Integrated River Basin Management and Development Master Plan

Tagoloan River Basin

Volume 1 - Executive Summary

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College of Forestry and Natural Resources
University of the Philippines Los Baños

River Basin Control Office
Department of Environment and Natural Resources
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<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<td>AFF</td>
<td>Agriculture, forestry, and fisheries</td>
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<td>Comprehensive Land Use Plan</td>
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<td>DPSIR</td>
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*VOLUME 1 – EXECUTIVE SUMMARY*
GIS Geographic Information System
GOCC Government Owned and Controlled Corporations
GOP Government of the Philippines
GSIS Government Service Insurance System
GTZ German Technical Cooperation
HEC-HMS Hydrologic Engineering Center-Hydrologic Modeling System
HEC-RAS Hydrologic Engineering Center-River Analysis System
IEC Information, Education, and Communication
iNREMP Integrated Natural Resources and Environmental Management Project
IRBMD Integrated River Basin Management and Development
IRBMDMP Integrated River Basin Management and Development Master Plan
JICA Japan International Cooperation Agency
JWTC Joint Typhoon Warning Center
KBA Key Biodiversity Area
LGU Local Government Unit
LWUA Local Water Utilities Administration
M&E Monitoring and Evaluation
MCM Million cubic meters
MGB Mines and Geosciences Bureau
MinDA Mindanao Development Authority
MO Manila Observatory
MOU Memorandum of Agreement
MSDF Mindanao Strategic Development Framework
MW Megawatts
NCIP National Commission on Indigenous Peoples
NDRRMC National Disaster Risk Reduction and Management Council
NEDA National Economic and Development Authority
NGO Non-Government Organization
NIA National Irrigation Administration
NIS National Irrigation System
NPC National Power Corporation
NWRB Natural Water Resources Board
ODA Official Development Assistance
PD Presidential Decree
PENRO Provincial Environment and Natural Resources Office
PES Payment for Ecosystem/Environmental Services
PHIVIDEC Philippine Veterans Investment Development Corporation
PO People’s Organization
PPP Public-Private Partnership
PSF Presidential Support Fund
PFTFC Philippine Tropical Forest Conservation Foundation
RB River Basin
RBC River Basin Council
RBCO River Basin Control Office

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Integrated River Basin Management and Development
Master Plan for the Tagoloan River Basin

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EXECUTIVE SUMMARY

BACKGROUND

In compliance with Executive Order 510, the River Basin Control Office (RBCO) of the Department of Environment and Natural Resources (DENR) established an Integrated River Basin Management and Development (IRBMD) Master Plan in 2007. Eighteen (18) major river basins in the Philippines were identified and categorized as priority areas of the Government by the Cabinet Cluster on Climate Change Adaptation and Mitigation. The College of Forestry and Natural Resources (CFNR) of the University of the Philippines Los Baños (UPLB), in recognition of its vast experience and expertise in watershed management, was awarded a contract to formulate the IRBMD Master Plan for the Tagoloan River Basin. The project was envisioned to develop frameworks, guidelines and strategies on how to manage the river basin amidst the threats posed by global warming, urbanization, population growth and destructive anthropogenic activities.

RATIONALE

The enhancement of existing programs and projects in the light of new socio-economic and environmental challenges confronting the Tagoloan River Basin within the context of the IRBMD is of utmost importance. In support of this, a comprehensive information base is necessary for the development, implementation, monitoring, and evaluation of the IRBMD. It will be a key basis in decision making and in developing strategic options for a more responsive plan to achieve the broader socioeconomic and environmental goals of the management of the river basin.

OBJECTIVES OF THE STUDY

This project aimed to formulate an Integrated River Basin Management and Development Master Plan for the Tagoloan River Basin, which addresses concerns on the following:

1. Water Resources Management
2. Watershed Management
3. Flood Control/Mitigation and Disaster Risk Reduction Management and Hazard Management
4. River and River Delta Management
5. Coastal and Fresh Water Resources Management
6. Biodiversity Conservation
7. Climate Change Adaptation and Mitigation
8. Mineral Resources Management
9. Sustainable Management through Community Participation
10. Economic Development, and
11. Institutional Linkages and Organizational Structure for River Basin Management
SCOPE
As per the Terms of Reference, the scope of the project consisted of two phases which included:

- **Phase 1**: covered activities related to the review and assessment of water policy and basin development approaches and strategies, and;
- **Phase 2**: focused on the formulation of an integrated river basin management and development of a master plan.

The scope of the two phases consisted of the following:

a) Preparatory planning for the implementation of the two phases  
b) Characterization of the river basin  
c) GIS mapping and database development  
d) Land capability assessment/classification and land use suitability analysis  
e) Vulnerability assessment of the river basin into climate change  
f) Design of appropriate river basin management options and/solutions including strategies on climate change adaptation and mitigation  
g) Formulation of the River Basin Management Plan  
h) Technical support and management development

METHODOLOGY

**Guiding Principles and Approaches**
To achieve the objectives and cover the scope of the project, the following principles, approaches and methods were applied as a basis for Project implementation.

A **Holistic and systems approach** was adopted as a general approach to capture the interactions of the various factors, processes and components of the river basin as complex ecological and social systems. This ensured that concerns spanning the bio-physical, social, economic, and institutional characteristics of the river basin was taken into consideration and integrated into the strategy formulation and planning of the areas. Such an approach provided a multi-discipline analysis and facilitated the identification of the management and policy development issues common to the 11 areas of concern mentioned in the project objectives.

