverse, as expected in most tropical freshwater habitats. All the mollusks noted in the study are widely distributed in the Philippines. For the crustaceans, the study noted three (3) native species in Ligawasan Marsh. All three species are known to be edible. The relatively smaller *Caridina* are usually gathered with scoop nets in the riverbanks where they school among submerged vegetation. The relatively larger *Macrobrachium* species are usually caught with bamboo traps or scoop nets.

13. The marshes are relatively depauperate. Only about a dozen plankton genera were collected and identified. Only about four species of phytoplankton were collected and identified from Ebpanan marsh and the adjacent Cotobato River. As Libungan Marsh is just nearby and would be continuous with Ebpanan during the floods, it is assumed that Libungan would also have similar species of plankton as Ebpanan. Not only are the plankton species depauperate, they are also so rare that the average density is about 20 individuals per liter of water.

14. With the paucity of phytoplankton, it is assumed that primary and secondary (zooplankton) productivity is generally low, though probably increasing a little in the more lentic areas of the marsh during the dry season. Fish aquaculture appears, for now, not to be a good alternative livelihood option. Maintaining traditional methods will probably have a lesser negative impact than introducing high-energy subsidy aquaculture on the aquatic environment.

15. **Socioeconomic Context:** The Ligawasan Marsh is located in three (3) provinces, namely, Maguindanao, North Cotabato, and Sultan Kudarat, covering 20 municipalities and one (1) city with 183 barangays. Together, they comprise a population of 1,094,376 made up of 179,027 households as of year 2000 census.

16. For this investment project, only 10 municipalities falling under Priority Zones 1 and 2 will be considered. These municipalities, namely, M'lang, Kabacan, Tulunan, Datu Montawal, Pagalungan, Paglat, Sultan sa Barongis, S. K. Pendatun, Pikit, and Datu Piang have a strategic importance in the protection and preservation of the biodiversity in the Ligawasan Marsh. These are the identified priority areas for protection, divided into five (5) core zones. These 10 municipalities comprising Priority Zones 1 and 2 of Ligawasan Marsh have a total population of 468,210 made up to 87,237 households as of year 2000 census.

17. Results of the socioeconomic survey would indicate that majority of the households (56.8%) in the "waterline" barangays have a household size of 3 to 6 members. With majority of the household-respondents falling within the 26 to 40 age

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bracket, there is a high probability that household size will expand within the next 5 to 10 years. An increase in population will exert additional pressure on the natural resources of Ligawasan Marsh. The survey also noted low level of education among households across the 10 municipalities. On the average, less than two percent of the household heads had a college degree, less than four percent reached college level, less than seven percent finished and reached high school, less than six percent finished elementary, and less than 35% reached elementary level. It also appears that almost one-third of the household heads interviewed have no formal schooling. About 10% of them took up Arabic studies. Inaccessibility of educational facilities to marsh communities may help explain the low level of education of the households in Ligawasan Marsh.

18. Farming, livestock/poultry production, and fishing are the three major sources of livelihood of the people in the marshland. Overall, 80.4% of the households rely on farming for subsistence while 46.2% and 44.5% were engaged in fishing and livestock/poultry raising. It can also be inferred from the results of the survey that the households had multiple sources of income. That is, aside from farming, they are also involved in other livelihood activities, such as fishing, livestock/poultry raising, wildlife gathering, handicraft-making, and the like. It must be noted that a big portion of the marshland is submerged under water for almost six months, from the later part of June to the early part of December. Having multiple sources of income is, therefore, one coping mechanism of the people in order to survive during this period when farming is not possible. This also explains why fishing is the second major livelihood source, next to farming, as this is the most feasible livelihood activity when most of the marshland communities are submerged under water.

19. Rice, corn, cassava, and vegetables are the major food crops planted by the households in the area. Unlike rice and corn, cassava and vegetables are planted in small patches of land. Some 95.09% of the respondents were found to be rice farmers while 56.06% of them are corn farmers. Rice is planted, either in ricefields adjacent to herbaceous swamp and freshwater forest swamp or in ricefields found in the interior of the marsh. It is usually planted in these areas as flood water recedes. Planting of rice may start as early as November or as late as June depending on how fast the flood water recedes. Harvesting may start as early as February if planted in November or as late as October if planted in June. Most farmers, however, plant rice during the January-February period when flood water has already subsided. Corn, cassava, and vegetables are planted in areas that have been exposed after flood water had receded. These areas are not planted with lowland rice varieties due to inadequate water supply during the summer months. Planting of corn may start as early as October but most farmers start planting during the months of March and April. Harvesting takes place as early as February if planted in November or as late as June or July if planted between March and April, which is just in time before the start of the rainy season.

20. Farming is the main source of income of the majority of the households living within or along the marshland. Due to periodic flooding, income from farming is so low as shown by majority of the households (58.1%) whose annual income is ₱ 60,000 and below, which is way below the annual per capita poverty threshold of ₱12,267 set by the National Statistics Coordinating Board (NSCB). If income is used as the basic indicator of poverty, the household settlers in Ligawasan Marsh may be aptly called the “poorest” of the poor. Low income of the households is translated and manifested by their poor living condition that is characterized by inadequate access to basic social services and amenities. Most of the housing units (66.00%) are made of temporary materials like *nipa* for roofing, bamboo slits for flooring, and coconut leaves or coconut fronds for walls. Majority of the households (65.00%)

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obtain their water supply from deep well, stream, and rivers which are prone to contamination. Only a small number of households (about 5.00%) do not have their own toilet but waste disposal of most households appear unsanitary. Most of the households do not have household appliances, which is explained by the fact that only 14.7% of them have electricity connection.

21. **Policy Context:** There is no overall policy for wetlands in the Philippines (DENR, 1993). However, the Government of the Philippines (GOP) has regulatory mechanisms that impact on the management of wetland resources, particularly to control activities, allocate resources among actual and potential users, and resolve conflicts. Major legislations relevant to the conservation and management of the Ligawasan Marsh were enacted in the past like the Local Government Code of 1991, the National Protected Area System (NIPAS) Act of 1992, Indigenous People's Rights Act (IPRA) of 1997, the Wildlife Resources Conservation and Protection Act, and many more. Under the Local Government Code of 1991, the LGUs have the responsibility over extension and on-site research services and facilities related to agriculture and fishery activities, including water and soil resource utilization and conservation projects and enforcement of fishery laws in municipal waters. Implementation of community-based forestry projects which include integrated social forestry programs and similar projects like management and control of communal forests, establishment of tree parks, greenbelts and similar forest development projects shall also be the responsibility of the LGUs pursuant to national policies and subject to the supervision, control, and review of the DENR.

22. One landmark legislation of the GOP on environmental protection and management is the NIPAS Act of 1992 which provides for the establishment and declaration of identified portions of land and water that are considered to have unique physical and biological significance as protected areas. The law also provides the framework for a decentralized, community-based resource management strategy. A complementary policy to the NIPAS Act is the Wildlife Resources Conservation and Protection Act which aims to conserve wildlife resources through regulated sustainable use and establishment of critical habitats for threatened species. Under this legislation, habitats of threatened species outside the protected areas under the NIPAS Act may be set aside by the DENR Secretary. These critical habitats shall be managed in partnership with concerned LGUs and other stakeholders. The survival of the threatened species shall be given paramount importance in the designated critical habitat's management and shall be protected from any form of exploitation or destruction which maybe detrimental to the species' survival.

23. While there were attempts to protect and conserve Ligawasan Marsh, limited resources could not warrant the implementation of these policy measures. It can also be observed that projects implemented in the Ligawasan Marsh were not within the ambit of a comprehensive management and conservation framework and are mostly independent of each other. The Ligawasan Marsh Development Master Plan developed by NEDA-Region XII in 1998 was an attempt to holistically address the threats obtaining in the area. This is a comprehensive plan encompassing socioeconomic enhancement through livelihood opportunities, infrastructure, agricultural development, and environmental protection and management. It also recommended the establishment of the Ligawasan Marsh as a protected area under the NIPAS. The present project takes off from the Ligawasan Marsh Development Master Plan and from other related policy measures to comprehensively address the threats which confront the Ligawasan Marsh.

24. **Institutional Context:** The DENR is the government body that is responsible for most environmental management functions such as biodiversity conservation,

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enforcement of environmental legislation, regulation of forest industries, and other aspects of natural resource management. It has a decentralized organizational structure with the national office in Metro Manila responsible for policy development, supervision and monitoring while regional offices coordinate management and regulatory functions. The Provincial Environment and Natural Resources Offices (PENRO) oversee environmental management at the provincial level while the Community Environment and Natural Resources Offices (CENRO) are responsible for discharging DENR functions at the municipal level. The Protected Areas and Wildlife Bureau (PAWB) of DENR is charged with the management of protected areas and ensuring compliance with wildlife laws. PAWB functions are shared at the site level between the: (1) Office of the Protected Area Superintendent [PASu] which is charged with regulatory and administrative duties pertaining to site management, and (2) Protected Area Management Board [PAMB] which is mandated with overseeing planning and coordinating other basic conservation functions within the protected area.

25. There will be three levels of management for implementing the project, namely, national, regional, and local levels. The DENR will establish a national Project Management Office (PMO), which will be responsible for the overall administration and coordination of the project. The project will also work with DENR regional offices, the DENR-ARMM in Cotabato City and DENR-Regional XII, with each having a support group using organic staff. Participating municipalities will establish their Project Management Units (PMU) which will be responsible for project implementation in collaboration with the people's organizations and project beneficiaries.

26. The project recognizes the rigid procedure involved in the establishment of a PAMB. The strategy that will be adopted is to first establish an Ligawasan Marsh Steering Committee (LMSC) consisting of the Mayors from the 10 municipalities and governors of the two (2) provinces to provide direction and leadership in the interim management of the marsh until a presidential proclamation is signed placing the entire marsh under PA status. The LMSC would, therefore, evolve into the PAMB of Ligawasan Marsh having jurisdiction over ARMM and Region XII.

BASELINE COURSE OF ACTION

27. **Threats:** The marsh is known to support species of endemic and threatened birds, including the Philippine eagle and the Philippine duck. Because of its relatively expansive swamp forests, it is identified as an important wetland site of many water bird species like herons, egrets, rails, shorebirds, and ducks. It is also the last stronghold for the endemic and endangered Philippine crocodile and supports at least 33 species of freshwater fishes. The original flora in the area had been largely altered due to considerable human encroachment and land use conversion for agricultural purposes. The floristic composition in the marsh showed that there are 201 species belonging to 159 genera in 68 plant families. Of these, 12 are endemic to the Philippines. Most of them are upland species. There are no endangered, threatened, rare or vulnerable species in the area. None is of immediate conservation concern. Observations suggested that the swamp forest sites are no longer intact. The vegetation study conducted for PASA also revealed that only 826 hectares can be considered as closed canopy forest and 6,655 hectares is considered as open canopy. It also showed that the Game Refuge and Bird Sanctuary, declared as a sanctuary in January 1941, with an area of 50,000 hectares, is relatively free from agricultural activities. However, no apparent close

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canopy forest was found in the area and is mostly covered with brush lands/ shrub lands.

28. Annex D contains the overall assessment made by the consultants summarizing all the threats (identified by the stakeholders and observations made by the team of consultants) and their impacts to the environment and proposed interventions to address these threats. These threats are then linked to the prescriptions contained in the Management Plan. In relation to the proposed interventions recommended by the consultants, the threats facing the Ligawasan Marsh can be classified into two major categories: either on-site threats or off-site threats. This classification was used because the interventions being recommended were formulated to address the problems and threats found inside (on-site) the marsh, while those threats found outside (off-site) the marsh would be addressed through the prescriptions providing competitive grant funds to support research by highly qualified researchers from the academe and research agencies.

29. Under the on-site threats, nine categories of threats have been identified, namely: (i) subsistence-based destructive resource utilization, (ii) poor environmental practices, (iii) infrastructure, (iv) high population pressure, (v) potential for oil and natural gas, (vi) palm oil plantations, (vii) political boundaries and A & D lands, (viii) peace and order problems, and (ix) lack of education and access to schools. Examples of activities and impacts on the environment are shown in Annex D.

30. Under the off-site threats, six major types have also been identified: (i) slash-and-burn farming practices in the upland watersheds surrounding the marsh, (ii) conversion of mangrove forests at Cotabato City, (iii) commercial banana plantations, (iv) hazardous tailings from mining operations, (v) dumping of solid waste in the rivers being deposited in the marsh, and (vi) lack of clearing of debris in rivers and waterways (see Annex D).

31. Illegal logging activities and *kaingin* farming in the uplands that surround the marsh pose a serious threat to the marsh. Most of the uplands around the marsh are already denuded resulting to heavy erosion of hillsides during the rainy season. Eroded soil particles find their way to the rivers and tributaries and eventually to the marsh resulting to heavy siltation and build-up of large portions of the marsh. These newly built areas eventually attract new households to settle there. With more households residing inside the marsh who does not have a steady source of income, they then turn to the Ligawasan Marsh for their subsistence and, thereby, exert a lot of pressure to its natural resources.

32. Illegal fishing activities also pose a serious threat to Ligawasan Marsh as they indiscriminately kill or eliminate aquatic fauna irregardless of size and species. Illegal fishing, therefore, affects the biodiversity of the aquatic habitat and endangers the existence of some fauna species. Results of the survey indicate that inadequate livelihood opportunities drive many fishers to employ illegal fishing techniques to gain advantage over the others.

33. Hostilities between the AFP and the MILF during the last 30 years have also contributed to the degradation of the Ligawasan Marsh. Since it is the home of the MILF, many battles have been staged in Ligawasan Marsh by the military, the most recent of which was in year 2000. The numerous hostilities between the military and the MILF have physically altered the Ligawasan Marsh and have disturbed the marsh ecosystem that provide important habitat for various fauna.

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34. Land conversion has also contributed to the rapid degradation of the Ligawasan Marsh. This usually takes place along the borders of the marsh where silt deposit has accumulated over the years or in shallow portions of the marsh where farmers convert herbaceous swamp vegetation to ricefields and into small pockets of fishponds. Inadequate livelihood opportunities drive many households to convert portions of the marsh to new agricultural uses in order to derive additional income.

35. Pollution of marsh water is also a serious threat facing Ligawasan Marsh area as it contributes to loss and/or reduction of biodiversity. This is mainly brought about by the chemical and fertilizer application by farmers in food crop production activities, by large commercial plantations using aerial spraying, and by dumping of waste materials into rivers that found their way to the Ligawasan Marsh. The respondents have identified three plantations which have allegedly contributed to the pollution of the Ligawasan Marsh.

36. **Baseline:** The baseline course of action in a business as usual situation is described below. The incremental cost analysis annex summarizes information on baseline costs projected over five years, from 2006-2010.

37. ***Biodiversity Conservation Efforts:*** Planning for biodiversity conservation in Ligawasan Marsh first began with the declaration of a part of Ligawasan as a Game Refuge and Bird Sanctuary earlier in 1941. No effective interventions were carried out for lack of a program and funding to carry out the plan. This was followed by a formal master plan to cover the Ligawasan Marsh complex covering the whole marsh, consisting of three marshes: Ligawasan Marsh proper, Libungan Marsh, and Ebpanan Marsh, which was formulated by Region XII Office of NEDA in 1998 resulting to the preparation of the Ligawasan Marsh Development Master Plan (1999-2025). The Plan recommended the inclusion of Ligawasan as a protected area under NIPAS pursuant to Republic Act 1586. However, the plan lacked an inventory of the flora and fauna of Ligawasan Marsh complex and required consultation with the key stakeholders of Ligawasan Marsh complex. Consequently, actual conservation activities could not be started.

38. The results of the Wetland Biodiversity study confirmed that the stakeholders of Ligawasan are aware of the threats to conservation and biodiversity. However, there were no unified actions to effectively address these threats and concerns. Although the DENR provides budgetary and human resources for planning and monitoring operations, these are hindered by weak in-house capability, inadequate baseline biological, ecological, and socioeconomic data, and the complexity of the wetland environment. Planning operations for Ligawasan Marsh also lacks a common direction in the absence of a Management Plan. There is a need for targeted strengthening and capacity building support to address the weak in-house capability and to enhance the efficiency of the planning and monitoring system and for optimizing resource allocation and finding additional funding sources. However, such support is not planned and provided in the baseline scenario.

39. The baseline activities under the business-as-usual situation in the next five years include conservation efforts by LGUs, NGOs, and national and regional DENR. Five LGUs will use their IRA amounting while two NGOs (the MDFI and LYASDI) obtained grant funds from the UNDP to \$ 20,000. Small Grants Program, Foundation for Philippine Environment, Ford Motors Company, USAID-AMORE, and NASSA covering community forestry and reforestation. The cost of the NGO baseline activities is estimated at \$ 30,000.

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40. The baseline activities of two (2) DENR offices at Region XII and ARMM cover biodiversity conservation, wildlife protection and PA support. The baseline cost amounts to \$154,575. The activities of the PAWB include providing support to PA operations and monitoring with a baseline cost amounting to \$0.9 million.

41. Despite existing baseline biodiversity conservation efforts in the area, the baseline scenario is that the marsh is not managed systematically by its inhabitants and other stakeholders. It is also unlikely that the objective of enhancing and restoring the natural habitat and biodiversity in Ligawasan Marsh would be realized without the provision of investments by external funding agencies--- in community organizing, LGU staff training, government agencies staff strengthening, institution building, rural infrastructure, and equipment.

42. Environmental Education: Imparting environmental awareness is crucial to protecting and conserving the biodiversity of Ligawasan Marsh. Awareness raising is a key function of local NGOs by way of their advocacy works, the DENR which is accorded statutory responsibility for environmental education, the Department of Education and the academe, the media, and the religious sector which is also involved in environmental advocacy. There is, however, limited effort in coming up and in disseminating broad-based information on the conservation and protection of the Ligawasan Marsh from these key actors. One NGO, the Maguindanaoan Development Foundation, Inc. is actively involved in environmental awareness campaign producing documentaries and environmental radio programs but is constrained by limited funds. What is needed is a broad-based effort involving all other stakeholders to strengthen the conservation constituency and build strong public support for biodiversity protection.

43. Environmental Management: The provincial and municipal local governments comprising the Ligawasan Marsh have long been cognizant of its ecological significance. A number of these LGUs had, in fact, passed local legislations and adopted measures to regulate activities in the marsh like cutting of wetland forest trees, bird trapping, collecting eggs, and electro-fishing. Efforts to curb environmental destruction, however, remains uncoordinated and loosely implemented. There is also a weak integration of conservation objectives into development planning and general environment management characterized by: (a) absence of zoning requirement to satisfy conservation needs; (b) weak regulatory measures against environment-risky business and development undertakings; and (c) lack of conservation-specific appraisal within environmental impact assessments. The LGUs shall continue performing this difficult function of protecting the biodiversity of the marsh until such time that a permanent body is created to execute this function. Complex socio-cultural setting of the marsh requires an institutional capacity in order to address the present weaknesses that characterize conservation initiatives at Ligawasan.

44. Sustainable Livelihood. Currently, majority of the household settlers in Ligawasan Marsh are dependent on resource-extractive livelihood activities like fishing, bird trapping, egg and wildlife collection, fuelwood gathering and others which contribute to the degradation and biodiversity loss of the marsh. The main reason for this baseline scenario is the absence of complementary alternative livelihood opportunities to most of these households.

45. The proposed project for Ligawasan Marsh is based on lessons learned in conserving biodiversity in the Philippines and in other countries that biodiversity conservation in settled and highly populated areas will be successful and more sustainable if supplemented with livelihood development activities. By enhancing the

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productive capacity of the inhabitants through these livelihood opportunities, it is argued that they will become less dependent on the natural resources for livelihood support, thereby, sparing the forest or other ecosystem from the settlers' destructive extraction activities. A significant infusion of investment on livelihood projects is being planned for the priority biodiversity conservation zones of Ligawasan Marsh within the next five years. Investments in livelihood activities should, however, contribute to conservation objectives. Complementation between livelihood activities and conservation management interventions must be underscored such as: (1) making sure that the raw materials are available locally and do not pose a threat to biodiversity; (2) enhancing linkage between livelihood project and ecological and/or habitat restoration projects; (3) creating safeguards, through legal compacts or other appropriate instruments to tie development support to communities to the fulfillment of agreed conservation objectives; and (4) reinvesting of a portion of the net proceeds of the livelihood projects into conservation management.

ALTERNATIVE COURSE OF ACTION

46. *Project Preparation.* The preparation of the Ligawasan Marsh Investment Program is supported and financed by the World Bank and the GOP through the DENR. Preparation of the investment proposal is based on the participatory approach wherein project interventions basically emanated from the stakeholders of the marsh. The following activities were undertaken to come up with this investment proposal: (i) socioeconomic survey covering primary stakeholders between May and June 2004; (ii) stakeholder consultation workshops held in April 2004, August 2004, and December 2004; (iii) barangay stakeholder consultation and planning workshops in 10 municipalities in October 2004; (iv) appraisal and prioritization of project interventions by the team of Consultants held in UP Los Baños in November 2004; and (v) proposal writing.

47. The overall goal of this investment program is to conserve and manage in a sustainable manner the wetland biodiversity of the Ligawasan Marsh and to reduce the level of poverty in the area. This goal will be achieved through the establishment of the Ligawasan Marsh Protected Area within ten years after approval of this proposal that covers the 10 municipalities in priority zones 1 and 2. The proposed protected area will have five (5) management zones, namely, the multiple use zone, recreational/tourism zone, communal fishing zone, strict protection zone, and sustainable use zone. Management zoning in Ligawasan Marsh will be practically different from upland forest ecosystem due to its complex environmental setting. The multiple-use zone will basically comprise of present settlement and agricultural areas but opening or expansion of new settlement or agricultural areas will not be allowed. The recreational/tourism zone will cover existing and proposed wildlife and bird sanctuaries. There are currently three (3) wildlife and bird sanctuaries in Ligawasan Marsh which the project will replicate in other municipalities. Communal fishing zone will also be established in open waterways where fishing will not be allowed during certain periods of the year to allow fish to spawn. The strict protection zone covers the swamp forest and fish sanctuary zones where total ban on cutting of trees, fishing, wildlife hunting, and collection of eggs of wild birds will be observed. Finally, a sustainable use zone will be established as buffer against continuous encroachment on the swamp/wetland forest. It is in this zone where sustainable extraction of nipa, libi, bamboo, and other plant species will be allowed. Actual area for each of the management zones will be determined after survey mapping activities.

48. To realize the conservation and management of the Ligawasan Marsh and eventual establishment of the protected area, project interventions will be

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implemented along the following components: (i) ecosystems management and protection; (ii) institutional development and capacity-building; (iii) conservation enabling livelihood interventions; (iv) environment-friendly small rural infrastructure; and (v) monitoring and evaluation for wetland biodiversity conservation. The logical framework provides a clear overview of the project's goal, objectives, activities, and outputs. It also provides a framework for monitoring and evaluating the performance of the project (see Annex B). The following complementary outputs are proposed, with the GEF financing the incremental costs on environmental conservation and protection and provision of social infrastructure. Co-financing will be provided by the GOP for project management support and the World Bank for livelihood and small-scale rural infrastructure.

Output 1. An ecosystems management and protection program established and operational.

49. Ecosystem management interventions for Ligawasan Marsh consist of interrelated activities, namely, (i) laying the groundwork for a Presidential Proclamation declaring Ligawasan marsh as a protected area, and initial lobbying with Congress towards getting Congressional approval for a PA in the second 5-year phase of the Management Plan; (ii) implementation of a management zoning system; (iii) protection and law enforcement; (iv) habitat restoration; and (v) on-site and off-site research and development activities. Details are given in Annex A.

50. This proposal recognizes the rigid procedure involved in the establishment of a protected area. It is for this reason that there is a heavy emphasis on the conduct of consultation meetings with various stakeholders. These series of consultations will eventually lead to the delineation of management zones following the protected area concept. There shall be five (5) management zones to be established, namely, the multiple use zone, recreational/tourism zone, communal fishing zone, strict protection zone, and sustainable use zone.

51. The strategy is to first establish a Ligawasan Marsh Steering Committee (LMSC), consisting of the Mayors from the 10 municipalities and governors of the two (2) provinces to provide direction and leadership in the interim management of the marsh until a Presidential Proclamation is signed placing the whole marsh under a protected area status. An LMSC will be the precursor to the Protected Area Management Board (PAMB) which will be established after the Marsh has been declared by Congress as a protected area. Each municipality will have to promulgate local ordinances to provide clear guidelines in the management and protection of the marsh. Activities of the LMSC include quarterly consultation meetings with members of the local communities to identify and decide on the types of management zones that are appropriate for each municipality. Delineation of Ligawasan Marsh into suitable management zones will be done through community focus group discussions, survey mapping, and other related activities.

52. Proposal for the establishment of Ligawasan Marsh as a protected area will be prepared in Year 1 of the project following public consultation. An executive committee of the LMSC will be organized that would be responsible for the day-to-day execution of the project. They will also meet more regularly to address pressing issues besetting conservation and management of the Ligawasan Marsh.

53. Taking the lead in these activities are the Project Management Units of the 10 municipalities. They shall be responsible for the quarterly consultation meetings and in the delineation of suitable management zones in Ligawasan Marsh. The GEF will

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provide the funds to defray the cost of activities leading to the establishment of the Ligawasan Marsh Steering Committee (LMSC).

54. Protection and law enforcement in Ligawasan Marsh shall be done through the organization of Bantay Pawas. The project shall have organized on the second year the Bantay Pawas in each of the barangays covered by the project to effectively enforce approved policies and rules and regulations to protect the biodiversity of the marsh. The Bantay Pawas shall operate under the direction of the Municipal Environment and Natural Resources Officer (MENRO), if existing, or the LGUs Project Management Unit (PMU). They shall follow a program of regular visits to the designated protected area to deter illegal activities. There shall be a total of 53 barangays where the Bantay Pawas will be organized. Each Bantay Pawas will have a minimum of five (5) members coming from the POs. All members of Bantay Pawas and PMU staff of the LGUs shall undergo intensive training on the (i) do's and don't's of conserving and protection wetland biodiversity and (ii) straight-forward arrest procedures to minimize risks in life and to avoid unnecessary court litigations.

55. The GEF will provide the funding assistance to cover the cost of uniform, rubber boats, raincoats, flashlights, GPS, radio communications, and other necessary field equipment and supplies to make the Bantay Pawas functional. To support the Bantay Pawas operation, the LGUs shall enact local ordinances detailing allowable and non-allowable activities in the Ligawasan Marsh. A reward and incentive system for Bantay Pawas shall be instituted and awarded to those who made successful arrest of violators of environmental laws and regulations.

56. Using GEF funds, the project will implement six (6) habitat restoration interventions designed to address on-site environmental problems like the loss of habitat for important marsh fauna, diminishing wetland forest cover, siltation and riverbank erosion and the like. These natural resource management interventions will be jointly implemented and managed by the POs in the area. These interventions consists of: (i) assisted natural regeneration; (ii) wetland forest restoration; (iii) buffer zone restoration; (iv) riverbank protection and stabilization; (v) upland reforestation; and (vi) wildlife and bird sanctuary.

57. Assisted natural regeneration intervention will be introduced in the Municipalities of Kabacan, M'lang, and Tulunan covering 660 hectares of wetland forest and 2,000 hectares of herbaceous swamp. The objective of rehabilitating the wetland forest is to restore the habitat for important bird and wildlife species. The strategy for doing this is to reforest. Once rehabilitated and restored, these wetland forests will be declared as protection forest which means the trees will not be harvested and will remain there to provide sanctuary and habitat to various fauna. Tree species chosen for this intervention are endemic in the area like talisay, putat, and bangkal.

58. Existing wetland forests in the aforementioned municipalities are enveloped by a thick vegetation of herbaceous swamp. These herbaceous swamp used to be a part of the wetland forest but unabated cutting of trees gave way to grass vegetation. Restoration of the wetland forest in the herbaceous swamp would require the planting of the same trees which will be used in assisted natural regeneration activity such as talisay, bangkal, and putat.

59. Buffer zone reforestation shall be undertaken in the herbaceous swamp which surrounds the wetland forest. This will be implemented to establish a barrier between wetland forest and the built-up area. The vegetative cover or strip provided by the buffer zone forest will shield the herbaceous swamp and the remaining

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wetland forest from further encroachment and conversion into built-up area. About 2,000 hectares out of the 6,300 hectares herbaceous swamp will be placed under buffer zone reforestation using nipa and libi as vegetative cover.

60. One of the factors causing heavy siltation of the Ligawasan Marsh is erosion of riverbanks. Erosion of the riverbank is largely due to the absence of deep-rooted and extensive root system of vegetative cover along the riverbanks. It is for this reason that the riverbank protection and stabilization will be implemented in the Municipality of Datu Piang which is one of the severely affected municipalities by this problem. The proposed project intervention will cover an estimated river length of 23 kilometers. A 7.5 meter easement on each side of the river shall be placed under this intervention. Locally adapted and indigenous vegetative cover and/or tree species will be used like kawayan tinik, pandan tinik, and anahaw. These vegetative cover will be planted in strips with spaces in between to be planted with cover crops and/or forage crops to prevent surface soil erosion and as feed source of livestock.

61. Complementary to rehabilitating the wetland forest of Ligawasan Marsh is the proposal is to introduce upland reforestation intervention in the 180 hectares denuded upland ecosystem of Datu Piang. Present vegetation of the municipality's upland forest cover includes cogon and other grasses with patches of pioneering shrubs and trees. The objective of rehabilitating the forest cover of Datu Piang is to stabilize the soil and minimize soil erosion which is contributing heavily on the siltation of river which drains into Ligawasan Marsh. The strategy calls for the conversion of the grassland ecosystem into a secondary forest which will eventually develop into a climax forest complete with the inhabitation of interrelating flora and fauna. Reforestation of the upland area is one measure that will complement the effort of protecting and conserving the biodiversity in the Ligawasan Marsh as it will later on provide alternative habitat or sanctuary to selected fauna. Tree species that will be used in the rehabilitation of the upland forest cover of Datu Piang includes narra, ipil-ipil, and mango. The choice for narra, mango, and ipil-ipil is based on the fact that these tree species are adaptable and grow well in the area. Narra shall provide permanent root structure which will protect the soil from further erosion and store rainwater for groundwater serve. Mango is widely grown in the province and its fruits have huge market potential both locally and abroad. The choice for ipil is due to its soil amelioration potential as a nurse tree and the fact that substantial income maybe derived from its twigs and branches once sold as firewood.

62. With dwindling wetland forest cover, the number of bird and wildlife species seeking sanctuary in Ligawasan Marsh was also observed to have diminished. The swamp forest sanctuary needs replanting and assisted natural regeneration to attract migratory bird species. The project will provide assistance in the rehabilitation and establishment of wildlife and bird sanctuary in three (3) barangays. They will be provided with technical and financial support to establish a 10-hectare each of wildlife and bird sanctuary that will cover: (i) fencing of periphery; (ii) re-introduction of selected birds and wildlife species; (iii) replanting of certain portions of the forest; (iv) construction of foot paths and/or walking tracks; (v) construction of 20-ft watchtower; (vi) development of rest and recreation area; and (vii) sanctuary website development.

63. To support the marsh settlers' requirement for fuelwood and furniture wood, the project shall support smallholder tree planting intervention covering a maximum of one-fourth hectare per partner. Beneficiaries of this project intervention will be provided with seedlings of locally adapted and indigenous tree species which they will plant in their backyard or in the periphery of their farms.

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64. Threat analysis for Ligawasan Marsh had shown the confluence of on-site and off-site causal factors which undermine its biodiversity. Cognizant of this, the project will make available from the GEF funding support some amount to address these on-site and off-site research concerns. A research program for the conservation of Ligawasan Marsh shall be developed involving leading scientists and research institutions. These research undertakings are intended to solve and/or mitigate site-specific environmental problems. Likewise, results of these studies will provide important baseline information and feedback on the effectiveness of project interventions in arresting biodiversity-related problems in Ligawasan Marsh.

Output 2. A framework for institutional development and capacity-building developed and operational.

65. The project shall organize and mobilize local government units, NGOs and communities, and stakeholders to enable them to engage in conservation and environment-friendly livelihood activities. To achieve this end, the project will pursue the following activities: (i) strengthening governance of LGUs; (ii) organizing communities to strengthen their capacity to actively engage in conservation and protection activities; (iii) launching of environmental education and awareness program; (iv) implementing a special functional literacy program for out-of-school youths, and (v) sourcing of sustainable financing. More details are given in Annex A.

66. The project will follow a community organizing framework where project implementation is divided into three (3) phases, namely, (i) Phase 1- Social Preparation and Mobilization; (ii) Project Establishment and Capacity Building; and (iii) Phase 3- Phase out and Follow Through. Phase 1 of project implementation shall commence six (6) months after project approval or immediately after project mobilization and shall cover 12 months of intensive social preparation activities, information and education campaign, capacity building, and other related activities. Phase 2 of project implementation shall cover 36 months or three (3) years of establishing the various project interventions. It will be coupled with capacity building activities focused on institution building and technical capability building. It is expected that before the end of Phase 2, the project has already organized well-functioning POs which will assume an important role in project implementation. The last 12 months of the project shall correspond to Phase 3 when most of the project interventions had been implemented and most capacity building activities had been provided. It is also in this stage when terminal evaluation may be conducted to measure the accomplishments of the project.

67. Funding support for community organizing and social mobilization activities shall be provided by the GEF in support to the various habitat restoration interventions (e.g. assisted natural regeneration, buffer zone restoration, etc.). There will also be a series of training activities to enhance the capacity of the project beneficiaries, project implementers and other project stakeholders.

68. The project shall develop broad-based environmental education and awareness campaign program to impart conservation values among the different stakeholders and to alert them of the threats to biodiversity. The design of the program shall be based on an in-depth survey and analysis of awareness status and needs of various stakeholders. Messages shall be disseminated through various media including local radio, newspapers, and TV. A 30-minute information dissemination program on Ligawasan Marsh biodiversity conservation and protection shall be developed and hosted by a local radio station. The project will contract the services of the academe or an NGO to prepare the environmental education and awareness campaign program and film documentaries that depict the present state

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of the Ligawasan Marsh. Funding for the development and implementation of this broad-based environmental education and awareness campaign program will come from the GEF.

69. Consultations and dialogues with various sectors shall also be undertaken to provide answers and/or arrive at a consensus on certain issues. To become more effective, the project shall work for the integration of the environmental education and awareness program with the curricula of both elementary and secondary schools in the 10 municipalities. The project shall likewise promote the integration of the campaign program in barangay and municipal celebrations and festivities.

70. The objective of the Special Literacy Program is to promote human resource development particularly the out-of-school-youth (OSYs) in the marsh. It is to be integrated into the social sector (education) development program for the Ligawasan Marsh with the different LGUs within the marsh. The OSYs are also among the youth stakeholders in the marsh. They will be organized to actively participate in the task of rehabilitating, protecting, and conserving the natural resources/biodiversities of Ligawasan Marsh. This special program is not to take the place of the formal or nonformal education national program of DepEd. In addition to becoming literate or knowing how to read and write, and gaining numerical knowledge, the OSYs will be provided with training on community organizing, livelihood skills training, community projects, and indigenous research and techno-transfer.

Output 3. Conservation-enabling livelihood projects implemented

71. The proposed project acknowledges the link between continuing degradation of Ligawasan Marsh and inadequate livelihood opportunities for marsh settlers. Farming and fishing are the two (2) major sources of income of the majority of households. Seasonality of these income sources force marsh settlers to resort to resource-extractive livelihood activities like cutting of trees for fuelwood and charcoal, collecting wildlife, *etc.* Seven (7) conservation-enabling livelihood interventions will be supported by the project that will benefit a total of 2,550 households. These livelihood interventions include: (i) duck raising; (ii) smallholder goat raising; (iii) backyard feedlot cattle fattening; (iv) mat-weaving; (v) kalakat-making; (vi) pandan hat-making; and (vii) food cover making.

72. Funding for the aforementioned livelihood interventions will come from World Bank loan proceeds. Support for these livelihood interventions underscores the need to address rural livelihood needs as part of the overall conservation strategy. These are, therefore, livelihood interventions that will promote biodiversity conservation effort in Ligawasan Marsh that adopts the principle of compatible utilization of natural resources.

Output 4. Environment-friendly small rural infrastructure provided to complement livelihood projects.

73. The prevailing poverty situation of marsh settlers has a negative environmental impact on Ligawasan Marsh. Provision of additional livelihood opportunities is expected to wean the marsh settlers from resource-extractive activities. These livelihood interventions shall be complemented with infrastructure facilities for the needed post-harvest and market support. In addition, the component will provide social infrastructure to address important sanitation and health problems affecting the inhabitants of the marsh.