A **Participatory epistemology** was applied to ensure the sustainability of an integrated river basin management and development effort. Considering that a specific river basin will have more than one sector of stakeholders, the participation of the different stakeholders was considered imperative in resolving conflicting interests that may affect the efficient, effective and sustainable management and utilization of resources. An inclusive river basin management and development management regime anchored on stakeholder participation was helpful in implementing multiple use management strategies to ensure sustainable use of resources in the river basin.

A participatory approach would also ensure sensitivity to issues otherwise hidden and/or taken for granted in development efforts. These included gender and other social sectoral concerns. The identification and consideration of the stakeholders’ voices facilitated the inclusion of their needs and concerns at the local and community levels all the way up to the national level. These concerns may vary from
the short term and day to day subsistence needs of the local communities, to long term, macro, and societal needs for stable and healthy river basins that can sustainably provide goods and services.

As much as possible, given the period of time for the implementation of this project, efforts were undertaken to provide opportunities for key stakeholders to participate in the conduct of project activities, including but not limited to data gathering and generation, and in the crafting of the river basin master plan.

**Demand driven** planning approach was done in both from local and national levels. The decisions on what and where to implement projects in a watershed was guided by the perceived as well as real needs of the stakeholders at the local level all the way up to the national level. These demands varied from the short term to the day subsistence needs of the local communities to long term macro societal needs for stable and healthy environment that sustainably provides goods and services. In this Project, while DENR plays a major role in the management and development of the river basins as part of its mandate, it is imperative to engage the other stakeholders as well to complete the frame of demands that the Project must respond to.

**An Interdisciplinary approach** was employed to ensure an integrated analysis to back up the integrated development plan for the river basin. The approach was operationalized as experts and researchers coming from different disciplines worked together with a clear and shared goal of generating a coherent and integrative assessment of a river basin – in this case, the Tagoloan River Basin.

An interdisciplinary team assessed the river basin covered by the engagement in terms of their bio-physical, human, social, and economic vulnerabilities which are usually brought about by internal systems processes that lead to the area’s weaknesses in the light of larger, often external threats such as climate change and socio-political pressures. The same inter-disciplinarity was applied in assessing the capacities and opportunities of the river basin for holistic development.

Central to this interdisciplinary approach was the generation of a common conceptualization of a river basin as a socio – ecological system (SES) having interrelated bio-physical, human, and social characteristics. This necessitated the disciplinal experts to initially come together into a leveling of terms, concepts and methodologies, to conduct the successive phases of the assessment using a combination of data generation and analytical methods and tools.

**Science and technology-based assessment** was done using methods that use state-of-the-art soft and hard technology to assess the river basins. The engagement was conducted not only using the scientific rigor useful to advance a valid and reliable assessment; but it also used scientific knowledge, both methodically as well as content-wise, that has grown over the last decade in the area of biodiversity, climate change, and watershed and resources management.
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Figure 1. Flow Chart of Activities and Expected Outputs.
**Coordination with Concerned Agencies**

Close coordination with the DENR field offices, LGUs, DA, NIA, Water Districts, NEDA and NWRB as main stakeholder agencies was done during the conduct of the study. The purpose of the study was explained; the specific objectives, outputs and process were also discussed. In the process of coordination, it was expected that the Team would be able to generate important comments and suggestions that may be considered in the overall improvement of the conduct of the Project activities and delivery of outputs. It was deemed important to establish at the onset a good rapport for buy-in by the partners. Coordination with these agencies was done during the whole period of engagement. Eventually these will be the key organizations who shall be implementing the plans, programs and projects.

A compilation of communication materials, results of coordination updates, and minutes of the meetings, was done and was made part of the report documents. Other pertinent records and documents generated as a result of the coordination were also be part of the compilation. These included not only discussions and comments on existing policies relevant to river basin management and development, but also efforts and milestones toward the promulgation of new policies, ordinances, laws, and regulations that may enhance and ensure a more responsive river basin development and implementation plan.

A stakeholders meeting was held from May 21 to May 22, 2014 at Philtown Hotel, Cagayan de Oro City, Misamis Oriental. The Multistakeholders’ meeting had the following objectives:

a) Validate assessments of secondary data gathered by UPLB experts
b) Identify stakeholders’ issues and concerns regarding the river basin;
c) Identify their visions and goals for the river basin; and
d) Identify their strategies to achieve these visions and goals

A report that described the outputs of Phase 1 has been prepared and submitted in the form of Proceedings of the Stakeholders meeting.

**Gathering of Secondary Data**

**Examination of existing documents**

An exhaustive collection, examination and analysis of existing documents were conducted. Among the broad categories examined included the following characteristics of the river basin:

**a. Bio-ecological**

This included relevant data on the known biological composition of the river basin (e.g. existing inventory and assessment of flora and fauna), diversity studies, environmental and ecological assessments, and other related studies in order to understand the interrelationships among the organisms in connection with the present status of the river basins. This also included studies on protected areas, seascapes, and landscapes.
b. Physical and hydrological characteristics

Topography, geographical location, rainfall pattern, climate influences, vegetation, land use, and soil conditions are some of the bases to characterize and distinguish a river basin.