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74. Drying pavements will be constructed in 26 barangays in eight (8) municipalities in support of the marsh settlers' agricultural production activities. The lack of drying facilities in the Ligawasan Marsh communities prevents marsh settlers from maximizing agricultural production so as to pavements avoid postharvest-related problems. Rehabilitation of farm-to-market roads will be undertaken in 10 barangays in 10 municipalities which will connect them to the mini-growth centers. These farm-to-market roads will enhance the accessibility of these barangays to social services and open them up to outside market. This will also spur agricultural production in these barangays due to speedy movement of agricultural commodities and assured market.

75. Mini-growth centers shall be established in 16 strategic barangays under 10 municipalities. The mini-growth center is a convergence of social and physical infrastructure facilities intended to uplift the socioeconomic condition of the marsh settlers. It shall provide basic social services and support utilities apart from functioning as input and output market of marsh settlers in the clustered barangays along the marsh.

76. Ligawasan Marsh inhabitants lack access to basic social services and amenities. This leads to some practices which are detrimental to the protection and management of Ligawasan Marsh. The project will, therefore, provide some social infrastructure support to address health and sanitation concerns. Part of this social infrastructure support is the provision of potable water supply and sanitary waste disposal among household-settlers. The project shall construct 300 units of communal toilets for households who cannot afford their own and shall also distribute 3,000 units of toilet bowls to selected households. Similarly, the project shall construct 30 units of potable water supply system which will serve a cluster of households. About 2,000 units of jetmatic pumps will also be distributed to households who have the means to put up their own water system.

77. The provision of social infrastructure support will be funded out of the GEF funding assistance.

Output 5. A monitoring and evaluation system for Wetland Biodiversity Conservation established and operational.

78. A monitoring and evaluation system focusing on the major efforts to conserve and protect the remaining biodiversity of the Ligawasan marsh shall be established. It would also monitor and evaluate changes in the socioeconomic conditions of the stakeholders and would also monitor the progress of project implementation. At the start of the project, monitoring formats will be developed by project management staff to guide project staff who will perform this specific project activity. Information generated from monitoring activity will be feedback to project management for appropriate management and policy action.

79. Evaluation will actually begins at project start-up where project management staff will be required to formulate impact indicators, such as presence of indicator species, changes in habitat size, changes in human settlement patterns, siltation level, etc.) which will be used later on to measure project performance. These impact indicators will be incorporated in the draft logical framework given in Annex B, which will guide project management in their monitoring and evaluation activities. Evaluation will be carried out by phase, that is, during (i) project start-up when impact indicators are formulated, (ii) mid-term of project implementation, the focus of which will be more on formative aspect, and (iii) project completion using impact indicators formulated earlier.

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80. The LMSC will be formed at the start of project implementation to provide direction, leadership, and coordination of the conservation activities to be done by ten participating LGUs. The LMSC will also be tasked to identify financial sustainability schemes to raise funds to cover recurrent costs of the LMSC operation after project closure. Examples of these costs include: (i) DENR staff salaries and entitlements; (ii) maintenance and replacement of facilities and equipment; (iii) monitoring and evaluation; (iv) staff travel; (v) Board meetings; and (vi) continuing IEC program. The project plans to undertake a more detailed quantitative analysis at the next stage of project implementation to estimate financial requirement for recurrent cost and set an affordable scale of activities that is sustainable through self-financing.

81. In the future, the primary source of funds for the PAMB will be the Integrated Protected Area Fund (IPAF). The IPAF is a "trust fund established for purposes of financing projects of the system" established pursuant to Section 16 of RA 7586 (NIPAS Act of 1992). Sources of income for the IPAF can be derived from the (i) taxes for the permitted sale and export of flora and fauna and other resources; (ii) proceeds from the lease of multiple use areas, including tourism concessions; (iii) contributions from industries and facilities directly benefiting from the PA; (iv) fines and fees, including protected area entry fees, collected from operation of the protected area; (v) contributions, donations, endowments and grants from any source; and (vi) any other revenues derived from operation of the protected area. Specifically, the Ligawasan *interim* Board shall generate income thru the following :

- (a) Solicit funding or grants from the private sector and foundations;
- (b) Fixed government contribution through congressional enactment for the Protected Area Office salaries and benefit and other operating and logistical requirements;
- (c) Percentage share from the Internal Revenue Allotment of the 10 participating municipal LGUs and two provincial LGUs;
- (d) Lobby the ARMM Regional Legislative Assembly for budget insertion;
- (e) Imposing resource users fee to entities and individuals directly using the Ligawasan protected area resources like conservation fee from local tourists visiting the wildlife/bird sanctuaries, user fees for new restaurants and new commercial agricultural plantations and mining firms, and rental fees for the mini-growth center facilities.

82. The PAMB will retain 75 percent of the total IPAF collected for its Protected Area Sub-fund for the development and maintenance of the area. The remaining 25 percent will be remitted to the Central IPAF which shall form part of the National Treasury.

83. *End of Project Situation:* The Ligawasan Marsh would be established as a protected area in the category of a Natural Biotic Area. Local communities will be actively involved in conservation management activities, environment-friendly livelihood undertakings, and environmental advocacy. At the end of the project, a "social fencing" framework have been established providing a buffer against illegal encroachment and incompatible resource use. Livelihood activities that are compatible with the achievement of conservation objectives are in place providing the needed supplemental income for the marsh settlers. Delivery of basic social

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services to marsh settlers had been enhanced thereby raising their standard of living. There will be clear indicators that threats to Ligawasan Marsh had been mitigated as evidenced by the expansion of swamp forest areas and herbaceous vegetation and decline in resource-extractive activities of the marsh settlers. Local capacity to manage the Ligawasan Marsh had been developed and strengthened. Strong manifestation of support to protect and conserve Ligawasan Marsh will be observed in the barangays comprising the protected area and at level of local decision-makers.

84. *Project Beneficiaries:* The proposed wetland biodiversity conservation project for Ligawasan Marsh accords a broad range of benefits at the local, national, and global levels. At the global level, benefits would result by protecting migratory bird species and their habitats which would have been destroyed as a result of unabated degradation of the Ligawasan Marsh. Benefits at the local level will result from the introduction of the various interventions that would enhance the productive capacity of the settlers and facilitate the delivery of basic social services. The proposed project is designed to benefit more than 11,300 families or more than 405,000 people living in or around the Ligawasan Marsh. The habitats of birds and wildlife in the project area will be restored and expanded through various habitat restoration interventions. More than 7,000 hectares of degraded wetland and upland forests and vegetation will be restored and close to 1,000 families will directly benefit from the employment opportunities these interventions will provide. Finally, the DENR and its regional staff will benefit from lessons learned and know-how acquired in managing wetland biodiversity conservation.

85. *Eligibility for GEF Financing:* As a recipient of UNDP assistance, the Philippines satisfied the eligibility criteria described in paragraph 9(b) of the GEF instrument. The project is eligible for GEF assistance under Operational Programme No. 3 (Forest Ecosystems). In particular, the project meets eligibility criteria by: (i) adopting a highly participatory management strategy; (ii) being country-driven and initiated by the Philippine government authorities in accordance with their policy commitments; (iii) securing co-financing to share the costs of executing conservation measures and achieving the sustainable development baseline; and (iv) providing for long-term financial and institutional sustainability. The GEF would finance the agreed incremental costs of attaining biodiversity conservation objectives.

86. *Linkage with UNDP CCF:* The proposed project is consistent with the objectives of UNDP's country programs. UNDP's Country Cooperation Framework (CCF) includes environmental protection as a key thematic focal area. UNDP also supports components of PA 21 and NBSAP primarily by building institutional capacities to integrate conservation and development strategies.

87. *Linkage with Other GEF Initiatives:* The project design draws on lessons from the World Bank-GEF Conservation of Priority Protected Areas project which commenced in 1993. The proposed project would be the first World Bank-assisted initiative on protecting and conserving wetland biodiversity. It will also be the first such project that will be supported by GEF funding.

Project Implementation

88. The project will be implemented by the GOP through the DENR and concerned LGUs in the Ligawasan Marsh. It shall follow the World Bank requirements for nationally executed projects. The DENR will be responsible for (i) certifying expenditures in line with the approved budgets and work plans; (ii)

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monitoring and reporting on the procurement of inputs and delivery of outputs; (iii) coordinating interventions financed by the World Bank; and (iv) preparing Terms of Reference for consultants and tender documents for subcontracted inputs. A national project management office (PMO) headed by a Project Director and backstopped by a staff of technical experts and administrative support personnel will be created to assist perform these functions. World Bank will be responsible for funds management and the final approval of payments to vendors. DENR will be responsible for the recruitment of consultants, procurement of equipment, and subcontracting arrangements.

89. DENR will assume the responsibility for overall supervision, coordination, and financial management of the project. PAWB will provide policy support, including lobbying for the proclamation and providing technical assistance to the project. The concerned field officer of the DENR Region XII and DENR ARMM will conduct the day-to-day operations of the project, and will be led by the respective Regional Executive Directors (RED) or Director. The regional office will establish a regional PMO office. Each LGU will form a project management unit (PMU) to be headed by the Municipal Planning and Development Officer (MPDO) as the PMU Manager. The PMUs, the people's organizations (POs) in each community, and local NGOs, will be the frontline project implementers with the local NGOs providing the needed support in social preparation and human resource development.

90. Public Participation: Preparation of this project is a product of participatory approach where extensive stakeholder participation was successfully sought. Consultations were made with various stakeholders to get their insights on the pressing environmental problems and constraints affecting the marsh, strategy to overcome these problems, and specific actions to take to solve these problems.

91. It is also recognized that the participation of all stakeholders is the essential key in ensuring a successful project implementation. Therefore, various activities such as social preparation, community organizing, community mobilizations, information, education and communication (IEC) will be undertaken as an integral part in each phase of project implementation. These activities aim to foster a collaborative climate among the primary, secondary and key stakeholders, develop a deep understanding of the common needs and common dreams of the people as well as setting of the stage for shared decision-making. These exercises have proven to be very effective in instilling a sense of "ownership" and a shared responsibility among the individuals concerned in the management and implementation of the project.

Financial Arrangements

92. Incremental Costs: The proposed incremental cost to be financed by the GEF amounts to \$4,429,190. Co-financing amounting to \$9,920,770 shall be provided by project partners which affirm that the project will generate domestic in addition to global benefits.

93. Cost Effectiveness: The total costs of this project compare favorably with other projects aimed at establishing a protected area. The anticipated benefits to be derived from this project and the projected number of beneficiaries also make this project comparatively cost effective.

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Sustainability of Project Results

94. *Project Risks:* The project is complex and is likely to take time to generate tangible results and benefits. It could suffer from lost commitment or financial resources of government. The following key risks are identified which could threaten the success of the project. These are listed below together with the description of the abatement measures.

Risk	Rating	Abatement Measure
Delay in obtaining congressional approval of PA status.	M	The creation of an <i>Ligawasan Marsh Steering Committee</i> will serve as vehicle to facilitate the approval of the PA status of the Ligawasan Marsh. Lobby groups shall be organized also to ensure that the proposal will be given priority attention in the legislative body.
Institutional rigidity or bureaucratic procedures may hamper the creation of LMSC/PASu office.	M	Functions will be delineated between PASu, PENRO, and CENRO. The PASu will report directly to the Regional Executive Director.

Risk	Rating	Abatement Measure
Lack of cooperation by local communities in arresting threats to the Ligawasan Marsh.	L	Strong social preparation and mobilization shall precede actual project field implementation.
Conflict with other project stakeholders like the MILF and other marsh settlers.	M	Intensive social preparation activities is a key to getting the support of all stakeholders. Conduct of stakeholder analysis had also identified possible areas of cooperation between or among stakeholders.
Efforts to explore natural gas reserve in the interest of the national economy.	M	Strong national and local support for the protection and conservation of Ligawasan Marsh will deter any attempts at exploiting this natural resource. Creation of the <i>Ligawasan Marsh Steering Committee</i> will also buffer the Ligawasan Marsh from resource-extractive activities.
Change in local political landscape	M	Creation of an Ligawasan Marsh Steering Committee duly supported by the provincial and municipal LGUs thru a joint legislation will insulate the project from local political dynamics.

Sustainability: Protecting the biodiversity of Ligawasan Marsh is a very complicated effort because of the physical, socio-cultural, and political constraints obtaining in the area. To ensure the sustainability of project interventions, participation of POs in project implementation shall be maximized. These POs and project partners shall undergo the rigid process of social preparation. The required organizational structures, institutional arrangements, and policy support system shall be installed at the municipal and barangay levels to ensure that project operation will not be disrupted even after financial support is withdrawn.

95. As part of the implementation strategy, project assistance shall be extended to project partners following the principle of “no free ride”. Recipients of livelihood

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assistance shall be required to return part of the capital to the project/LGU either in cash or in kind depending on the agreed arrangements between them. The project partner will be required to give the LGU 30% share from the proceeds of habitat restoration projects from three (3) consecutive harvests. This is needed to generate additional funds which can be used by the project/LGU for expansion and/or replication purposes.

MONITORING AND EVALUATION

96. The bases for the conduct of monitoring will be the detailed work plan, action plan of the project, and the logical framework (see Annex B). Project monitoring will involve both the government and local communities in order to obtain feedbacks from all stakeholders and have a common understanding of project accomplishments and problems. Information generated by project staff from their monitoring activities shall be fed back to the project management for appropriate management and policy action. Monitoring will involve several methods like field surveys, transect plots, evaluation of aerial imagery, canopy cover assessments, and targeted questionnaires. Process monitoring will also be conducted to assess changes in the magnitude of threats. Project monitoring shall be conducted by the project staff which is one way of building local capacity.

97. The project management office will be required to prepare quarterly and annual accomplishment reports based on approved work plans and/or logical framework for submission to the World Bank and other project partners. The quarterly progress reports would provide a brief summary of the status of input procurement and output delivery, explain deviations from work plans, and present work plans for each successive quarter for review and endorsement. Annual progress reports would provide a more in-depth summary of work-in-progress, measuring performance against both implementation and impact indicators.

98. Evaluation will be based on the project logical framework and performance indicators validated and/or formulated at project start-up (Annex B). The project management office will conduct annually a year-end evaluation as a routine activity to determine the progress of project implementation and improvements to be made in project design. Annual year-end evaluation will, therefore, become part of the project's formative evaluation.

99. A more comprehensive final or summative evaluation will be done towards the end or immediately after project completion. A project completion report (PCR) preparation will be done by an external evaluation team which will be contracted for this purpose by the project management office. The PCR prepared by the project management will become the basis of external evaluators in conducting an independent project performance report. The PCR evaluation is necessary to determine if the objectives were achieved or not, to justify the possible expansion/replication of project interventions within and outside the present participating communities.

100. Design builds on lessons learned from similar related programs implemented by the DENR in the Philippines:

Lesson	Design Feature
Congressional approval of PA status is time consuming and requires considerable advocacy to ensure	Creation of an <i>Ligawasan Marsh Steering Committee</i> and lobby group will address this issue.

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smooth passage of an enabling legislation.	
Success of biodiversity conservation efforts is ensured if complemented with socioeconomic enhancing activities	Introduction of livelihood interventions and small infrastructure support addresses this concern.
Intensive social preparation is a must for participating communities to internalize environmental conservation strategies and approaches.	The project will operate within a community organizing framework that is broken down into three (3) important phases.

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ANNEX A

INCREMENTAL COST ANALYSIS

A. Broad Development Objective:

1. The GOP is committed to biodiversity conservation, which is one of the policy priorities included in the broader developmental agenda. The Philippines have also ratified the Convention on Biological Diversity in 1993 and have completed a National Biodiversity Strategy and Action Plan in 1997. One of the six Conservation Strategies contained in the Plan is the establishment and sound management of the National Integrated System of Protected Areas (NIPAS) pursuant to Republic Act 7586.

2. The GOP has recognized that for the NIPAS to be successful, the full participation of local communities is necessary. Under NIPAS, the protected area (PA) schemes in 1992 comprise about 209 sites, with a budget of over \$9.0 million annually. By 2004, there are 259 sites with a budget of about 0.93 million annually. However, this amount is clearly not sufficient to cover the full expenditures to ensure the successful implementation of the PA system. For this reason, the GOP is seeking international assistance to cover the incremental costs of implementing conservation programs through the GEF.

B. Global Environmental Objectives:

3. The Wetland Biodiversity Project's global environmental objective is to conserve the wetland habitats and natural resources that would ensure the long-term sustainability of wildlife and birds in the area. This will be done by establishing a PA under the NIPAS Act, based on natural biotic area, wherein the way of life of societies---living in harmony with the environment to adapt to modern technology at their own pace---is allowed.

4. The PA will encompass the whole Ligawasan Marsh, consisting of three marshes: the Ligawasan Marsh proper, the Ebpanan marsh and the Libungan marsh. Ligawasan contains many biological and ecological attributes that makes it globally significant as follows: (i) it is a distinct and unique region among 15 biogeographic regions of the Philippines; (ii) the marsh is one of the largest wetlands in the Philippines comprising about ten percent of the Mindanao River Basin; (iii) the marsh is known to support 201 plant species belonging to 159 genera in 68 families, 206 terrestrial vertebrate species---under the classes Aves, Mammalia, Reptilia, Amphibia, 31 aquatic vertebrates and 17 invertebrates; (iv) the marsh is a globally important bird area, and our studies have recorded at least 170 bird species, belonging to 47 families, to be frequent or considered resident of the area, and of this total, 39 species are endemic, 13 species are threatened, and at least 37 species are migratory; (v) one part of the Ligawasan Marsh was declared as a Game Refuge and Bird Sanctuary, under FAO No. 19 signed in January 1941, signifying its global importance; and (vi) the marsh is also considered the last stronghold for the endemic and endangered Philippine crocodile.

5. The original flora in the area have been largely altered due to considerable human encroachment and land use conversion for agricultural, residential, commercial and industrial uses. The above biological and ecological attributes are threatened by land conversion, which is considered the number one threat for the sustainability of the marsh as a Natural Biotic Area. The other threats that have been

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identified are illegal logging, rapid increase in population, water pollution, solid waste, wildlife gathering and illegal fishing.

6. Although GOP and LGUs are committed to the protection of the biodiversity Ligawasan Marsh, the amount of funding devoted to baseline interventions is limited and is restricted basically for monitoring and operations activities. Two local nongovernmental organizations (the Maguindanaon Development Foundation, Inc. and the Ligawasan Youth Association for Sustainable Development, Inc (LYASDI), are active in Ligawasan Marsh covering activities such as conservation, community organizing, and education and awareness activities. If no systematic and well-funded conservation project is put into operation soon, the risk increases that important global environmental benefits would be lost.

C. Baseline:

7. The threats facing the biodiversity of Ligawasan Marsh are summarized in the threat matrix shown in Annex D. The threats were identified by primary stakeholders (e.g. farmers, fisherfolks, women groups, youth leaders, traditional leaders, religious leaders, teachers, and business persons), and by secondary stakeholders (GOs/GAs, LGUs, NGOs, and academic institutions) during the (i) socioeconomic surveys conducted in May-June 2004---covering more than 4,200 stakeholder families from nine municipalities, (ii) two stakeholder consultation workshops held in August 2004 and December 2004, and (iii) barangay consultation and planning workshops in ten municipalities in October 2004. The consultant team also provided a synthesis and overview combining all of the known and observed on-site and off-site threats as shown in Annex D.

8. Annex D also described the impacts of these threats on the environment, and proposed interventions to address these threats. These threats were then linked to the management prescriptions shown on the second table of Annex D. Details of these prescriptions are described in the Management Plan (Volume I) and in Chapter 2 of the Investment Program (Volume II) of the Wetland Biodiversity Study.

9. In relation to the interventions recommended by the consultants, the threats facing the Ligawasan Marsh can be grouped into two major categories, either as on-site threats or as off-site threats. This grouping was used because the interventions being recommended were formulated to address the problems and threats found inside (on-site) the marsh, while those threats found outside (off-site) the marsh would be addressed through the prescriptions providing competitive grant funds to support research by highly qualified researchers from the academe and research agencies.

10. Under the on-site threats, nine categories of threats have been identified which are caused by (i) subsistence-based destructive resource utilization, (ii) poor environmental practices, (iii) infrastructure, (iv) high population pressure, (v) potential for oil and gas, (vi) palm oil plantations, (vii) political boundaries and A & D lands, (viii) peace and order problems, and (ix) lack of education and access to schools. Examples of activities and impacts on the environment are shown in Annex D.

11. Under the off-site threats, six major types have also been identified: (i) slash-and burn farming practices in the upland watersheds surrounding the marsh, (ii) conversion of mangrove forests at Cotabato City, (iii) commercial banana plantation, (iv) hazardous tailings from mining operations, (v) dumping of solid wastes in the rivers being deposited in the marsh, and (vi) lack of clearing of debris in rivers and waterways (See Annex D).

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12. The baseline course of actions in a business as usual situation is described below. The major players in biodiversity conservation are the Government of the Philippines (GOP), represented by DENR (including PAWB and the DENR Regional XII and DENR-ARMM), the LGUs and two NGOs described above. Funding of LGUs (Kabacan, M'lang, Tulumun, S.K. Pendatun, and Pikit) is allocated from their IRAs, while the funding for the NGOs are being provided by the Foundation for Philippine Environment (FPE), UNDP Small Grant Program, Philippine German Fund for Integrated Development Project, Kuwait Government, United Kingdom Government, Association of Islamic Development, Ford Motors Company, USAID-Winrock International, and the Secretariat for Social Action (NASSA).

(a) Biodiversity Conservation Efforts

13. Planning for biodiversity conservation first started with the declaration of a part of Ligawasan Marsh as a Game Refuge and Bird Sanctuary in 1941. This was followed by the preparation of the Ligawasan Marsh Master Plan by the Region XII Office of NEDA in 1998. The plan recommended the inclusion of Ligawasan as a PA under the NIPAS Act. Only after the completion by DENR of two follow-up studies (the PASA in 2001 and the Wetland Biodiversity Study in 2004), financed by the GEF-World Bank, and supervised by the United Nations Development Programme (UNDP), that the required inventory of flora and fauna of Ligawasan and the required consultations with the key stakeholders were fully satisfied. It was under the PASA Study, that the recommendation to declare the Ligawasan as a PA under NIPAS Act based on Natural Biotic Area was made.

14. The baseline activities under the business-as-usual situation in the next five years include conservation efforts by LGUs, NGOs, and regional and national DENR. Five LGUs will use their IRA amounting to \$20,000, while two NGOs (the MDFI and the LYASDI) obtained grant funds from the UNDP Small Grants Program, FPE, Ford Motors Company, USAID and AMORE, and NASSA, covering community forestry and reforestation. The cost of the NGO baseline activities is estimated at \$30,000.

15. The baseline conservation activities of two DENR offices at Region XII and ARMM cover biodiversity conservation, wildlife protection and PA support, while activities of PAWB include providing support to PA operations and monitoring. The baseline cost amounts to \$465,500.

(b) Environmental Education

16. Raising awareness among the stakeholders of Ligawasan Marsh is necessary to the protection of the natural resources of Ligawasan. Local NGOs have contributed to raising awareness through their advocacy work while the DENR, the Department of Education, and the academe have also provided support. However, the magnitude of the efforts is considered limited to date for lack of a systematic program to accomplish the job. MDFI received small grants from the Ford Motor Company and produced brochures and documentaries while LYASDI obtained funds from the UNDP Small Grants for education and awareness campaign aimed at raising awareness among the inhabitants of Ligawasan marsh. The cost of baseline activities of NGOs amounts to \$51,800.

(c) Environmental Management

17. A number of local legislations have been passed by the provincial and municipal governments participating in the project. These legislations include

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measures to regulate activities in the marsh that are destructive to the biodiversity of Ligawasan Marsh. Integration of conservation objectives into development planning and management is also weak and the outlook is bleak for the future if no systematic program of conservation is formulated and implemented. The cost of the baseline activities, covering the strengthening of local governance and village development, amounts to \$51,800.

(d) Sustainable Livelihood

18. Lack of livelihood opportunities in the marsh is a major threat to the protection of the biodiversity of Ligawasan. Stakeholders continue to cut the wetland forest and collect fuelwood to increase their meager income and also resort to collecting wildlife and bird eggs to the detriment of maintaining and increasing the population of fauna in the area. The LGUs and two NGOs have livelihood programs funded by their IRAs, and grants from NASSA and the Association for Islamic Development. The cost of the baseline activities, covering support to livelihood activities in the communities by both LGUs and NGOs, amounts to \$1.15 million.

D. Proposed GEF Alternative Course of Actions:

19. **Project Preparation.** One of the outputs of the Wetland Biodiversity Study is the formulation of a five-year investment project (Volume II), which is a time slice of the ten-year management plan (Volume I) for Ligawasan Marsh. The goal of the investment project is to conserve the biodiversity of Ligawasan marsh and reduce the poverty in the area. The requirements for completing the inventory of the flora and fauna and consultations with stakeholders have been satisfied following a series of workshops (April 2004, August 2004 and December 2004), information dissemination drive in 21 municipalities and one city, socioeconomic survey between May and June 2004, and barangay stakeholder consultation and planning workshops in October 2004.

20. The proposed GEF alternative would lay the groundwork for the creation of a PA under NIPAS Act based on a Natural Biotic Area for the Ligawasan marsh complex. To accomplish the objective, it is proposed that a ten-year investment program, consisting of two phases, be undertaken: Phase I covering the period 2006-2010 will lay the groundwork for the approval of a Presidential Proclamation and completing a part of the preparatory work towards getting Congressional Approval to declare the Ligawasan as a PA; and Phase II covering the period 2010-2015 will lead to declaring it as a PA through approval by the Philippine Congress, and thus assuring budget appropriations for the operations of the PA. We have identified five outputs to address the threats facing the Ligawasan as follows:

a. Ecosystems Management and Protection

21. The ecosystems management and protection Interventions consist of five inter-related activities, namely: (i) lay the groundwork for a Presidential Proclamation declaring Ligawasan Marsh as a protected area, and initial lobbying with Congress towards getting Congressional approval in the next five years, (ii) implementation of a management zoning system, (iii) protection and law enforcement, (iv) habitat restoration, and (v) on-site and off-site research and development activities.

22. As described above, the process of declaring the Ligawasan Marsh as a protected area will involve obtaining first a Presidential Proclamation, during the next five years (2006-2010). During the implementation of this project, PAWB will take the

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lead in preparing the draft of the presidential proclamation and will target getting this proclamation by the Year 2008. This will be preceded by documenting the occupants of the marsh inside the protected area and getting their concurrence to declare the marsh as a PA. PAWB will also organize a lobby group financed under the project to seek the support of Congress for enactment of a law declaring the marsh as a PA. The cost of the baseline activities is nil, while the GEF cost is projected at \$33,400 inclusive of contingency.

23. There will be a heavy emphasis on conducting many intensive consultation meetings with stakeholders to meet the rigid procedure required when establishing a protected area. Among others, these consultations are expected to result to the demarcation of five management zones following the protected area concept. The five zones include: (i) multiple use, (ii) recreational/tourism, (iii) communal fishing, (iv) strict protection, and (v) sustainable use (see details in Prescription I contained in the Management Plan, Volume I). GEF cost is projected at \$173,700 inclusive of contingency .

24. The protection and enforcement interventions would (i) form and strengthen local law enforcers, the Bantay Pawas, (ii) formulate local ordinances delineating the responsibilities of various stakeholders, (iii) produce a record of compliance on PA regulations; and (iv) set up a reward system to sustain the conservation efforts. All the Bantay Pawas guards will undergo intensive training on the do's and don'ts of conserving and protecting wetland biodiversity, and straight-forward arrest procedures to minimize risks in life and limbs and also to avoid unnecessary court litigations. The LGUs will enact local ordinances detailing allowable and non-allowable activities in the Ligawasan Marsh, for example, banning of the use of battery-operated electric probes that kill even the young fishes and collecting wildlife animals and migratory and endangered endemic bird species. The cost of the baseline survey is nil, while the GEF cost is projected at \$183,700 inclusive of contingency.

25. The habitat restoration interventions, directly provided by the primary stakeholders of Ligawasan Marsh would (i) restore degraded wetland forest and herbaceous swamp habitats, through assisted natural regeneration, wetland forest restoration, buffer zone development, and restoration of a second growth forest; (ii) stop erosion of riverbanks in selected municipalities, through riverbank protection and stabilization, involving 23 line km long, by planting appropriate species; (iii) increase the number of birds and the number of bird species by supporting existing and new bird sanctuaries in several municipalities; (iv) stabilize the land and reduce soil erosion through community-based replanting; and (v) reduce dependence of inhabitants on forest resources for firewood and raw materials for furniture-making by establishing smallholder tree farms on private lands. The total cost of baseline activities is estimated at \$515,500 (GOP-\$465,500; LGU-\$20,000 and NGO-\$30,000) while the GEF cost is projected at \$2, 985,160 inclusive of contingency.

26. The on-site and off-site research interventions would address major environmental problems at various on-site and off-site locations that would not be addressed otherwise under a regular conservation project. For example, the interventions would make available---on a competitive basis---to qualified scientists and institutions research funds to (i) determine the extent and impact of various sources of environmental degradation (chemical pollution, heavy sedimentation, etc.) originating from on-site and off-site locations, (ii) conduct studies on fishery and resources and biology of important fauna and flora present in the marsh, and (iii) assist in rehabilitation and conservation of the only mangrove swamp area in Ligawasan. A research committee of up to seven members will direct and manage

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the research grants under the project manager heading the national project management office. Results from the research projects will solve or mitigate the progressive degradation of the environment in the marsh, which will benefit the Ligawasan marsh stakeholders. There is no baseline cost for this intervention since there are no baseline activities and there are no appropriations at present and none expected in the next five years. However, the GEF cost is projected at \$301,600 inclusive of contingency.

b. Institutional Development and Capacity Building

27. The project shall organize and mobilize local government units, NGOs, and community members and other stakeholders to enable them to engage in conservation activities and environment-friendly livelihood activities. To achieve this goal, the project will undertake the following activities: (i) strengthening governance of LGUs, (ii) organizing communities to strengthen their capacity to engage in conservation and protection activities, (iii) launching of environmental education and awareness program, (iv) implementing a special literacy program for out-of-school youths, and (v) sourcing of sustainable financing.

28. The interventions involving strengthening of governance of LGUs would include the following activities: (i) prepare an institutional support program, including training needs assessment and a human resource development plan to strengthen local institutions, and (ii) engage local communities in co-management (planning, implementation, and monitoring) of marsh biodiversity conservation programs. Based on in-depth training needs assessment, training will be designed for LGUs and other regional/national agencies to integrate biodiversity conservation into development planning for Ligawasan Marsh.

29. In mobilizing communities, the interventions will be based on the community organizing (CO) framework in all the participating barangays. The CO framework consists of three interrelated phases, namely, Phase 1 (Social Preparation and Mobilization); Phase 2 (Project Implementation and Capacity Building), and Phase 3 (Phase out and Follow-through). Details of the phasing activities are shown in the section on alternative course of actions in the main text of the Project Brief. The GEF cost is projected at \$244,300 inclusive of contingency.

30. The environmental education and awareness interventions would develop and make operational a broad-based education and awareness campaign program. The interventions would: (i) design an environmental education and awareness program for the marsh; (ii) develop information materials suitable for use in various media, including local radio and newspapers; and (iii) conduct a broad-based conservation awareness campaign, including use of multi-media.

31. The activities would include assessing the level of environmental awareness of marsh inhabitants, implementing 5-year IEC program, and producing IEC materials, radio and newspaper, documentary films. Messages should also be communicated through religious organizations and through dialogues with various groups. The environmental education and awareness program will be integrated in the curricula of schools (both elementary and secondary) found in the ten municipalities covered by the project. The interventions would also integrate the environmental education and awareness program in barangay and municipal festivities to promote awareness on the environmental issues affecting Ligawasan. The interventions would also promote and enhance environmental consciousness among government's field workers, such as barangay health workers and agricultural technicians, and the people's organizations (POs). The cost of the baseline activities

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is estimated at \$51,800 while the GEF cost is projected at \$169,420 inclusive of contingency.

32. The special literacy program would address the special needs of more than 1,200 disenfranchised out-of-school youths, aged between 11 and 14, who because of poverty are unable to attend schools or because they are handicapped because their families were displaced during repeated military conflicts in the marsh or because of distance between their homes inside the marsh and the primary schools that are normally located in barangay or town centers. There are no significant baseline activities in functional literacy in Ligawasan Marsh at the moment. The GEF cost is estimated at \$365,600 inclusive of contingency.

33. The sustainable financing intervention would generate funds that will sustain the conservation efforts for Ligawasan Marsh on a long-term basis. The intervention would develop a program of generating funds from various institutions, private sector or foundations; and establish a fee system to support the Bantay Pawas and devise other revenue-generating initiatives. Some examples to be targeted include seeking a small share of budget appropriation from participating LGUs, through their internal revenue allotment, budget appropriations from the ARMM Legislative Assembly and the two provincial governments, appropriations from Congress during the proclamation of the Ligawasan Marsh as a PA, collect a conservation fee from tourists visiting the wildlife and bird sanctuaries to be assisted under the project, and revenues from printing post cards and royalties. The collected funds will be deposited in an Integrated Protected Area Fund (IPAF). The cost for the intervention is included in the funds for engaging the services of consultants (Team Leader and Regional Coordinator) and a part of the funds included in Prescription I (Ecosystems Management and Protection).

c. Conservation-enabling Livelihood Activities

34. The livelihood intervention is very critical to any conservation effort because the results of the socioeconomic surveys and consultations with primary stakeholders indicated that the major threat affecting the biodiversity and natural resources of Ligawasan marsh is lack of alternative and sustainable livelihood. As a result, stakeholders resort to cutting poles and firewood from the remaining wetland forest and the woody vegetation. The intervention would provide the stakeholders with a sustainable source of income through seven livelihood projects. The activities would include duck raising, goat raising, backyard feedlot cattle fattening, mat weaving, kalakat weaving, pandan hat and food cover making. Due to the importance of this intervention, the GOP and the LGUs are interested to seek a World Bank loan to finance this intervention to provide livelihood support to the stakeholders. The total cost of the baseline activities is estimated at \$2,517,199 (WB Loan-\$1,367,400; LGU-\$115,000; and NGO-\$1,034,700) while the GEF cost is nil.

d. Environment-friendly Rural Infrastructure

35. The rural infrastructure intervention would enhance the viability of the recommended rural livelihood activities, thereby promote the sustainable protection of the biodiversity of Ligawasan. These interventions were identified by the stakeholders themselves during the barangay consultation meetings. Examples of small infrastructure to be provided include drying pavement for food crops produce, rehabilitation of farm-to-market roads, and mini-growth centers. The total cost of the baseline activities is estimated at \$559,600 (WB -\$543,800 and LGU - \$15,800) while the GEF cost is also nil.

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36. Furthermore, the intervention would also address important sanitation and health problems affecting the inhabitants of the marsh by providing social infrastructure. Lack of potable water and improper disposal of human waste are important problems affecting the health and sanitation conditions of stakeholders. The intervention would construct 300 units of potable water supply system in selected 30 barangays, distribute 3,000 units of toilet bowls to 50 barangays, construct 300 units of communal toilets in 4 municipalities, and distribute 2,000 units of jetmatic water hand pumps and piping systems to 50 barangays. The total cost of the baseline activities is estimated at \$225,400 (WB - \$205,400 and LGU - \$20,000), while the GEF cost is projected at \$289,200 inclusive of contingency.

e. Monitoring and Evaluation (M&E) System for Biodiversity Conservation

37. The intervention would establish a comprehensive monitoring and evaluation system which will focus on the major efforts to conserve and protect the remaining biodiversity of the marsh. The M&E system will also monitor and evaluate improvements in the socioeconomic conditions of the beneficiaries and will also monitor the progress of project implementation. The interventions would: (i) establish the set of performance indicators, and (ii) put into operations a monitoring and evaluation system for Ligawasan Marsh. Activities will include (i) development of analytical tools for monitoring changes in the magnitude of threats by conducting field and aerial surveys, (ii) identify impact indicators, such as the presence of indicator species, changes in habitat area, increases in the variety of the flora and fauna, and changes in human settlement patterns, and (iii) identify lessons learned from completed and ongoing conservation projects. The performance evaluation will assess the appropriateness, effectiveness, and efficiency of the strategy and policy in achieving its objectives and outcomes at all levels contained in the initial project logical frame (see Annex B). There are no baseline appropriations at present for this output and in the next five years, while the GEF cost is projected at \$91,410 inclusive of contingency.

d. Other GEF and Non-GEF Assistance

38. A number of activities were deemed necessary to ensure the success of the conservation and livelihood interventions, such as training support to LGU, support for project management, and provision of consulting services. Details follows:

(i) Training Funds for LGUs and Others

39. The consultants pooled in one fund all the funding needed to provide training support to LGUs, NGOs, and stakeholders. Each municipality will form a project management unit (PMU), which will be responsible for project implementation in that municipality. The intervention would provide intensive training for the members of the PMUs and other LGU staff, covering the following aspects: participatory processes, social preparation, local policy development and legislation, project development management, wetland development technology package, and institutional development to develop the capacity to implement the different interventions. The intervention would start by training the trainers who in turn would conduct training to stakeholders or partners belonging to the people's organizations (POs). The total cost of baseline activities is estimated at \$229,400 (WB - \$176,100 and LGU - \$57,500) while the cost of GEF intervention is nil.