This also included, but not limited to, irrigation systems, dams, hydropower plants, aquifers, and other water reservoir facilities that are dependent on the river basins. These were examined with regards to their relation to the physical characteristics of the river basin.

c. Socio-demographic and Human

Data on population and settlement pattern, employment, income, agricultural production, conflict, provision of social services, land rights, and other socio-economic aspects, were analyzed to formulate a human development plan for the stakeholders of the river basin. The analysis was focused on alleviating the high poverty incidence in the river basin to improve the overall quality of life of its residents.

d. Economic

Agriculture, Hunting, and Forestry industry group were among the identified major income-generating activities for Region X accounting for 40.60% of employment (Bureau of Labor and Employment Statistics, 2013). Data were gathered and their implications on poverty incidence were analyzed, considering that the annual family income for Region X (Region X= Php 82,299) was lower than the national average. The present available data in the industries, services, and AFF (agriculture, forestry, and fisheries) sectors were analyzed, and developments plans formulated in consideration of the other sub-systems guided by the broader goals of the river basin development. Other information on the following as either applied or applicable to the river basin, were also examined:

e. Institutional Framework

Development frameworks concerning the river basin were also studied for their implication to the project. Some of the important documents were the Mindanao 2020 Peace and Development Framework, the Mindanao Strategic Development Framework (MSDF) and the Region 10 Physical Framework Plan 2004-2030 (2005) by the National Economic Development Authority (NEDA), which paved the way for the conduct of studies as well as formulation of river basin programs and policies.

Also, prominent organizations and institutions advancing the sustainable use of water resources and their development and management were considered.
f. Water Policies

The formulation of an Integrated River Basin Management and Development Plan for the Tagoloan River Basin required an in-depth study of the existing laws that have quintessential implications on the use of water resources and environmental services. Such law included PD 1067, which provides the legal framework for the extraction, allocation, and management of water resources in the country.

Other recent laws were likewise examined and proved to be helpful in devising an integrated management plan that addresses the interest of the different stakeholders. Meanwhile, local ordinances provided specific justifications for proposed programs and strategies.

Some of the policies that have direct impacts on the utilization and course of management strategies are as follows:

- **Presidential Decree 538**
  
  This decree gave PHIVIDEC the power to utilize, alter, and/or modify certain bodies of water which traverse industrial areas within the municipalities of Villanueva and Tagoloan.

- **Republic Act 8435**
  
  This prescribed the Department of Agriculture (DA) to coordinate with DENR concerning preservation and rehabilitation of watersheds to support irrigation systems and to promote development and preservation of the ecosystem in areas where agriculture and fisheries activities are carried out. Multiple benefits could be derived such as the ability to supply a significant amount of water for agricultural and aqua-cultural activities, thereby supporting two major contributors of income-generation for the dependent communities.

**g. Water Accounting**

Water accounting was done using a water balance approach to quantify the amount of water entering and leaving a system. Enabling the concerned government agency to do this is essential in order to plan for the development, allocation, and management of water resources. Water accounting can assist in multiple water use, shifting from a lower to a higher-value use, or in improving the productivity of water and target intervention. The potential impacts on all stakeholders were likewise considered.

One scenario considered was the projected substantial increase of Mindanao’s demand for power supply. As reported by the Department of Energy last year, the demand for power will increase to 2,068 MW in 2020 and 3,250 MW in 2030 from 2012’s projected peak demand of 1,407 MW. This change may require a new water allocation strategy since conflicting interests may arise from the agriculture sector (accounting to around 82% in total water use), industries (more or less 10%) and the hydropower system.
h. Water Related Projects

Irrigation projects, water facility constructions, and other related developments were looked into. These and other related studies focusing on environmental, structural, and developmental projects were also accounted. Documents that shed light to existing as well as planned development programs for the river basins or areas within them were examined. This included, but were not limited to: available development plans (provincial, municipal, and barangay level), CLUPs and FLUPs, biodiversity inventories, and climate change vulnerability assessments.

**Acquisition of GIS datasets and imageries**

Part of data collection was to access GIS datasets and imageries (including satellite images with analysis) of the river basin areas on the following:

- Administrative and political boundaries, base/topographical characteristics, slope and elevation, soil/geological characteristics, river networks, road networks, fault lines, land use, vegetative cover, socio-demographic characteristics, and other relevant data sets

**Data Analysis and Reporting**

The analyses of data focused on the following:

1. Analysis of social-demographic-economic conditions (population growth, poverty incidence, settlements, etc.)
2. Stakeholder and institutional analysis
3. Analysis of biophysical data w/ emphasis on the current conditions, problems, and effects of the land uses
4. Analysis of current land use with regards to conflicts, pressure, and changes
5. Land capability evaluation and zoning
6. Analysis of current land suitability and development opportunities
7. Analysis of current land use carrying capacity
8. Analysis of supply-demand of water, raw materials, and environmental services of industries, manufacturing sector, agriculture sector, energy sector, and hydropower
9. Assessment of watershed and river basin vulnerability to climate change

**Review of documents and projects related to River Basin Management**

Some projects related to river basin management which were supported by ADB and other funding agencies were reviewed to build on the lessons learned and the recommendations suggested for a better approach on sustainable management and development of the river basin.

An integrated assessment report was prepared and submitted to the RBCO.
ASSESSMENT REPORTS

This report is organized to have the following chapters related to Assessment:

Introduction
The Introduction part of this report focused on background information as to the Project Area, objectives of the Project, the methodology adopted, analysis done and strategies proposed. In conjunction with the objectives and scope of the project, the collection primarily of secondary data covering biophysical, socioeconomic, institutional and policy as well as acquisition of GIS data and imageries on watershed boundaries, land use (forest, agricultural lands and built up areas) was done. Moreover, the chapter presents a quick guide as to the different components of the project which are categorized into 1) Water Resources, 2) Watershed, 3) Wetlands and 4) Environment as affected by extreme climate events.