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(ii) Project Management Support

40. Similarly, financial support for personnel at national and regional levels and operating expenses at these two levels, plus purchase of training vans and staff motorcycles (on credit to own scheme) is necessary to support the efficient implementation and administration of the investment program. The total cost of baseline activities is estimated at \$5,808,730 (WB - \$3,461,940; GOP - \$1,736,090 and LGU - \$610,700) while the cost of GEF intervention is nil.

(iii) Consulting Services

41. The services of a team of experienced domestic consultants are needed to provide technical assistance to the National PMO, Regional PMOs, and the ten PMUs. The TA team will prepare the training and capacity building program, review and approve annual work plans and budgets for LGUs, assess R&D project proposals, design and prepare the project monitoring and evaluation system, and prepare the 6-month progress and financial reports. The baseline cost is nil while the GEF cost is projected at \$654,110.

E. Incremental Costs and Benefits

42. The incremental cost matrix provides a summary of the domestic and global benefits associated with each of the five project outputs. GEF funds, amounting to \$5,491,580, would be appropriated for interventions that would improve and restore the Ligawasan Marsh biodiversity and its habitats, including activities with intangible and long-term benefits accruing globally. The cost of the baseline activities, has been estimated at \$9.92 million (GOP - \$2.28 million; LGU - \$0.8 million, NGO - \$1.11 million and a World Bank loan - \$5.8 million).

43. Activities that would generate highly tangible domestic benefits, such as livelihood activities and rural infrastructure, would be co-financed under a WB loan of \$5.8 million, which are needed to complement the conservation activities. Lack of alternative livelihood was found to be the main cause of overexploitation of Ligawasan Marsh's natural resources. Incremental cost is estimated at \$4,429,190. Total project cost is estimated at \$15,412,350 including the contributions of LGUs using a part of their IRAs, NGOs bringing in grants to support the conservation and other interventions for Ligawasan Marsh, and GOP contributions.

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INCREMENTAL COST MATRIX

Component	Cost Category	Cost (in \$'000) inclg. Contingency	Domestic Benefit	Global Benefit
Output 1: Ecosystems Management and Protection (consists of five subcomponents)	Baseline	<i>GOP-\$465.50 LGU -\$20 NGO -\$30</i>	Lack of a national policy for wetlands leads to rapid deterioration of Ligawasan ecosystems--caused by overuse and over exploitation of its resources.	Rapid destruction of the Ligawasan wetlands affects the globally important migration routes of migratory birds and local wildlife
	GEF Alternative	\$3,677.56	Approval of declaring Ligawasan as a PA under NIPAS Act as a natural biotic area by presidential proclamation in 2008, followed by a congressional approval in 2015 would arrest the deterioration of the ecosystem. Stakeholders directly participate in day-to-day protection through an agreed management zoning system	Creation of a management zoning system provides a clear way of conserving and protecting the ecosystem.
	Incremental	\$3,172.06		
1.1 Habitat Restoration	Baseline	LGU-\$20 NGO-\$30 GOP-\$465.50	All parts of Ligawasan can be considered as disturbed habitats due to lack of conservation activities	Progressive and unsustainable reduction of wildlife and migratory birds causes irreversible loss of global biodiversity
	GEF Alternative	\$2,985.16	Habitat restoration interventions proposed by stakeholders expected to expand habitat areas, mitigate serious erosion of embankment, establish a buffer zone , and provide new sources of fuelwood	Community-based habitat restoration activities inculcate new values to stakeholders ensuring sustainability of conservation programs
	Incremental	\$2,479.66		
1.2 Management Zoning	Baseline	0	Lack of a management zoning system in the marsh creates confusion and disorder among the stakeholders which leads to further deterioration of the	Confused implementation affects the viability of the conservation program
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Component	Cost Category	Cost (in \$'000) inclg. Contingency	Domestic Benefit	Global Benefit
			natural resources	
	GEF Alternative	\$173.70	Having an agreed management zones in each community ensure sustainability of conservation program	Significant loss of biodiversity reversed by community-based management of the marsh
	Incremental	\$173.70		
1.3 Presidential proclamation of LM as a Protected Area	Baseline	0	Lack of a formal declaration of the marsh as a PA deters successful implementation of conservation program	Poor co-management of the marsh's natural resources results to continued destruction of biodiversity
	GEF Alternative	\$ 33.40	Presidential proclamation in 2008 expected to bring support in Congress on the need to conserve the marsh as a PA	Prospects for improved reversal of progressive loss of diversity assured
	Incremental	\$ 33.40		
1.4 Law Enforcement	Baseline	0	Weak enforcement of government regulations and lack of field personnel such as Bantay Pawas contribute to overexploitation of the natural resources	Failure to operationalize law enforcement leads to irreversible destruction of habitat and loss of wildlife and birds
	GEF Alternative	\$183.70	Better enforcement through Bantay Pawas ensures sustainability of conservation efforts	Prospects for achieving conservation objectives improved
	Incremental	\$183.70		
1.5 On-Site and Off-Site Research	Baseline	0	Lack of systematic financial support to research to address problems located off-site negates any progress made involving efforts to address on-site problems	Environmental problems located outside the marsh continue to destroy the ecology and natural resources of Ligawasan
	GEF Alternative	\$301.60	A viable research program contributes to reduction of biodiversity loss	A more holistic approach provides practical solutions to all the sources of environmental problems in Ligawasan ensuring success of conservation programs
	Incremental	\$301.60		

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Component	Cost Category	Cost (in \$'000) inclg. Contingency	Domestic Benefit	Global Benefit
Output 2: Institutional Development and Capacity-Building	Baseline	NGO- \$51.80	Lack of strong institution and communities lead to unabated loss of biodiversity	Improved capacity greatly enhance the prospects for success of conservation activities
	GEF Alternative	\$779.30	Strong institutions ensure effective protection of the environment	Significant reduction on loss of flora and fauna
	Incremental	\$ 727.50		
2.1 Empower the Community and Training	Baseline	0	Current conservation activities failed to take into account the needs of the communities	Lack of empowerment of communities in conservation efforts contributes to failure to reverse the widening environmental degradation
	GEF Alternative	\$244.30	Communities empowered and fully mobilized to undertake conservation measures in their respective areas of responsibility	Prospects for attaining conservation objectives improved
	Incremental	\$244.30		
2.2 Environmental Education and Awareness Program	Baseline	NGO-\$51.80	Lack of appreciation of the value of conservation to sustainable development	LGU leadership and stakeholders remain grossly ill informed about values of conservation
	GEF Alternative	\$169.40	Enhanced awareness of values of conservation led to broad-based support at all levels for effective conservation	Improved understanding by communities and LGU officials increased chances of success of conservation efforts
	Incremental	\$117.60		
2.3 Special Literacy Program	Baseline		Lack of educational opportunities among the youth continues to widened	Youth deprived of a productive life
	GEF Alternative	\$ 365.60	Disenfranchised youths trained and became productive members of the community	Youth able to contribute to sustainable conservation of the natural resources and provide continuity
	Incremental	365.60		
2.4 Seek Sustainable	Baseline	0	Limited appropriations from	Uncertainty in sourcing funds
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Component	Cost Category	Cost (in \$'000) inclg. Contingency	Domestic Benefit	Global Benefit
Financing			GOP and LGUs and weak fund raising capacities of national and local DENR affects effectiveness of conservation efforts	deters sustainability of conservation programs
	GEF Alternative	0	Strengthening of fund raising capacities and widening of funding base	Regular GOP and LGU budget appropriations assure sustainability of conservation operations
	Incremental	0		
Output 3: Livelihood Activities	Baseline	WB -\$1,367.44 LGU-\$115.00 NGO-\$1,034.70	Destruction of natural resources and habitats is greatly affected by lack of livelihood opportunities among poor and ever increasing number of family members and new settlers in Ligawasan	Lack of conservation programs lead to full destruction of remaining wetland forests and habitats
	GEF Alternative	GEF – 0	Provision of alternative conservation-enabling livelihood activities relieves pressure to overexploit and over utilize the natural resources	Conservation of wetland forest and habitats assured by effective livelihood interventions and sustainable utilization of resources
	Incremental	0		
Output 4 Small Rural Infrastructure (Including Social Infrastructure)	Baseline	WB- \$749.20 LGU-\$35.80	Poor rural and social infrastructure impedes economic growth and quality of life	Continued irreversible loss of biodiversity
	GEF Alternative	GEF-\$ 289.20	Prospects for successful conservation work increased by provision of these infrastructure	Conservation efforts sustained by improved income of stakeholders
	Incremental	0		
a. Rural Infrastructure	Baseline	WB- \$543.80 LGU-\$15.80	Poor infrastructure hinders livelihood programs and conservation efforts	Destruction of habitat continues at rapid rate
	GEF Alternative	0	Improved infrastructure promotes livelihood programs and relieves pressure by stakeholders to overexploit the natural resources	Marked reduction in biodiversity loss

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Component	Cost Category	Cost (in \$'000) inclg. Contingency	Domestic Benefit	Global Benefit
	Incremental	0		
b. Social Infrastructure	Baseline	WB- \$205.4 LGU- \$20.	Quality of life among stakeholders declining	Lack of amenities further depressed the quality of life of stakeholders
	GEF Alternative	GEF-\$289.20	Social infrastructure provided to stakeholders improved the quality of life	Proper disposal of human wastes and availability of potable drinking water improved quality of life and youth able to contribute to sustainable development
	Incremental	\$304.9		
Output 5: Monitoring and Evaluation System	Baseline	0	Lack of comprehensive monitoring and evaluation (M&E) impeding progress in conservation and other activities	Lack of progress in conservation mirrored by a lack of effective M&E system
	GEF Alternative	\$91.41	An effective M&E system expected to hasten improvement in habitat conditions	Performance indicators used in the M&E system provide effective tools for measuring achievement of project objective
	Incremental	\$91.41		
Other GEF and non-GEF Assistance: (i) Training Support for all components	Baseline	WB- \$176.10 LGU- \$57.50	Limited impact of current training programs on LGU capacities to implement conservation programs	No impact on reducing loss of biodiversity
	GEF Alternative	0	More effective project implementation due to specific training support programs provided	Significant reduction in loss of biodiversity
	Incremental	0		
(ii) Project Management Support	Baseline	WB- \$3,461.94 GOP- \$1,736.09 LGU-\$619.70	No need for project management support since the project not yet implemented	Lack of operational funds hinders support for conservation projects
	GEF	GEF-0	Operational expenses and transportation support provided made implementation more effective	Timely provision of GOP, LGU and other funds sustain the efforts towards conservation of biodiversity
	Incremental	0		
(iii) Consulting Services	Baseline	0	No need for consulting services	No reduction in progressive
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Component	Cost Category	Cost (in \$'000) inclg. Contingency	Domestic Benefit	Global Benefit
			since the project not yet implemented	destruction of biodiversity
	GEF	\$654.11	Better project implementation assured by provision of services of selected specialists	The success of conservation programs facilitated by consultants lead to reversal of progressive loss of global diversity
	Incremental	\$654.11		
Total	Baseline -GOP -LGU -NGO -WB Loan	\$ 9,920.77 -\$2,201.59 -\$ 848.00 -\$1,116.50 -\$5,754.68		
	GEF Alternative	\$5,491.58		
	Incremental	\$ 4, 429.19		
Grand Total		\$15,412.35		

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ANNEX B Logical Framework

OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
<p>Goal: The wetland biodiversity of the Ligawasan Marsh (LM) is conserved and managed in a sustainable manner.</p>	<p>1. Declaration of LM as a Natural Biotic Area achieved by year 2010</p> <p>2. Habitat monitoring in year 2010 showed expansion in wetland forest and tree cover and more vegetation compared with 2004 baseline.</p> <p>3. Buffer zones established and riverbanks of several rivers stabilized by 2010.</p> <p>4. Three wildlife and bird sanctuaries established by 2010.</p>	<ul style="list-style-type: none"> • DENR notification • Aerial photographs 	<ul style="list-style-type: none"> * Interest of national, provincial and local governments to proclaim LM as a PA remains at a high level. * Interest of beneficiaries in habitat restoration and conservation remains high * Competence of government officials at all levels to manage biodiversity programs continues to improve * Alternative livelihood activities successful resulting to sustained income, thus reducing pressure on natural habitat and wildlife resources
<p>Purpose: The groundwork to proclaim the LM as a Natural Biotic Area is successfully laid; all concerned stakeholders are empowered to conserve and manage the wetland resources; and environment-friendly livelihood activities and sustainable use of the resources are achieved</p>	<p>1. Presidential proclamation of LM as a protected area signed by Yr. 3, Q2</p> <p>2. Substantial number of key stakeholders trained in biodiversity conservation</p> <p>3. Income of beneficiaries substantially increased due to successful livelihood activities</p>	<ul style="list-style-type: none"> • DENR notification • Annual monitoring records 	<ul style="list-style-type: none"> * All requirements for declaration of marsh as a natural biotic area will be met * Interest of stakeholders to participate in biodiversity conservation training remains high * All constraints to carry out livelihood activities can be overcome
COMPONENTS			
<p>Output 1: Ecosystem Management and Protection</p> <p>-A management framework for conservation and protection of Ligawasan is established and operational</p>	<ul style="list-style-type: none"> • The LM Steering Committee established and operational • Approval of natural biotic area obtained by Yr.5, Q3 	<ul style="list-style-type: none"> • DENR notification • DENR notification 	<ul style="list-style-type: none"> • Provincial and municipal officials remains supportive of the conservation and protection of LM • Widespread legislative support can be generated and sustained
<p>1.1 Habitat Restoration</p> <p>-Natural habitats of wildlife and birds enhanced and restored</p>	<ul style="list-style-type: none"> • Program of habitat restoration operational by Yr.1, Q4 	<ul style="list-style-type: none"> • APR 	<ul style="list-style-type: none"> • Concerned stakeholders willing to conserve and

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OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
	<ul style="list-style-type: none"> Appropriate training program for habitat restoration in place by Yr.1, Q3 		expand wildlife habitats
<p>1.2 Management Zoning System</p> <p>-A management zoning system developed and operational</p>	<ul style="list-style-type: none"> Land use map and zoning plan completed by Yr.1, Q4 	<ul style="list-style-type: none"> DENR notification 	<ul style="list-style-type: none"> Digitizing of aerial photos completed
<p>1.3 Two-Steps Towards Declaring LM as a PA</p> <p>-Groundwork for declaring LM as a PA laid down</p>	<ul style="list-style-type: none"> 10-year Management Plan and a 5-year Investment Plan approved for implementation by Yr.1, Q3 	<ul style="list-style-type: none"> DENR notification 	<ul style="list-style-type: none"> Management Plan received wide support from provincial and local governments
<p>1.4 Law Enforcement</p> <p>-Government regulations to protect the LM natural resources are enforced</p>	<ul style="list-style-type: none"> Bantay Pawas deputized by Yr.1, Q4 Training program for law enforcers started by Yr. 1, Q4 New local ordinances for Protection of Ligawasan in place starting in Yr.2, Q2 	<ul style="list-style-type: none"> Regular reports of arrest of violators APR 	<ul style="list-style-type: none"> Adequate funds for training and enforcement of regulations continue to be available on timely basis LGUs pro-active in promulgating ordinances to protect Ligawasan
<p>1.5 Off-Site and On-Site Research</p> <p>-Financial support for research grants, addressing environmental problems found at various on-site and off-site locations provided</p>	<ul style="list-style-type: none"> Criteria for selection and awarding of research grants in place by Yr. 1, Q2 Adequate funds available by Yr. 1, Q2 	<ul style="list-style-type: none"> APR 	<ul style="list-style-type: none"> Interest among qualified researchers remain high
<p>Output 2: Institutional Development and Capacity Building</p> <p>2.1 Establish an LM Steering Committee</p> <p>- LM Steering Committee established and operationalized</p>	<ul style="list-style-type: none"> The LM Steering Committee operational by Yr. 1, Q3 	<ul style="list-style-type: none"> DENR notification 	<ul style="list-style-type: none"> Provincial and municipal officials remains supportive of the conservation and protection of LM
<p>2.2 Empower the Community and Training of LGUs, GAs and NGOs</p> <p>-Stakeholders are empowered for sustainable conservation and utilization of LM natural resources</p>	<ul style="list-style-type: none"> People's organization (POs) trained starting Yr. 1, Q2 Program for training for good governance in place by Yr. 1, Q2 	<ul style="list-style-type: none"> APR 	<ul style="list-style-type: none"> Willingness of communities to participate actively in conservation activities remains high