Tagoloan River Basin Area Profile

Location and Description
The Tagoloan River Basin is situated between 8°07" and 9°39" north latitude and 124° 44" and 125°12" east longitude in the provinces of Misamis Oriental and Bukidnon.

The river basin has a total drainage area of 1,577 square kilometers. Its main drainage is the Tagoloan River with a generally north western flow. The Macajalar Bay serves as the discharge point of the whole basin. A total of 10 municipalities and 94 barangays encompass the river basin’s network.

The major rivers of the river basin are Tagoloan River, Malitbog River, Siloo River, Titian River, Mangima River, Alulum River, Amusig River, and Dila River.

Climate
Tagoloan River Basin lies in two provinces in the region of Northern Mindanao: Misamis Oriental and Bukidnon. Using the Coronas Climate Classification, these two provinces fall under Type III and Type IV, respectively. Type III describes a climate that is relatively dry from the months of November to April and wet for the remaining months of the year. This climate mainly affects Misamis Oriental and Central Bukidnon. Type IV is characterized by rainfall that has relatively even distribution throughout the year.

Biophysical Profile
This chapter focused on the watershed and water resources aspect of the basin such as geomorphology, geology, drainage density, water inflows and outflows and potential water availability in the future, especially under climate change scenarios.

Almost 29% (53,012 ha) of the total basin area is devoted to cultivated annual crops (mostly pineapple) while just 14% (24,984 ha) is covered with closed forests. These forests are mainly situated in elevations above 1,500 masl. Open forests and land cultivated with perennial crops (sugarcane or banana) cover 10% (17,912.2 ha) and 7% (12,305.9 ha), respectively; while 39% (67,968.9 ha) are classified as grassland and other wooded lands. Built-up areas are sporadically scattered which aggregate partake 2% (2,865.7 ha) of the area. Among the sub-watersheds, Amusig and Dumalaguing have the highest forest cover at 44%, while Diklum and Colosotan are almost completely covered with annual crops (pineapple) with 96% and 95%, respectively. Tagoloan have 19% considered as built-up areas.
The estimated dependable surface water and projected demand of water resources reveal that seven percent (7%) of the Tagoloan watershed catchment is supporting the increasing demand for water supply currently used by municipal industries and by the agricultural sector.

The Lower Tagoloan River, which is supported by the Mangima River, has the highest dependable surface water of 1,142.53 MCM. The surface water demand in 1996 is estimated at 39 MCM; 29.7 MCM is used by the industrial sector while 9.3 MCM is exhausted by the agricultural and municipal sectors.

By 2025, the demand for water is projected at 176.6 MCM. Without proper management intervention to protect the water resource of Tagoloan River, the supply might not be enough to sustain the increasing demand of the increasing population dependent on the river system.

Flooding incidents within the Tagoloan River Basin are normally classified as fluvial (or those occurring along the river). Coastal flooding on the area is geographically limited, since the river basin is only connected to the coastal area through the main Tagoloan River outlet, located at the province of Misamis Oriental. MGB has identified some the flood prone coastal areas within Misamis Oriental.

Flooding incidents are generally caused by tropical cyclones that have made landfall in the Mindanao region. Based from the reports of the Manila Observatory (MO), an average of one (1) typhoon has hit Mindanao from 1883-1990. The report was based on data from the Joint Typhoon Warning Center (JTWC). JTWC reported that 35 tropical cyclones made landfall in Mindanao from 1945 to 2010 (65 years). MO inferred that an average of one tropical cyclone occurs in Mindanao every two years. From this assessment, the number of tropical cyclones hitting the island has decreased. However, in recent year, Mindanao has been hit by a series of strong storms and typhoons which included Sendong, Pablo and last year, Yolanda, among others. There seems to be a changing storm pattern in the region which could be linked to climate change.

**Existing Infrastructures**

The Tagoloan River Basin has many lined-up proposed development infrastructure projects and the major infrastructures include access roads, flood control, irrigation development, and power generation.

**Irrigation Development**

Irrigation is considered as a major factor in increasing crop productivity. From the outset, irrigation development in the country has been mainly focused on rice production. The National Irrigation Administration (NIA) is the government agency mandated to develop water resources for the purpose, and continues to be involved in all the necessary planning, design, construction and operation functions of irrigation systems. NIA has been spearheading the development of new systems, the opening of new service areas and the rehabilitation or restoration of existing irrigation systems.

The estimated irrigable area in Misamis Oriental and Camiguin combined is 13,014 ha. The NIA data do not provide a breakdown of the irrigable areas in Misamis Oriental and Camiguin.
There are many areas that are irrigable or are actually irrigated but are non-contiguous with slopes not exceeding 3%, and other areas with slopes greater than 3% that are irrigable. It is estimated that about 6.145 million hectares with slopes not exceeding 8% are potentially irrigable. Thus, in reality the country’s level of irrigation development is quite low, especially in Mindanao.

The status of irrigation development in provinces covering the Tagoloan River Basin, including only towns and barangays within the administrative boundaries of the basin shows that the mean percent irrigation development is 65.09% in the TRB. It is better than the country average of 55.59%.

**Power Generation**

Energy is fundamental to reducing poverty. It provides major benefits and opportunities such as job creation through energy-dependent industrial and manufacturing sector investments, improved basic services and increase in literacy rates. In Mindanao, addressing the energy deficiency is vital in poverty alleviation promoting peace and order.

Currently, there are four major coal-fired power plants proposed in Mindanao by two of the biggest power players in the country: the Alcantara-led Conal Holdings, and the San Miguel Energy. The two power plants of Conal Holdings is set to be built in Sarangani, while San Miguel plans to build its plant in General Santos City. Although the power plants are outside of the river basin, they can influence the river basin in several ways, both positive and negative. On the positive side, stable energy source will attract more investments and create jobs thus reducing pressure on the environment but on the negative side, it may pose environmental threats if left unmitigated to the island of Mindanao. The coal-fired power plants are geared towards providing additional power to the Mindanao Grid, which at present is barely enough to supply power to the island of Mindanao. The projected demand of the region will continually increase even when there are proposed projects aimed at increasing the committed electrical capacities in the Mindanao Grid. By 2030, the Mindanao Grid needs roughly around 3,500 MW to sustainably supply power in the island of Mindanao.

Within the scope of the river basin, the Tagoloan Hydroelectric Power Plant is being proposed by First Gen Corporation. Reports have located the project at Sumilao in the province of Bukidnon. At present, the project is in its exploratory stage and is set to be built by 2015.

**Basin simulation**

**Inundation Model**

Though storms should be rarely affecting Mindanao, in the recent past years, Mindanao was struck by a number of storms and typhoons. Last 2011, tropical storm Sendong devastated Mindanao greatly affecting Cagayan de Oro City and Iligan City.

A year after Sendong, a Category 5 typhoon based on US scale, again hit Mindanao. The typhoon is popularly known as Pablo. Among the affected areas, Davao Oriental and Compostela Valley were the most affected. Though not greatly affected, Lanao Del Sur and Lanao Del Norte were among the affected provinces by the typhoon.

The HEC-HMS model for Tagoloan watershed was run to simulate different rainfall scenarios at different points in the basin. Considering the main Tagoloan river outlet (“Outlet” element in HEC-HMS model) as the reference point provides the design hydrograph and peak flow at that point in the watershed. The design hydrograph
represents the magnitude of discharge entering the outlet from upstream sub-basins, while peak flow represents the highest discharge throughout the simulation period.

Just last year, the strongest typhoon Yolanda made a landfall to Visayas which is just near Mindanao. However, NDRRMC reported a total of 89 billion worth of damages. The damages occurred in ten (10) regions including Regions 10, 11 and CARAGA which are in Mindanao.

**Flood Simulation**

HEC-RAS and HEC-HMS equipped with the GIS software were used to simulate flood scenarios in selected areas in Tagoloan River Basin. Hydrological model developed in the HEC-HMS was used to determine flows in the river basin considering different rainfall scenarios. The flow scenarios were then inputted to the HEC-RAS model to determine the extent of flood along the floodplain in selected river reaches. It should be noted that accuracy of the model can be based on the resolution of the available DEM of the river basins. Due to low resolution of the DEM, the model was not enough to accurately represent the flood level in the considered floodplains along the river reaches in the river basin. Rather, the results of the HEC-RAS model only provided the extent of flood in the delineated floodplains.

All the shown flow events were only 10-year flow since simulation results showed less difference between the 10 and the other more rare events (25-, 50- and 100-year events). It should be noted that the results of simulation on water level or depth was not given so much importance since the cross sections were derived from DEM having low resolution. Flood extent was the most generalization that can be deduced from the result of the flood simulation.

**Simulation Results**

Flooding is most prevalent in Reach 01. The town encompassing Reach 01 is Tagoloan. The villages in the said town are very prone to flood which can scatter throughout the flood plain which extends at least 500 m from the main river. Water entering the whole river basin of Tagoloan drains in this reach. If areas in basin are simultaneously subject to rainfall event of high intensity and high duration, flow peaks in this reach, flooding the nearby villages of Tagoloan.

Flooding in the basin was found to pose serious problem in some reaches or tributaries of the River (e.g. Reach 09) which passes the town of Malitbog, Bukidnon. The tributary overflows when 10 year return period storm occurs. So with climate change which can give higher flows for higher T, then the town will experience serious flooding in the future. Thus flood mitigating measures (both structural and non-structural) should be planned/implemented to avoid serious damage to properties and society.

**Socioeconomic**

Water is a critical resource that is shared by all, particularly by households for domestic use, private water and power companies, agro-industries and business establishments. This therefore demands equitable water governance system since many of lowland and upland farmers are deemed to be displaced if priority programs of the river management council will focus more on non-farm sectors particularly hydropower generation.

Non-government organizations, academe and funding institutions have critical roles in promoting river basin conservation, and improving tenure security and climate change adaptation capacities of local communities. They have both funds and
technical capacities to empower local communities hence their roles were properly reflected in the integrated river basin management plan.

Though limited in their capacity to influence river basin policies and programs, the barangay–level service volunteers, police, military, women’s associations and other civic organizations have important roles that need to be strengthened in the river basin management plan. These groups have niche in grassroots works hence further tapping them in IEC, environmental law enforcement and social work will surely make progressive paces to improve the well-being of the people in the river basin.