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OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
	<ul style="list-style-type: none"> Citizen participation in governance enhanced 		
<p>2.3 Environmental Education and Awareness Program</p> <p>-A broad based education and awareness campaign program developed and operationalized</p>	<ul style="list-style-type: none"> In-depth survey of level of awareness of stakeholders completed by Yr. 1, Q 4 Education and awareness program in place by Yr. 1. Q 3 	<ul style="list-style-type: none"> APR 	<ul style="list-style-type: none"> Stakeholders accept the findings of the in-depth survey Willingness of stakeholders to support the education and awareness program
<p>2.4 Implement a Special Literacy Program</p> <p>-The special literacy program operationalized</p>	<ul style="list-style-type: none"> Special Literacy Program in place by Yr.1,Q3 	<ul style="list-style-type: none"> APR 	<ul style="list-style-type: none"> Stakeholder support to conduct the training and HRD assessment remains high Adequate number of trainable out-of-school youth available
<p>2.5 Seek Sustainable Financing</p> <p>-Mechanism for funding of the recurrent costs of conservation activities is established</p>	<ul style="list-style-type: none"> Additional sources of grant funding identified and becomes available in Yr.3,Q 1 	<ul style="list-style-type: none"> APR 	<ul style="list-style-type: none"> POs would qualify for credit
<p>Output 3: Livelihood Activities</p> <p>-Alternative, conservation-enabling livelihoods are in place, and the sustainability of natural resource use is assured</p>	<ul style="list-style-type: none"> Appropriate environment-friendly livelihood activities started by Yr. 1, Q3 Program for participation of women and youth groups in place by Yr. 1, Q3 Training program for entrepreneurship in place by Yr. 1, Q3 	<ul style="list-style-type: none"> APR 	<ul style="list-style-type: none"> Stakeholders willing to pursue alternative, conservation-enabling livelihoods Interest of women and youth groups continue to remain high Need for entrepreneurship training program recognized by stakeholders
<p>Output 4: Small Rural and Social Infrastructure enhanced the sustainability of livelihood activities</p>	<ul style="list-style-type: none"> Program for construction of rural infrastructure developed and operational by Yr. 1, Q3 Effective enforcement of environment-friendly protection measures after construction of infrastructure Newly constructed mini-growth centers, serving as multi-purpose coop stores, operational by Yr. 1, Q4 	<ul style="list-style-type: none"> APR 	<ul style="list-style-type: none"> Funds for infrastructure is available on time Concept of mini-growth center accepted and supported by stakeholders
<p>Output 5: A monitoring and evaluation system for wetland biodiversity and socio-economic</p>	<ul style="list-style-type: none"> Impact indicators for socio economic and improvement in protection of habitat in place by 	<ul style="list-style-type: none"> APR 	<ul style="list-style-type: none"> Stakeholders willing to accept the M&E indicators

WETLAND BIODIVERSITY COMPONENT FOR LIGAWASAN MARSH PROJECT

	Winrock International and Winrock Philippines	<ul style="list-style-type: none"> SUSTEC Minsupala Foundation Maguindanaoan Foundation
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OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
upliftment established and operationalized	Yr. 1, Q3 <ul style="list-style-type: none"> • Lessons learned from similar biodiversity program incorporated in project design by Yr. 1, Q2 • A project M&E program developed and operationalized by Yr. 1, Q3 		
ACTIVITIES			
Output 1 Ecosystem Management and Protection 1.1 Habitat Restoration <ul style="list-style-type: none"> • Program of interventions for habitat restoration is finalized • Specific interventions to conserve natural resources developed 	<ul style="list-style-type: none"> • Manifesto expressing interest and willingness of stakeholders to participate signed starting in Yr. 1, Q4 • Sites of interventions are identified and mapped out by Yr. 1, Q4 • Income generating activities implemented starting in Yr. 1, Q4 • Work plans and budget for each interventions prepared by PMUs annually • Beneficiaries organized for habitat restoration starting in Yr. 1, Q4 • Training programs developed and implemented starting in Yr. 1, Q4 • System of monitoring volume of fish catch and other products established by Yr. 1, Q3 • Barangay resolutions and ordinances promulgated and implemented starting in Yr. 2, Q2 • Specific interventions indicators include: <ul style="list-style-type: none"> ❖ ANR – 660 ha of wetland forest and 2,000 ha of herbaceous swamp rehabilitated by Yr. 5, Q3 ❖ Wetland forest restoration – 2,000 ha of herbaceous swamp restored by Yr.4,Q3 ❖ Buffer zone reforestation – 2,000 ha of herbaceous swamp reforested as buffer zone by Yr. 5, Q3 ❖ Riverbank stabilization – 23 km degraded riverbanks of two major rivers in Datu Piang stabilized by Yr. 5, Q3 	<ul style="list-style-type: none"> • Monitoring/ Progress Report • Barangay Development Plan • Monitoring/Progress Report • Inventory chart mapping • Direct Field Inspection 	

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OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
	<ul style="list-style-type: none"> ❖ Upland reforestation – 180 ha second growth forest in Datu Piang rehabilitated by Yr. 5, Q3 ❖ Wildlife/bird sanctuary – 10 ha wildlife/ bird sanctuary established in three municipalities by Yr. 5, Q3 ❖ Smallholder tree planting – 215 ha of 860 households (0.25 ha per household) in 10 municipalities planted to mixed fruit trees and indigenous tree species by Yr. 5, Q3 		
<p>1.2 Management Zoning</p> <ul style="list-style-type: none"> • Groundwork for establishing Ligawasan as a Natural Biotic Area completed 	<ul style="list-style-type: none"> • The general management plan validated by LM Steering Committee by Yr.1, Q4 	<ul style="list-style-type: none"> • Monitoring Report • APR 	<ul style="list-style-type: none"> * The Office of the President willing to support and sign the proclamation * Legislators willing to support the proclamation of Ligawasan as a PA
<p>1.3 Two-Steps Towards Declaring LM as a PA</p> <ul style="list-style-type: none"> • Preparatory works for congressional approval to declare Ligawasan as a protected area completed • A management zoning system developed and operational 	<ul style="list-style-type: none"> • Groups to lobby congress fully organized by Yr.5, Q4 • Series of Dialogues with Legislators and public hearings achieved by Yr.5, Q4 • Discussions on proposed legislation to declare Ligawasan a Protected Area calendared at a committee meeting by Yr.5,Q4 • Stakeholders agreed to a common management zoning system by Yr. 2, Q3 • Critical zones on hotspots identified and agreed upon by Yr. 2, Q3 	<ul style="list-style-type: none"> • Copy of signed agreement • Monitoring Report • APR 	<ul style="list-style-type: none"> * Stakeholders willing to accept the management zones
<p>1.4 Protection & Law Enforcement</p> <ul style="list-style-type: none"> • Competent and well-trained law enforcers in place • Social ordinances delineating the responsibilities of various stakeholders are in place • Records of compliance 	<ul style="list-style-type: none"> • Appropriate law enforcement training program developed and implemented by Yr.1, Q4 • Bantay Pawas members are recognized & accepted by communities by Yr. 3, Q4 • Penalties and sanctions are 	<ul style="list-style-type: none"> • Monitoring Report • APR • Field Inspection 	<ul style="list-style-type: none"> * Stakeholders willing to serve as Bantay Pawas * LGUs continue to show high level of interest in promulgating social ordinances *Level of commitment

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	Winrock International and Winrock Philippines		<ul style="list-style-type: none"> • SUSTEC • Minsupala Foundation • Maguindanaoan Foundation
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OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
<p>with environmental laws and apprehensions regularly kept by PMUs</p> <ul style="list-style-type: none"> A reward system for arrest of violators of environmental laws and regulations in place 	<p>being imposed on violators by Yr. 2, Q3</p> <ul style="list-style-type: none"> Bantay Pawas conducting regular visits to PA areas by Yr. 2, Q2 Carefully prepared signage are installed in strategic places by Yr. 2, Q2 Reduced violations of environmental and other laws on natural resource use by Yr. 3, Q3 and Yr. 5, Q5 A record of rewards given is established at PMUs by Yr. 2, Q4 	<ul style="list-style-type: none"> Monitoring Report APR Field Inspection Monitoring Report APR Field Inspection Monitoring Report 	<p>of Bantay Pawas continues at a high level</p> <ul style="list-style-type: none"> LGUs willing to establish a reward system for Bantay Pawas from their own resources
<p>1.5 On-site and Off-site Research</p> <ul style="list-style-type: none"> A research program is developed to address environmental problems of Ligawasan Specific researches intended to solve or mitigate site-specific problems are being carried out 	<ul style="list-style-type: none"> Priority research topics established by PMO Research Committee (PRC) by Yr. 1, Q3 Research proposals submitted by the PRC by Yr. 1, Q3 annually Solutions to environmental problems identified from research results starting in Yr. 3, Q4 Research findings disseminated starting in Yr. 4, Q1 		
<p>Output 2 Institutional Development and Capacity Building</p> <p>2.2 Community Organizing Mobilization</p> <ul style="list-style-type: none"> POs formed and are actively involved in conservation work Training program on governance for LGUs and staff of regional agencies developed and in place Workshops conducted for both LGUs and POs in 	<ul style="list-style-type: none"> POs accredited by COA starting Yr. 2, Q2 POs Register is maintained by PMU by Yr. 2, Q3 Availability of trained staff who have acquired skills in various conservation work starting Yr. 2, Q1 Regular consultation being held among LGUs and POs at 	<ul style="list-style-type: none"> Monitoring Report APR Monitoring Report APR 	<ul style="list-style-type: none"> Beneficiaries willing to form POs to participate in protecting the marsh LGUs and POs successful in holding regular consultations
WETLAND BIODIVERSITY COMPONENT FOR LIGAWASAN MARSH PROJECT			
	<p>Winrock International and Winrock Philippines</p>		<ul style="list-style-type: none"> SUSTEC Minsupala Foundation Maguindanaoan Foundation

OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
conservation, habitat restoration, law enforcement, livelihood ventures, etc..	least twice a year by Yr. 1, Q4		
2.3 Environmental Education & Awareness Program <ul style="list-style-type: none"> Environmental Education & Awareness Program for Ligawasan formulated Information materials for various media produced on regular basis A viable conservation awareness campaign conducted in ten municipalities 	<ul style="list-style-type: none"> Education and awareness program being implemented in municipalities by Yr. 1, Q4 until Yr. 5, Q3 New information materials produced by consultants by Yr. 1, Q3 until Yr. 5, Q3 Multi-media materials on conservation are available by Yr. 1, Q3 	<ul style="list-style-type: none"> Monitoring Report Field Inspection 	
2.4 Support Program for Environmental Protection <ul style="list-style-type: none"> A special literacy program for Ligawasan is formulated 	<ul style="list-style-type: none"> Marked increase in literacy, numeracy, and improved communication involving 1,200 out-of-school youths (OSYs) 	<ul style="list-style-type: none"> Monitoring Report 	
2.5 (Sustainable Financing) <ul style="list-style-type: none"> Fund sources from various institutions identified and funds received A fee system to support maintenance and protection work for Ligawasan established Other significant sources of revenue identified and funds received 	<ul style="list-style-type: none"> Trust fund for Ligawasan established by Yr. 2, Q4 The fee collection system for the PA is established starting in Yr. 2, Q4 LMSC-approved activities start to generate additional revenues for the PA by Yr. 2, Q4 		<ul style="list-style-type: none"> * Officials of LGUs, Province, and ARMM Legislative Assembly willing to contribute to a trust fund * POs and private sector willing to pay conservation fee * Ligawasan Marsh Steering Committee interested in collecting user fees from commercial establishments located in or near the marsh.
Output 3 Livelihood Activities <ul style="list-style-type: none"> Work plans and budgets for each specific project completed and approved annually 	<ul style="list-style-type: none"> Beneficiaries consulted and manifesto signed indicating willingness to participate in livelihood projects starting in Yr. 1, Q4 Beneficiaries organized and trained starting in Yr. 1, Q4 Training programs developed and implemented starting in Yr. 1, Q4 	<ul style="list-style-type: none"> Monitoring/ Progress Report Barangay Development Plan Monitoring/ Progress Report 	<ul style="list-style-type: none"> * POs willingness to actively participate continues at a high level

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OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
<ul style="list-style-type: none"> Environment-friendly livelihood programs implemented 	<ul style="list-style-type: none"> Markets identified and marketing of products organized on timely basis starting in Yr. 1, Q4 Sales record properly kept and organized by Yr. 2, Q2 Specific livelihood indicators include: <ul style="list-style-type: none"> Duck Egg Raising – 32 POs or about 640 households (HH) from 10 barangays in 10 municipalities engaged by Yr. 5, Q3 Goat Raising – 1,020 HH from 35 barangays in 10 municipalities engaged by Yr. 5, Q3 Backyard cattle fattening – 460 HH from 23 barangays in 7 municipalities engaged by Yr. 5, Q3 Mat weaving – 270 HH from 19 barangays in 7 municipalities engaged by Yr. 5, Q3 Kalakat/Amakan weaving – 40 HH from 2 barangays in Kabacan engaged by Yr. 5, Q3 Pandan hat making – 60 HH in 2 barangays in Kabacan engaged by Yr.5, Q3 Food cover making – 60 HH in 2 barangays of Kabacan engaged by Yr.5, Q3 	<ul style="list-style-type: none"> Sales Record Direct Field Inspection Livelihood Management Plan 	
<p>Output 4 (Small Rural and Social Infrastructure)</p> <ul style="list-style-type: none"> Work plans for infrastructure projects in each municipality prepared Small rural infrastructure interventions implemented 	<ul style="list-style-type: none"> Beneficiaries consulted and manifesto signed starting in Yr. 1, Q4 Work plans and budget prepared annually starting in Yr. 1, Q4 PMUs approval process for annual workplans operational starting in Yr. 2, Q1 Technical assistance extended by PMU Engineers starting in Yr. 1, Q4 Training program for infrastructure construction and maintenance developed and implemented starting in Yr. 1, Q4 Supervision on the construction and maintenance of completed facilities provided regularly starting in Yr. 2, Q2 	<ul style="list-style-type: none"> APR Barangay and Municipal Development Plans APR Copies of designs, specifications and procurement plans Direct Field Inspection 	<ul style="list-style-type: none"> POs willingness to actively participate continues at a high level Capability of PMU Engineers to provide technical advice and supervision continues to improve

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OBJECTIVES	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
<ul style="list-style-type: none"> Construction of social infrastructure sub-projects for each municipality completed 	<ul style="list-style-type: none"> Specific small infrastructure indicators include: <ul style="list-style-type: none"> ❖ Drying floor – 26 drying floors in 26 barangays in 8 municipalities are constructed by Yr. 5, Q3 ❖ Farm-to-market Road (FMR) – 2 km each in 10 barangays in 10 municipalities rehabilitated by Yr. 5, Q3 ❖ Mini-Growth Centers (MGC) – 16 MGCs in 16 barangays in 10 municipalities constructed by Yr. 5, Q3 Progress of infrastructure work recorded in each municipality annually Specific social infrastructure indicators include: <ul style="list-style-type: none"> ❖ Potable water supply system (PWSS) – 30 units of PWSS in 30 barangays in 10 municipalities (3 per municipality) constructed by Yr. 5, Q3 ❖ Toilet bowls – 3,000 units distributed to 50 barangays in 10 municipalities by Yr. 4, Q4 ❖ Communal toilets – 300 units of communal toilets constructed in 30 barangays in 10 municipalities in Yr. 5, Q3 ❖ Jetmatic water pumps – 2,000 units with pipings/fittings distributed to 30 barangays in 10 municipalities in Yr. 4, Q4 		
<p>Output 5 M & E System</p> <ul style="list-style-type: none"> Set of performance indicators to measure improvements in Ligawasan is established A monitoring and evaluation system is developed for Ligawasan 	<ul style="list-style-type: none"> Body of data collected using analytical and sampling tools developed to measure changes in socio economic conditions of the marsh starting in Yr. 1, Q4 Computer-assisted training of M & E specialists in ten municipalities started by Yr. 1, Q3 	<ul style="list-style-type: none"> Monitoring/ Progress Report 	

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ANNEX C

SUMMARY OF THE FAUNA AND FISH AND AQUATIC SURVEYS UNDER THE WETLAND BIODIVERSITY STUDY

A. Fauna of the Ligawasan Marsh

1. Birds

1. The fauna survey under the Wetland Biodiversity reported 206 terrestrial vertebrate species, under the classes Aves, Mammalia, Reptilia and Amphibia, which were recorded from 16 locations or study sites. There was an increase of 87 species from the previous list of 119 species of terrestrial vertebrates under PASA Study.

2. The birds surveyed have a total of 170 species from 47 families and accounted for an increase of 75 species from the previous list of 95 species. The number of endemic birds recorded was 39 species, a great majority of which are forest dependent species recorded from patches of swamp forests. They include: *Spizaetus philippensis* (one of three endemic raptors in the Philippines; *G. Allicolumba criniger*, the endangered Mindanao Bleeding Heart; the endemic *B olbopsittacus lunulatus* Guiabero and *Loriculus philippensis, Colasisi*; the vulnerable endemic forest kingfishers *Alcedo argentata, Ceyx melanurus* and *Cexy erithacus*; the Sunbirds, Spider Hunters, Flowerpecker, Leaf-warblers, Babblers, Flycatchers, Whistlers and Tailorbirds like *Aethopyga primigenius, Aethophyga pulcherrima, Arachnothera clarae, Dicaeum nigrilore, Dicaeum anthonyi, Dicaeum aeruginosum, Phylloscopuse olivaceus, Macronous striaticeps, Orthotomus nigirceps, Ficedula basilanica, Pachycephala philippensis*, etc). These forests were not accessible during the PASA surveys.

3. The marsh-dependent *Tachybaptus ruficollis cotabato* an endemic race of Grebe and *Anas luzonica*, the only endemic Philippine Duck are the only non-forest dependent endemic bird species in Ligawasan. The Comb-crested Jacana *Irediparra gallinacea* a marsh bird, which has been recorded only in Ligawasan Marsh in the Philippines, was also recorded during the survey. Table 1 lists some endemic species with their habitat preferences. The significant number of endemic species which are forest-dependent highlights the importance of the remaining swamp forest habitats for the biodiversity of Ligawasan Marsh.

4. A total of 37 migratory species was recorded (e.g. *Podiceps ruficollis* Black-necked Grebe; *Ardea sumatrana* Great-billed Heron; *Egretta intermedia* Intermediate Egret; *Egretta garzetta* Little Egret; *Egretta alba* Great Egret; *Anas crecca* Great-winged Teal; *Pandion haliaetus* Osprey; *Recurvirostra avosetta*, the rare Avocet; the common Plovers, Stilts, Redshanks, Godwits, Sandpipers and Terns like *Charadrius dubius, Charadrius peron; Rostratula benghalensis, Himantopus himantopus, Tringa erythropus, Limosa limosa Sterna berg; Sterna hirundo*, etc.). Ten of these species have resident populations in the Philippines (e.g. *Burides striatus* Little Heron, *Bubulcus ibis* Cattle Egret, *Nycticorax nycticorax* Black-crowned Night Heron, *Nycticorax caledonicus* Rufous Night Heron, *Halcyon coromanda* Ruddy Kingfisher, *Circus melanoleucos* Pied Harrier, *Anthus novaeseelandiae* Richard's Pipit, etc.

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Table 1 List of Some Endemic, Near Threatened and Vulnerable Species in 16 Survey Sites.