**Stakeholder Alliances and Conflicts**

River basin protection appeared as the most popular concern that cements alliances of various government and non-government stakeholders in the river basin. This was expressed in terms of collaborative partnerships in forest protection, reforestation, law enforcement and financing watershed rehabilitation projects. Respect for indigenous people’s rights over the watershed was also identified as another binding concern among tribal groups, LGUs and NCIP. Lastly, environmental awareness campaign was listed as an allying factor among academic institutions.

Future river basin programs should build upon these existing alliances. Providing these groups with projects that will further enhance their collaboration will also help uplift their commitment towards river basin conservation. It is also important that such projects will help align their goals with the overall vision for the whole Tagoloan River Basin.

Political boundary dispute was revealed as the most pressing concern among LGUs since it has serious implications on income opportunities from development projects (e.g. hydropower generation, agro-industries, etc), voting population, and delivery of social services. It is critical for the river basin council to help resolve this issue through close consultations with LGU officials and indigenous people's groups; careful review of historical boundary maps; and precise delineation of boundaries using GIS.

Lack of proper consultation over the extraction and commercialization, overwatering ancestral domains was also raised as an important concern of IPs against local water districts. Tribal communities believed that such commercialization degrades the spiritual and cultural values of the watersheds. Further, the absence of incentives for their efforts in protecting springs and rivers has emerged as an issue of injustice that needs to be addressed.

DENR raised the concern about illegal mining which are allegedly being allowed by local politicians in their area of jurisdiction. In addition, they also stressed the inequity issue regarding the income from mining permits which is funneled only to LGUs and politicians instead of DENR. Such problem transpired due to lack of proper coordination between these institutions.

The degradation of water quality due to toxic effluents from small-scale mining and agricultural plantations has created conflicts among local communities, small-scale miners and agro-industrial companies. Local communities believed that river basin council should arrest the proliferation of these industries since they put serious threat on the health of the people as well as the biodiversity surrounding them. Hence it is important to reflect in the integrated river basin management plan the conduct of environmental impact assessment and strict observance of identified mitigation measures.
Policy Assessment
The policy assessment in relation to the formulation of an Integrated River Basin Management and Development Master Plan (IRBMDMP) for the Tagoloan River Basin can be summarized into three (3) points - the recognition among stakeholders for the necessity of an IRBMDMP; the general opinion that policy implementation is required to address the protection of the Tagoloan River Basin; and the readiness of the stakeholders to participate and commit towards an integrated management and development of the Tagoloan River Basin.

Recognition of the Necessity for an Integrated River Basin Management and Development Master Plan (IRBMDMP)
The responsibility and accountability to protect, manage, and develop the Tagoloan River Basin is no longer an issue among the stakeholders of the said river basin, inclusive of which are the indigenous cultural communities, local government units, civil society organizations, religious groups, and other sectors. The individual efforts of these stakeholders such as facilitating development projects, community organizing, and continued lobbying have undeniably helped in the management and development of the Tagoloan River Basin.

For instance, the LGUs near the Tagoloan River Basin have developed various mechanisms in order to mitigate flood effects, such as the creation of a rescue, relief and recovery team, allocation of 5% disaster risk reduction and management fund, communication via SSB radio, temporary evacuation, cash for work, community volunteers, calamity loan for members of SSS and GSIS, and partnership with private companies through MOU.

The local government unit of Misamis Oriental has been doing research and watershed management activities in Macalajar Bay. Malaybalay City has also initiated a Payment for Environmental Services (PES) system while another LGU has allocated funds for agroforestry projects.

While these efforts may relatively have been beneficial to certain sectors, the stakeholders recognize that an integrated framework will address policy gaps, prevent overlapping plans and projects, and will likely result to a long-term program for the Tagoloan River Basin and the communities therein. Some of the suggestions and comments from the focus group discussions (FGDs) reflect this recognition for an IRBMDMP to be developed:

“Coordination of large river basins may be easier if management is divided into sub-watershed management groups.” – M. G. Isip, Executive Director, RBCO

“Coordination with PENRO may help in formulating the IRBMDMP.” – J. S. Bascug, Assistant Provincial Planning Officer, LGU-Misamis Oriental

“Funded by PRIMEX, the Upper Tagoloan Management Framework Plan has been on-going for two years already, and has already been submitted to the Provincial Governor. How will this management plan and this project’s river basin plan coexist in the same area?” – A. A. Caniba, PENRO Malaybalay.
Sufficient Policies, Deficient Implementation

Concerns and challenges on the resources and governance of the Tagoloan River Basin are already covered and supposedly being addressed by the existing policies enumerated above. The effective implementation of these policies appears to be the problem nonetheless. This is illustrated with comments by participants such as, “The implementation of policies and laws are constrained by political interventions” and “Law implementers are afraid to carry out their functions due to threats posed by highly influential entities.”

According to the stakeholders, while there are certain policies that have to be reconciled and harmonized such as those concerning political boundaries and jurisdictional overlaps, the more pressing concern is on the execution of mandates and existing policies.

The stakeholders identified activities such as continued illegal mining and timber poaching, conversion of ancestral and forest lands to industrial plantations and illegal extraction of sand and gravel, to illustrate the dilemma of having policies that fail to translate into results. Other challenges include the enforcement of the log ban on natural forests, the loose regulation of multi-national companies, and the imposition of penalties to violators of local and national policies concerning the Tagoloan River Basin.

The general sentiment among stakeholders is that the crafting of policies and formulation of plans and frameworks would prove futile if the people and agencies mandated to enforce them would not comply, for reasons such as the bureaucratic red tape, corruption, funding constraints, and lack of political power. One participant even gave the possibility that enforcers of such policies are pressed not to carry out their duties for fear of “threats posed by highly influential entities.”