Species Name	Common Name	Local Name	Conservation Status	Endemism	Habitat
<i>Aethopyga primigenius</i>	Grey-hooded Sunbird	K'nti (K-nti)	Near threatened	Near Endemic	Swamp Forest
<i>Aethopyga pulcherrima</i>	Metallic-winged Sunbird	Kenti	Non Threatened Species (NTS)	Endemic	Swamp Forest
<i>Aethopyga shelleyi</i>	Lovely Sunbird	K'nti (K-nti)	NTS	Endemic	Swamp Forest
<i>Alcedo argentata</i>	Silvery Kingfisher	Kasing-sing	NTS	Endemic	Swamp Forest
<i>Amaurornis olivaceus</i>	Plain Bush-hen	Tugling	NTS	Near Endemic	Swamp Forest
<i>Anas luzonica</i>	Philippine Duck	Wawaling	Vulnerable	Endemic	Marsh
<i>Arachnothera clarae</i>	Naked-faced Spider Hunter	Sulit	NTS	Endemic	Swamp Forest
<i>Gallicolumba criniger</i>	Mindanao Bleeding Heart	Punalada	Endangered	Endemic	Forest
<i>Phapitreron leucotis</i>	White-eared Brown Dove	Limoken or Tegol	NTS	Endemic	Forest
<i>Ptilinopus occipitalis</i>	Yellow-breasted Fruit Dove	Limoken or Tegol	NTS	Endemic	Forest
<i>Bolpopsittacus lunulatus</i>	Guaiabero	Kalopindo	NTS	Endemic	Swamp Forest
<i>Loriculus philippensis</i>	Phil Hanging Parakeet	Colasisi	NTS	Endemic	Swamp Forest
<i>Centropus melanops</i>	Black-faced Coucal	Sagusok	NTS	Endemic	Shrub Forest
<i>Centropus viridis</i>	Philippine Coucal	Sagusok	NTS	Endemic	Shrub Forest
<i>Collocalia troglodytes</i>	Pygmy swiftlet	Kalugay	NTS	Endemic	Open area
<i>Ficedula basilanica</i>	Little Slaty Flycatcher	N/A	Vulnerable	Endemic	Forest
<i>Dicaeum aerunqinosum</i>	Striped Flowerpecker	Btig (B-tig)	NTS	Endemic	Swamp Forest
<i>Dicaeum anthonyi</i>	Flame-crowned Flowerpecker	N/A	Near threatened	Endemic	Swamp Forest
<i>Dicaeum australe</i>	Red-keeled Flowerpecker	N/A	NTS	Endemic	Swamp Forest
<i>Dicaeum bicolor</i>	Bi-colored Flowerpecker	N/A	NTS	Endemic	Swamp Forest
<i>Dicaeum hypoleucum</i>	Buzzing Flowerpecker	Upa-na-bai	NTS	Endemic	Forest
<i>Dicaeum niqilore</i>	Olive-capped Flowemecker	N/A	NTS	Endemic	Forest
<i>Dicaeum pyqmaeum</i>	Pygmy Flowerpecker	Kmes-sa-bai	NTS	Endemic.	Swamp Forest

Source: Wetland Biodiversity Component for Ligawasan Marsh Study, 2004.

4. The migratory species recorded in Ligawasan Marsh and vicinities can be classified into three groups: (1) species that are forest dependent (e.g. *Gallicolumba criniger*, *Alcedo argentata*, *Ceyx melanurus*, *Dendrocopos maculates*, *Pernis ptilorhynchus*, *Halcyon coromanda*, *Muscicapa griseisticta* etc.); (2) species that favor the open field or swamp (*Podiceps ruficollis*, *Egretta garzetta*, *Butorides*, , *Anas crecca*) and (3) the species that utilize the forest but feed in the adjacent open field or swamp (e.g. *Pandion haliaeetus*, *Circus melanoleucos*, *Nycticorax nycticorax*).

5. Most of the resident bird species are common in the open swamp habitats or marshy grasslands (e.g. *Ardea purpurea* and *Ardeola speciosa*) or even in the cultivated rice fields (e.g. *Bubulcus ibis*, *Butorides striatus*, *Egretta garzetta*, *Egretta intermedia* and *Egretta alba*). These species have both resident and migrant populations. Table 2 shows the migratory species and their associated habitats.

6. A total of 13 threatened bird species was recorded for the Ligawasan Marsh e.g. *Gorsachius goisagi* Japanese Night Heron (Vulnerable), the endemics like *Anas luzonica* (Vulnerable), *Spizaetus philippensis* (Vulnerable), the *Gallicolumba criniger* (Endangered), *Alcedo argentata* (Vulnerable), *Ceyx melanurus* (Vulnerable), *Ficedula basilanica* (Vulnerable), etc.

2. Mammals, Reptiles and Amphibians

7. The mammals with 14 species accounted for four additional species from the previous ten species, with three endemic species, i.e., *ptenochirus minor* Lesser Musky Fruit Bat, *Ptenochirus jagori* Musky Fruit Bat and *Sus philippensis* Philippine Warty Pig. Nine (9) species are volant species comprising the fruit bats (Megachiropterans) e.g. *P. jagori*, *P. minor*, *Cynopterus brachyotis*, *Rousettus amplexicaudatus*, *Macroglossus minim us*, *Eonycteris spalaea*, and the insectivorous bats (Microchiropterans) e.g. *Hipposideros diadema* and *Myotis sp.*.

8. The reptiles with 13 species accounted for 6 additional species from the previous 7 species with one threatened endemic, i.e. The Philippine Crocodile *Crocodylus mindorensis*. The Ligawasan Marsh is considered as one of the last strongholds of this endemic crocodile in the country, where the more widespread and larger species is also known to occur.

9. Only nine species of Amphibian including one endemic species *Kaloula conjuncta*, were recorded from Ligawasan. There could have been more species of amphibians recorded if the team were allowed to freely conduct surveys on amphibians during the evening. However, due to security considerations the local leaders and officials did not advise the team to conduct a night survey. The marsh is considered also as one of the most important habitats for the Philippine amphibians. When the peace and order situation of the area would allow it, the survey on amphibians should be a priority activity.

10. All the above 87 species were not reported earlier in the PASA report, thus considered as new records.

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Table 2. List of Migratory Species of Birds Recorded in Ligawasan Marsh after Three Field Surveys in May-June, September and November-December 2004.

SCIENTIFIC NAME	COMMON NAME	LOCAL NAME	CONSERVATION STATUS	HABITAT
<i>Podiceps ruficollis</i>	Black-necked Grebe	Balisuk	NTS	Swamp
<i>Ardea sumatrana</i>	Great-billed Heron	B'gok (B-gok)	NTS	Swamp
<i>Egretta intermedia</i>	Intermediate Egret	Talong	NTS	Swamp/rice field
<i>Egretta garzetta</i>	Little Egret	Talong	NTS	Swamp/rice field
<i>Egretta alba</i>	Great Egret	Talong	NTS	Swamp/rice field
<i>Butorides striatus</i>	Little Heron	Bigua	NTS	Swamp
<i>Bubulcus ibis</i>	Cattle Egret	Talong	NTS	Swamp/rice field
<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Mamawa-sa-kuden	NTS	Swamp, forest
<i>Nycticorax caledonicus</i>	Rufous Night Heron	Bigua	NTS	Swamp, forest
<i>Ixobrychus eurhythmus</i>	Schrenk's Bittern	Tayabpis-sa-bagombong	NTS	Swamp
<i>Anas crecca</i>	Great Winged Teal	Itik	NTS	Swamp
<i>Pandion haliaetus</i>	Osprey	Banog		Open field swamp forest
<i>Circus melanoleucos</i>	Pied Harrier	Kuligi	NTS	Open field Swamp forest
<i>Pernis ptilorhynchus</i>	Oriental Honey Buzzard	Banog	NTS	Open field Swamp forest
<i>Gallinula chloropus</i>	Common Moorhen	T'lek (T-lek)	NTS	Swamp
<i>Charadrius dubius</i>	Little-ringed Plover	Tla-tla	NTS	Swamp
<i>Recurvirostra avosetta</i>	Pied Avocet	N/A	NTS	Swamp
<i>Himantopus himantopus</i>	Black-winged Stilt	N/A	NTS	Swamp
<i>Tringa erythropus</i>	Spotted Redshank	N/A	NTS	Swamp
<i>Tringa glareola</i>	Wood sandpiper	N/A	NTS	Swamp
<i>Calidris subminuta</i>	Long-toed Stint	N/A	NTS	Swamp
<i>Sterna hirundo</i>	Common Tern	Tulalang	NTS	Swamp
<i>Chlidonias hybridus</i>	Whiskered Tern	Tulalang	NTS	Swamp
<i>Chlidonias leucopterus</i>	White-winged Tern	Tulalang	NTS	Swamp
<i>Alcedo atthis</i>	Common Kingfisher	Kasiang-siang	NTS	Forest
<i>Halcyon coromanda</i>	Ruddy Kingfisher	Kasiang-siang	NTS	Forest
<i>Monticola solitarius</i>	Bluerock Thrush	Kasiang-siang	NTS	Forest or open field
<i>Locustella fasciolata</i>	Gray's Grasshopper Warbler	Kasiang-siang	NTS	Open Grassland
<i>Locustella lanceolata</i>	Lanceolated Warbler	Kasiang-siang	NTS	Open Grassland
<i>Locustella ochotensis</i>	Middendorf's Grasshopper Warbler	Tuliok	NTS	Open Grassland Grassland
<i>Muscicapa griseisticta</i>	Grey-streaked Flycatcher	Bonga	NTS	Forest
<i>Motacilla cinerea</i>	Grey Wagtail	N/A	NTS	Open field
<i>Motacilla flava</i>	Yellow Wagtail	N/A	NTS	Open field
<i>Anthus hodgsoni</i>	Olive Tree Pipit	Bayako	NTS	Open field
<i>Lanius cristatus</i>	Brown Shrike	Kendas	NTS	Forest/ grassland

Source: Wetland Biodiversity Component for Ligawasan Marsh Study, 2004.

11. The increase in the number of terrestrial vertebrate species compared to the PASA Report was largely due to (a) deliberate efforts exerted by the team to conduct more surveys, (b) the conduct of surveys during the bird migration season from September to December and (c) being able to conduct surveys in and a round the remaining patches of swamp forests that was never made feasible during the PASA surveys. A significant number of 39 endemic bird species was recorded, almost all of which are forest-dependent species. The number of migratory bird species also increased dramatically to 37 species.

12. Thirteen bird species, that were not recorded during PASA but were recorded prior to the 2001 survey, were all observed and recorded during the recent surveys. These include the *Tachybaptus ruficollis*, *Anhinga melanogaster*, *Amaurornis olivaceous*, *Bolbopsittacus lunulatus*, *Centropus viridis* etc.

B. Fish and Aquatic Biodiversity

1. Fishes

13. Table 3 presents the fishes so far collected and noted in this study. Libungan Marsh has the most number of species. Of the twenty-seven (27) species noted, at least five (5) species are marine forms known to be able to enter a few kilometers upstream of the river mouth. Twenty-two species (22) were collected and noted from Ebpanan Marsh, at least three of which are predominantly marine forms. Only eighteen (18) species were collected from Ligawasan Marsh, almost all of which are known to live in freshwater habitats only.

14. The three marsh areas mentioned above, though somewhat delineated/isolated from each other during the dry season, may form a relatively continuous body of water during the wet/rainy season. Even during the dry season, interconnections by way of Cotobato River and its tributaries may still be present however limited. It is presumed that variation in fish species richness between the three areas will not be great. If ever, one particular factor that may influence fish diversity may be salinity.

15. Libungan Marsh and Ebpanan Marsh are on the downstream area of Cotobato River. High tides and low inland water levels are very good conditions by which saltwater could enter several kilometers upstream. During such occasions, marine and estuarine euryhaline fish species (trevallys, glassfishes, etc) and other biota may be able to reach far inland. As a consequence, Ebpanan and Libungan Marsh, as occasional ecotones, exhibit edge effects such as having higher species counts than Ligawasan Marsh. On the other hand, there were species, like *Puntius binotatus* and *Clarias nieuhoffi* in Ligawasan Marsh that were so far not collected nor noted from the two other marshes. Presumably, they could not tolerate the occasional intrusion of saltwater.

16. Of the thirty (31) species collected from the three sites, nineteen (19) or 65% of them are native. In the PASA Report on Ligawasan Marsh, twenty-four (24) species were reported. Thus in this study, about 14 species are new site records. The cyprinids and gobies *sensu lato* are the dominant groups with 6 of 30 species (20 %) each, then followed by the catfishes and gouramys.

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Table 3. List of Fishes Found in the Ligawasan Marsh Complex Source: Wetland Biodiversity Component for Ligawasan Marsh Study, 2004

Family	Species	Local name	Common name	Origin	LIBUNGAN	EBPANAN	LIGAWASAN
Channidae	<i>Channa striata</i> (Bloch 1793)	dalag	mudfish/snakehead	native	present	present	present
Anabantidae	<i>Anabas testudineus</i> (Bloch 1792)	pupuyo	climbing perch	native	present	present	present
Clariidae	<i>Clarias macrocephalus</i> Guenther 1864	katipa	catfish	native	present	present	present
	<i>Clarias batrachus</i> (Linnaeus 1756)	katipa	walking catfish	introduced	present	present	present
	<i>Clarias nieuhoffi</i> Valenciennes 1840	balek	catfish	native	absent	absent	present
Cyprinidae	<i>Hyporhamphichthys molitrix</i> (Valenciennes 1844)	tumangting	silver carp	introduced	present	present	present
	<i>Cyprinus carpio</i> Linnaeus 1758	karpa	common carp	introduced	present	present	present
	<i>Labeo rohita</i> (Hamilton 1822)	lidep	rohu	introduced	present	present	present
	<i>Barbodes gonionotus</i> (Bleeker 1850)	tawes	Javanese carp/ Java barb	introduced	present	present	present
	<i>Puntius binotatus</i> (Valenciennes 1842)	pet	spotted barb	native	absent	absent	present
	<i>Poecilia reticulata</i> Peters 1860		guppy	introduced	present	present	present
Belontiidae	<i>Trichogaster trichopterus</i> (Pallas 1770)	gouramy	three spot gouramy	introduced	present	present	present
	<i>Trichogaster pectoralis</i> (Regan 1910)	gouramy	snakeskin gouramy	introduced	present	absent	present
	<i>Osphronemus gouramy</i> Lacepede 1801	manabing	giant gouramy	introduced	absent	absent	present
Cichlidae	<i>Oreochromis niloticus niloticus</i> (Linnaeus 1758)	tilapia	Nile tilapia	introduced	present	present	present
	<i>Oreochromis mossambicus</i> (Peters 1852)	tilapia native	Mozambic tilapia	introduced	present	present	present
Anguillidae	<i>Anguilla marmorata</i> Quoy and Gaimard 1824	kasili	giant mottled eel	native	present	present	present
	<i>Anguilla bicolor</i>	salan		native	present	absent	absent
Mugilidae	<i>Liza melinoptera</i> (Valenciennes 1836)	banak/balanak	Otomebora mullet	native	present	present	present
Megalopidae	<i>Megalops cyprinoides</i> (Broussonet 1782)	banak/balanak	Indo-pacific tarpon	native	present	absent	absent
Eleotridae	<i>Eleotris fusca</i> (Schneider and Forster 1801)	buted	dusky sleeper	native	present	present	absent
	<i>Eleotris melanosoma</i> Bleeker 1852	buted	broadhead sleeper	native	present	present	absent
	<i>Butis amboinensis</i> (Bleeker 1853)		Olive flathead audaeon	native	present	absent	absent
Gobiidae	<i>Stenogobius ophthalmopus</i> (Bleeker 1853) (<i>C. lachrymosus</i>)			native	present	absent	absent
	<i>Glossogobius giurii</i> (Buchanan Hamilton 1822)	kapalo	tank goby	native	present	present	present
	<i>Sicyopterus extraneus</i>		mud skipper	native	present	present	absent
Hemiramphidae	<i>Zenarchopterus gilli</i> Smith 1945		viviparous half-beak	native	present	present	absent
Ambassidae	<i>Ambassis interrupta</i> Bleeker 1852	idis	long spined glass perchlet	native	present	present	absent
	<i>Ambassis buruensis</i> Bleeker 1856	idis	buru glass perchlet	native	present	present	absent
Carangidae	<i>Caranx sexfasciatus</i> Quoy and Gaimard 1825		bigeye trevally	native	present	present	absent
Terapontidae	<i>Mesopristes cancellatus</i> (Cuvier 1829)	pigeik	tapitoid grunter	native	present	absent	absent

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17. The cyprinids are of interest to Mindanao. Of the cyprinids, however, only one is native. Four of them are introduced as a fishery resource, and one larvivore mosquito fish species was introduced in the Philippines as a biological control of mosquitoes. Herre (1924) reported 7 species of the genus *Puntius*. It is believed that only two species have remained extant. *Puntius binotatus* is one. It is present in Agusan River and its tributaries as well as in Agusan Marsh. As it is native to Southeast Asia, from Thailand to Indonesia and the Philippines, it may well be fairly distributed in the whole of Mindanao. In the PASA Report, *Puntius javanicus* Ounior synonym of *Barbodes gonionotus*, FISHBASE 2000) was also recorded, but this is an introduced species. The PASA report reported only four species.

18. Two species of gobies were reported in the PASA report, *Gobius biocellatus* (valid name *Glossogobius biocellatus*) and *Cterogobius criniger*. All the gobies collected in this study are native to the Philippines. These two species are mainly marine forms that can sometime enter the lower reaches of the river. Three species are eleotrids and the other three are "true gobies". *Eleotris fusca* and *E. melanosoma* are amphidromous fishes that can live in freshwaters as adults and spawning is usually in estuarine or mangrove habitats where the juveniles also spend some time. In Luzon, the juvenile production contributes much to the "ipon" fishery. *Butis amboinensis* is usually found in freshwater environments, though it can also enter an estuarine/ brackish water area. Though edible, they are not usually regarded as table fish. *Stenogobius ophthalmoporus* is known as a secondary freshwater fish not known for any commercial importance as yet. *Glossogobius giuris* is a colorful, commercial fish marketed fresh. Most of the goby sold in the Cotobato market is of this species. They can well tolerate fresh to brackish water; occasionally they enter the marine environment. It has been observed that those caught in estuarine or mangrove areas are larger than those caught in the freshwaters. They are most common in silty-muddy waters. *Sicyopterus extraneus* are usually found in the river banks clinging to the mud banks and sometimes getting out of the water. It is of no known commercial importance.