Because of the agreement that “good governance and political pressure” are important in the development and management of the Tagoloan River Basin, some participants are of the opinion that there is no need to focus much attention to amending or refining of existing policies. What is more important is the formulation of a set of actions to ensure that such existing policies are enforced.

The Tagoloan River Basin Management Council: A Case of Stakeholder Participation

Multi-stakeholder consultation and participation has proved to be meaningful in the management and development of the Tagoloan River Basin. The involvement and cooperation of indigenous communities, various sectoral and civil society organizations (CSOs), local government units (LGUs), government agencies, academic and religious institutions, and in some cases, business associations, affected and dependent on the Tagoloan River Basin have become more persistent especially with threats of floods and other disasters due to the effects of climate change.

While still far from being an effective and efficient organization, the commitment of these stakeholders is evident to be organized into one responsible and accountable body. An illustration of this is the creation of the Tagoloan River Basin Management Council (TRBMC) on December 6, 2013. Through the signing of a Memorandum of Agreement (MOA) among stakeholders and LGU heads representing eight (8) towns in Bukidnon and Misamis Oriental, the Tagoloan River Basin Management Council
was established to administer the implementation of the plans and programs for the protection, rehabilitation, and management of the river basin. Currently chaired by Malaybalay Bishop Jose Cabantan, the TRBMC is hoped and expected by the stakeholders to play a vital role in the formulation of the Integrated River Basin Management and Development Master Plan.

**Institutional Setting**

Various key government agencies from national and sub-national levels, sectoral groups and civil society play important roles in river basin management and development. The institutional arrangements of these agencies possess differing relationship in terms of mandates and functions. Nevertheless, they have pertinent roles to carry out under the components of river basin management and development framework, namely: water resource management, watershed management, wetland management, flood management and institutional development.

To implement these management strategies and as a solution to further eliminate the issue of fragmentation, lack of coordination, in efficiency and overlaps, there must be a coordinating mechanism that would harmonize the initiatives in the river basin. Also, there should be a coordinating body to facilitate delivery of goods and services by the stakeholders as well as provide mechanisms for conflict resolution among stakeholders.

The existing Tagoloan River Basin Management Council could be a foundational mechanism for the operation of an RBO for Tagoloan River Basin. Beyond the Memorandum of Agreement that binds and expresses the commitments of various groups for managing the Tagoloan River Basin, different issues and concerns poses critical challenges for the TRBMC which must be addressed to further its institutional development. Overlaps and duplications, not only in the roles and mandates of governance bodies such as BWPDC and LGUs but also in development approaches (i.e., INREMP), must be thoroughly examined for harmonization and to avoid fragmentation.

The lessons learned from Philippine experiences and the assessments from the comparison of cases of river basin management accent the indispensable characteristics of a river basin organization that we must refer and tailor fit to the context of the river basin in focus. The three main points in river basin governance: a) organizational structure of RBOs, b) decentralization, relation of government units and ownership, and c) financing of RBOs, must be regarded as requirements in constructing the RBO for the Tagoloan River Basin.
MANAGEMENT AND DEVELOPMENT PLAN

Human welfare and well-being is inextricably tied with the ability of the ecosystem to deliver its essential services. The assessment findings as summarized in the Problem Diagram in Figure 3 indicate that the Tagoloan River Basin is faced with interconnected biophysical, socio-political, economic and institutional problems. Such problems impair the delivery of key values, namely its supporting (flood mitigation and primary production), provisioning (water, fertile lands, timber, non-timber products, biodiversity and hydro-energy), regulating (climate regulation, agro-industrial waste filtering, water purification), and cultural (recreational, spiritual and educational) values of the river basin.

The present state of the river basin is brought about by several foundational problems such as increasing population, land tenure issues, weak regulatory mechanisms, poor institutional capacities to implement policies and mandates, patronage politics, limited inter-sectoral collaboration over river basin management, and various natural stressors (e.g. climate-related disasters such as floods and landslides). Conflicts of interests persist due to lack of clear mechanisms to identify and harmonize roles, functions, responsibilities and rights of different managers of the river basin. These conflicts are expressed in various forms such as political boundary disputes among LGUs, overlapping tenure instruments in forestlands, poor planning, unappreciated land rights, inadequate and inappropriate infrastructures to manage water and land resources, as well as poorly regulated agro-industrial development, settlement, small scale mining, quarrying and other resource extraction activities.

The local stakeholders associated wetland degradation with: river bank erosion due to quarrying and unregulated small-scale mining; conversion of mangroves to other land uses such as industrial ports and power plant, and lack of clear land use zoning to protect the wetlands. The continuous siltation and sedimentation of river systems is aggravated by agro-industrial activities thus negatively affecting local livelihoods particularly fishing. Mangrove deforestation also contributes to increase in the vulnerability of coastal communities to disasters such as storm surge and tsunami.

The socio-economic impacts are overwhelming as seen in the loss of livelihood and income opportunities, low incomes, displacement of small-holder farmers, and damage to properties. On the other hand, the deterioration of watershed values were attributed to conflicting resource use, over-extraction of resources, unsustainable land use conversion, thus resulting to erosion, biodiversity loss, water quality deterioration, to name a few. This leads to an undervaluation of the resources within the river basin (flora and fauna) with implications of an untapped sustainable economic and ecological potential. The advent of climate change amplifies the magnitude of environmental degradation and vulnerabilities of poor and already marginalized sectors.