19. Of the catfishes caught, two are native and the other is an introduced species. *C. batrachus* is the introduced species and is a major contributor to the catfish fishery in the three marshes. They are usually found in fresh waters but can also tolerate low salinities in the estuarine waters. It is usually marketed fresh or frozen but some enterprising fishermen also market smoke or sun-dried individuals. *C. larias macrocephalus* and *C. niuehoffi* are native to the Philippines. *Clarias macrocephalus* are also commercially sold though in lower quantities than *C. batrachus*. In other Southeast Asian countries like Thailand, the flesh of this species is regarded to be more superior in taste than that of *C. batrachus*. Attempts towards culture of this species are increasing in these countries. In the Philippines, most of the fishes caught are still from wild capture. The other native catfish, *Clarias niuehoffi*, is seldom seen in the market. This species was reported as *Clarias gilli* (a junior synonym) in the PASA Report. It is known as the "eel-catfish" by the local fishermen and has been captured, so far, only in the freshwater portions of the marshes. There is not much known on this species. Morphologically, the head:length ratio is smaller than that of *C. batrachus*, thus there could be relatively more edible flesh per individual.

20. *Channa striata* (snakehead-mudfish-dalag) and *Anabas testudineus* (climbing perch-pupuyo) are two other native relatively-freshwater fishes that are of commercial importance. Both can withstand periods of desiccation and low oxygen content of water. They are usually marketed live although "dried" or "smoked" dalag are sometimes available.

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21. All the gouramys are introduced commercially important fishes, although *T. pectoralis* and *T. trichopterus* are more common than *O. guramy*.
22. The cichlids *O. niloticus* and *O. mossambicus* are introduced as commercially important food fish. The local people still regard *O. mossambicus* as the "native" tilapia.
23. *A. marmorata* and *A. bicolor* are the two major catadromous eel species caught from the marshes that are sold commercially. *A. bicolor* probably reaches only the lower portions of the River but *A. marmorata* can reach further upland, even invading mountain streams. Thus there may be few, if not none at all, *A. bicolor* that are caught in Ligawasan Marsh than that in Ebpanan or Libungan Marsh.
24. The "banak/balanak" known to the locals comprise two species – *Liza melinoptera* and *Megalops cyprinoides*. *L. melinoptera* are schooling coastal fishes that can enter a river to feed. They are usually confined only in the lower portions of the river, although some individuals can reach the more upstream portions. *M. cyprinoides* are predominantly anadromous marine tarpons that can also invade the rivers to feed. They are predatory and some attempts to culture it in ponds as grow-outs have been reported to be successful. Both species are usually marketed fresh or frozen.
25. The half-beak *Zenarchopterus gilli* is mainly marine species but is able to enter the freshwater environment. They are not known to be of economic importance as of yet, though its potential as an aquarium fish needs to be explored.
26. The two species of glass perch let, *Ambassis interrupta* and *Ambassis buruensis*, are regarded as by-catch by fishermen. Generally freshwater, they can also live in estuarine/brackish water environments. They are not regarded as a valued marketable resource due to its long bony spines. However, they are still consumed as table food by marginal fishermen in the area.
27. The native *Mesopristes cancellatus* "pigeek" (incorrectly identified as *Terapon mesopristes* in the PASA Report) are sometimes caught at Cotabato River in the vicinity of Libungan Marsh. The adults usually inhabit the bay areas but can travel many kilometers upstream. It is regarded as a valuable food fish by the people in the area.
28. Juveniles of jacks (*Caranx sexfasciatus*) are also caught in the lower reaches of Cotabato River and they are mainly marine forms. Though jacks have been known to grow as long as 20 inches (in standard length) in the deep waters of Lake Taal in Luzon, there is doubt whether they can grow to such length in the relatively shallow waters of the marshes.
29. The most important fishery species from the marshes are dominated by introduced cyprinids, gouramys, cichlids, and the introduced catfish species. The native fishes, usually brought to and sold at fish landing sites, include the eels (*A. marmorata* and *A. bicolor*), the climbing perch, and the native catfish. Of these, the most expensive are the eels which usually fetch about PhP 700.00 in the Cotabato City markets.

2. Mollusks and Crustaceans Biodiversity

30. Fourteen (14) species of mollusks were collected during the study, most of which were handpicked (see Table 4). The thiarids are the most diverse, as expected

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in most tropical freshwater habitats. There are no notable species. All the mollusks collected in this study are widely distributed in the Philippines.

31. The neritid snails are numerous in Ebpanan and Libungan Marsh as well a portion of Cotobato River within this area. These species are usually common near brackish water or estuarine area. They are usually attached to parts of rooted plants in the riverbanks that are under water. *Septaria porcellana* can invade waters further upstream, thus its presence in the more inland Ligawasan Marsh. They are not known to be of economic importance.

32. *Vivipara costata* is an edible snail, observed sold in the Cotobato Market. They are usually benthic, found crawling in muddy substrates or clinging to submerged vegetation in the river banks.

33. The golden apple snail *Pomacea canaliculata* is an introduced pilid snail in the 1980's from America presumably a san additional fast growing protein source for the populace. It is now widely distributed in the Philippines and is regarded a major pest in rice paddies. They are very voracious and their conspicuous pink egg masses are seen attached to anything above the water surface. This species could be a major concern for the marginal and seasonal farmers in the area. The only ecologically-friendly way to control them is through handpicking or any form of manual gathering for use as food for humans or livestock. In some rice paddies, farmers use ducks to collect snails in the flooded rice paddies before planting.

34. The lymnaeid *Radix quadrasi* is known to be the first intermediate host of the liver flukes *Fasciola gigantica* and *Fasciola hepatica* in the Philippines. Fascioliasis can occur also in humans but in the Philippines, this disease is more of a veterinary and agricultural importance as most of those affected are usually ruminants, especially carabaos. An individual can get infected from eating relatively uncooked/raw metacercaria-laden aquatic vegetation, such as watercress or kangkong.

35. There are four thiarid species collected in this study. Of direct human importance are the relatively larger species of the genera *Melanoides* and *Stenomelania*, which are usually gathered for table consumption.

36. The two planorbids snails are of minor medical importance. These two species have been implicated as intermediate hosts of bird schistosomes in other countries. Bird schistosomes can penetrate the skin of humans and cause cercarial dermatitis. This disease is relatively unstudied in our country.

37. The three bivalve species are numerous in Ligawasan Marsh. They are usually buried in sandy-muddy substrate. All of them are edible. The introduced species *Cristaria plicata* has been cultured in Taiwan and in other countries not so much to their food value as their ability to produce pearls. In Taiwan, these are cultured in relative clean and transparent rivers, lakes or in man-made structures.

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Table 4. List of Species of Mollusks and Crustaceans including their Local and Common Names, Origin and Distribution in the Ligawasan Marsh Complex

Family	Species	Local name	Common Name	Origin	LIBUNGAN	EBPANAN	LIGAWASAN
A. MOLLUSCS							
VIVIPARIIDAE	<i>Vivipara costata</i>	Suso		native	present	present	present
AMPULLARIIDAE	<i>Pomacea</i>	Golden	Apple	Introduced	present	present	present
	<i>Canaliculata</i>	Kuhol	Snail				
NERITINIDAE	<i>Neritina coromandeliana</i>			native	present	present	absent
	<i>Septaria parcelana</i>			native	present	present	present
LYMNAEIDAE	<i>Radix auadrasi</i>			native	present	present	present
THIARIIDAE	<i>melanoides</i>			native	present	present	present
	<i>Perrimosa</i>						
	<i>Thiara scabra</i>						
	<i>Stenomelania Juncea</i>						
PLANORBIDAE	<i>Tarebia granifera</i>			native	present	present	present
	<i>Indoplanorbis Exustus</i>			native	present	present	present
	<i>Physastra Hungerfordiana</i>			native	present	present	present
CYRENIDAE	<i>Corbicula Manillensis</i>			native	present	present	present
	<i>Solentellina Elonaata</i>				present	present	present
TELLINIDAE	<i>Cristaria Dlicata</i>				absent	absent	present
B. CRUSTACEANS							
	<i>Caridina Brachydactyla</i>						
	<i>Macrobrachium mammilodactylus</i>						
	<i>Macrobrachium Scabriculum</i>						

Source: Wetland Biodiversity Component for Ligawasan Marsh Study, 2004.

38. Table 4 shows a list of the three native species of crustaceans gathered from Ligawasan Marsh. It is highly probable that these species also exist in the two other marshes. All species are known to be edible. The relatively smaller *Caridina* are usually gathered with scoop nets in the river banks where they school among submerged vegetation. They can be cooked fresh or sun-dried and used as salted condiment in cooking. The relatively larger *Macrobrachium* species are usually caught with bamboo traps or scoop nets. *Macrobrachium* can fetch a high price in the market.

3. Plankton Diversity

39. The marshes are relatively depauperate. Only about a dozen plankton genera were collected and identified (Table 5). Plankton species were collected by passing about 30 liters of water in a 60 um mesh plankton net. About three sites were sampled in Ebpanan Marsh and the portion of Cotobato River in the vicinity of the marsh. Most of the plankton samples were collected in Ligawasan Marsh.

40. Only about four (4) species of phytoplankton were collected and identified from Ebpanan marsh and the adjacent Cotobato River. As Libungan Marsh is just nearby and would be continuous with Ebpanan during the floods, it is assumed that

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Libungan would also have similar species of plankton as Ebpanan. Not only are the plankton species depauperate, they are also so rare that the average density is about 20 individuals per liter of water.

41. About 10 genera of phytoplankton and two zooplankton taxa were collected in Ligawasan Marsh. The phytoplanktons are dominated by the Chrysophyta in terms of taxa diversity with representatives by six genera. Density for any of these, however, ranges from rare to few. The Cyanophyta are represented by three genera. The most notable of these are the individuals of the genus *Microcystis*. In Ligawasan Marsh, the density of *Microcystis* varies. In the vicinity of Tukananes SKP and Pagalungan, as well as in the vicinity of Pibpulangan SKP and Bulod SSB, *Microcystis* is rare as is true for all the other genera. More plankton species have been collected from the vicinity of Kabuntalan and Tumaginting. In Langapanan and Mibpandakan SKP, there is a large increase in abundance of *Microcystis*, dominating the other genera in numbers although there is a slight increase in numbers for all the other genera.

Table 5. List of Species of Plankton and Distribution in the Ligawasan Marsh Complex

DIVISION	GENUS	EBPANAN	LIGAWASAN	
Phytoplankton				
Chlorophyta				
	<i>Spirogyra</i>	RARE	RARE	
Cyanophyta				
	<i>Microcystis</i>	RARE	MANY	Rare to abundant depending on site
	<i>Lynbva</i>		RARE	
	<i>Oscillatoria</i>		RARE	
Chrvsophyta				
	<i>Navicula</i>	RARE	FEW	
	<i>Fragilaria</i>		FEW	
	<i>Cymbella</i>	RARE	FEW	
	<i>Amohora</i>		FEW	
	<i>Aulacoseira</i>		FEW	
	<i>Svnedra</i>		FEW	
Zooplankton				
	<i>Brachionus</i>	RARE	RARE	
	Copepod	RARE	RARE	

Source: Wetland Biodiversity Component for Ligawasan Marsh Study, 2004.

ANNEX D SUMMARY OF THREATS AND PROPOSED INTERVENTIONS

Summary of Threats and Proposed Interventions Linked to Management Plan Prescriptions

Specific Threats	Activities/ Impacts	Proposed Interventions (see table below)
I. On-Site Threats		
A. Subsistence-Based Destructive Resource Utilization		
(i) Illegal Fishing	<ul style="list-style-type: none"> • Battery Operated Electric Fishing Probes • Use of Fish Poison • Use of Very Fine Mesh Fishing Nets 	2.2, 3.1, 1.4, 1.2
(ii) Illegal Cutting of Wetland Swamp Forest	<ul style="list-style-type: none"> • Harvesting of Poles to Sell • Collection of Firewood • Cutting of Forest to Start Settlement 	2.2, 3.1, 1.4, 1.2
(iii) Collecting Wildlife and Eggs	<ul style="list-style-type: none"> • Illegal collection of Wildlife 	2.2, 3.1, 1.4
(iv) Bird Hunting	<ul style="list-style-type: none"> • Use of Rifles to Hunt Birds 	2.2, 1.4
(v) Conversion of Herbaceous Swamp Habitats to Agricultural Lands	<ul style="list-style-type: none"> • Conversion of Herbaceous Swamp Habitats to Rice fields • Slash-and-Burn Practices for Land Clearing to Grow Food Crops 	1.1, 2.2, 1.4, 1.2
B. Poor Environmental Practices		
(i) Dumping of Solid Wastes in the River Causing Pollution in the marsh	<ul style="list-style-type: none"> • Pollution of the Marsh by dumping of waste 	1.4, 2.2
(ii) Unregulated Use of Inorganic Fertilizer and Chemicals	<ul style="list-style-type: none"> • Poisoning of Wildlife, particularly Migratory and Resident Birds 	1.4, 2.2, 1.2
(iii) Weak Enforcement of Environmental Laws	<ul style="list-style-type: none"> • Ineffective Protection of the Environment and Natural Resources 	1.4, 2.2
(iv)) Uncoordinated Policies of Government Agencies (Food Intensification Programs)	<ul style="list-style-type: none"> • Ineffective Protection of the Environment and Natural Resources 	2.1
(v) Introduction of Exotic Species (Armored Fish)	<ul style="list-style-type: none"> • Extinction of Native Fish Species 	1.4, 2.2
(vi) "Noisy" motorized bancas	<ul style="list-style-type: none"> • Disrupts the biology (feeding, roosting and reproducing) of local and migratory birds 	1.4, 2.2
(vii) Water Pollution and Waste Management Disposal	<ul style="list-style-type: none"> • Health Hazards 	1.4, 2.2
C. Infrastructure		
(i) Cut-Off Channel	<ul style="list-style-type: none"> • High Rate of Sedimentation and Expansion of Built-up Areas Leading to Loss of Habitat 	1.5
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D. High Population Pressure	<ul style="list-style-type: none"> Increased pressure on use of natural resources 	2.1, 1.4
E. Potential for Oil and Gas	<ul style="list-style-type: none"> Rapid deterioration of habitat if not mitigated 	1.2
F. Small holder Palm Oil Plantation	<ul style="list-style-type: none"> De facto conversion to agricultural land 	1.2, 1.4
G. Political Boundaries and A&D Lands	<ul style="list-style-type: none"> Conflict in boundaries in municipalities 	1.3, 1.2
H. Peace and Order Problems	<ul style="list-style-type: none"> Degradation of natural resources 	1.3
I. Lack of Education and Access to School	<ul style="list-style-type: none"> Prevalence of misconceptions and fears about protected areas 	2.3
II. Off-Site Threats		
(i) Slash-and Burn Farming Practices in the Upland Watershed	<ul style="list-style-type: none"> Soil Erosion Leading to High Sediment Load in the Rivers 	1.5
(ii) Conversion of Mangroves at Cotabato City	<ul style="list-style-type: none"> Loss of Habitat for Fish Breeding Grounds 	1.5
(iii) Use of Excess Chemicals by Commercial Plantations	<ul style="list-style-type: none"> Chemical Pollution Leading to Fish Kills and Negative Effect to Inhabitants 	1.5
(iv) Poisonous Tailings from Mining Operations	<ul style="list-style-type: none"> Chemical Pollution Leading to Poisoning of Inhabitants 	1.5
(v) Dumping of Solid Wastes (plastic and non-degradable materials) in the River	<ul style="list-style-type: none"> Pollution of Ligawasan Marsh 	2.2, 1.4
(vi) Lack of Clearing of Debris in Rivers and Waterways	<ul style="list-style-type: none"> Blocking of Waterways Causing River Diversion 	2.2, 1.4

Proposed Interventions Linked to Management Prescriptions

Prescription	Interventions and Specific Activities
1 Ecosystem Management & Protection	<p>1.1 Habitat Restoration:</p> <ul style="list-style-type: none"> Community-based Restoration of Disturbed Wetland Swamp Forest Habitat Riverbank Protection and Stabilization Community-based Buffer Zone Reforestation Wildlife Sanctuary for Future Ecotourism Activities Tree Planting on Lands Occupied by Farmers Planted to a Mixture of Fruit Trees and Indigenous Tree Species, including strips in backyards and perimeters of farms
	<p>1.2 Management Zoning System</p> <ul style="list-style-type: none"> Five management zones (multiple use, recreational /tourism, commercial fishing, strict protection, sustainable use)
	<p>1.3 Declaring LM as a PA</p> <ul style="list-style-type: none"> LM Steering committee (predecessor of PAMB)
	<p>1.4 Law Enforcement (Bantay Pawas)</p>
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	<ul style="list-style-type: none"> - Appoint Bantay Pawas - Promulgate new ordinances to strengthen conservation and protection activities
	<p>1.5 On-Site and Off Site Research</p> <ul style="list-style-type: none"> - Competitive Research Grants to Address Various On-Site and Off-Site Environmental Problems, resource assessment research, and other biodiversity related topics
2 Institutional Development and Capacity Building	<p>2.1 Community Empowerment and Mobilizing:</p> <ul style="list-style-type: none"> - Formation and Support to People's Organization (PO) - Capacity Building Support for LGUs, PENROs, CENROs, NGOs, and Others.
	<p>2.2 Environment Education and Awareness</p> <ul style="list-style-type: none"> - Broad-based Conservation Awareness Campaign to Impart Conservation Values to Stakeholders - Use of Media, including Local Radios and Newspapers, Religious Organizations, and Negotiations and Dialogues
	<p>2.3 Special Literacy Program</p> <ul style="list-style-type: none"> - Address functional literacy needs of out-of-school youth
3 Livelihood Interventions	<p>3.1 Environment-Friendly Livelihood Activities</p> <ul style="list-style-type: none"> - Goat Raising on Raised Pens - Duck Raising - Mat and Kalakat Weaving, and Handicraft - Support for Mini-Growth Centers, focused on Fish landings and Food Crops Marketing
4 Rural and Social Infrastructure	<p>4.1 Rural Infrastructure</p> <ul style="list-style-type: none"> - Village Infrastructure to Support Livelihood Activities - Social Infrastructure (health, sanitation and drinking water)
5 M & E	<p>5.1 M & E Activities</p> <ul style="list-style-type: none"> - Monitor program made in biodiversity conservation, social upliftment, and program in project implementation

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