For the planning period envisioned which cuts through 2020, this is untenable as it leads to further loss of river basin values, environmental degradation, poverty, loss of lives and damage to property. The Formulation of an Integrated River Basin Management and Development Master Plan for the Tagoloan River Basin seeks to address the challenges and problems identified in during the assessment and prepare a roadmap for a more productive and sustainable river basin.

The development planning process started with the assessment of the river basin using the DPSIR Framework (Driving Forces, Pressures, Impacts, State and...
Response) framework and the Problem Diagram. Both analytical frameworks integrate the causal factors affecting natural resources in the TRB, specifically Water Resources, Watershed, Wetlands and the Environment, as a whole, as affected by extreme climate events and the corresponding Responses or strategies which can mitigate the impacts on the resources.

STRATEGIES

• DPSIR Framework

Some strategies adopted to better manage the TRB include the application of DPSIR (Driving Forces, Pressures, Impacts, State and Response) framework which integrates the causal factors affecting natural resources in TRB which include Water Resources, Watershed, Wetlands and the Environment, as a whole, as affected by extreme climate events and the corresponding Responses or strategies which can mitigate the impacts on the resources.

With this framework (Figure 2), it is envisioned that future scenarios of climate and land use change can be analyzed and evaluated so that possible interventions to address the causal factors affecting the sustainability of the resources can be formulated and adopted.

![DPSIR Framework for Resource Assessment and Management](image)

Figure 2. Driving Forces-Pressure-State-Impacts-Responses (DPSIR) Framework for Resource Assessment and Management of Tagoloan River Basin.
• **Problem Diagram**

The problem diagram is a conceptual approach which identifies and relates the various factors influencing the state of the river basin. This will provide a better understanding of the causes and effects of the interactions among a number of factors. The problem diagram attempts to identify the root causes or foundational problems classified into socio-economic, cultural, political, institutional and natural stressors and how it impacts the thematic ecological areas namely, water, watershed and wetlands. The systematic identification of hierarchy of cause and effect starting from the foundational problems will allow determination of the critical factors that have to be addressed to create an impact (Figure 3). Ultimately, if the critical factors negatively influencing the riverbasin is not addressed, the quality of life of the people and the riverbasin values will further deteriorate.
Figure 3. Problem Diagram of the Tagoloan River Basin.
Vision, Mission, Goals, and Development Objectives

**Vision**

With the current and near foreseeable future of the Tagoloan River Basin in peril, where quality of life is threatened because of the inability of the basin’s resources to provide for provisioning services, regulating services, cultural services and supporting services, the stakeholders have agreed on the following vision statement:

> A sustainable and climate change resilient Tagoloan River Basin managed by empowered stakeholders imbued with cultural values, equitably sharing the responsibilities and benefits in protecting the ecosystems.

Each of the thematic concerns namely water, watershed, wetlands and extreme climatic events have similarly crafted their vision and goal statements in turn. This thematic vision and goals would make action in the river basin more focused following the IRBMD framework while collectively working towards the common vision.

**Water** - A safer community of empowered people living in harmony, equally sharing the bounties and responsibly protecting the ecosystems for generations to come.

**Watershed** - Tagoloan River Basin as a climate change-resilient ecosystem managed by empowered, dynamic and motivated communities imbued with cultural values towards sustainable development.

**Wetlands** – A sustainably managed Tagoloan River Basin with a maintained beauty and integrity through the collective action of united and empowered people toward its development and prosperity.

**Climate Effects** – A sustainably-managed Tagoloan River Basin with empowered stakeholders who are resilient to climate change.

**Mission**

From the Vision crafted by the stakeholders, it was further developed to create a mission statement to guide the formulation of development goals and objectives by providing a thorough framework to attain the long-term vision for the river basin. The mission statement reads as:

> “Promote Human, Environmental and Ecological Security”
### Thematic Goals

Table 1. Goals per thematic group.

<table>
<thead>
<tr>
<th>Group</th>
<th>Vision</th>
<th>Goals</th>
</tr>
</thead>
</table>
| Water   | A safer community of empowered people living in harmony, equally sharing the bounties and responsibly protecting the ecosystems for generations to come.                                                                                   | Protect, enhance and rehabilitate water resources for domestic, industrial, agricultural, power generation and other uses  
Ensure maximum sustainable and equitable distribution of economic and social benefits from water resources  
Ensure sustained water quantity, quality and even distribution  
Improve wastewater management and disposal  
Strict implementation of Clean Water Act and all related environmental laws and regulations |
| Watershed | Tagoloan River Basin as a climate change-resilient ecosystem managed by empowered, dynamic and motivated communities imbued with cultural values towards sustainable development.                                      | Protected from mining, quarrying and timber/wildlife poaching  
Protect, enhance and rehabilitate the watershed  
Introduce and implement sustainable farming practices  
Build resilience of the biodiversity, ecosystems and communities against impacts of climate change and unsustainable resource utilization  
Increase income/production of the deprived disadvantaged and underserved households |
| Wetlands | A sustainably managed Tagoloan River Basin with a maintained beauty and integrity through the collective action of united and empowered people toward its development and prosperity.                                           | Protect, enhance and rehabilitate the wetlands  
Sustain inflow of adequate and clean water  
Build resilience of the wetlands, including biodiversity, against increase siltation and other related impacts of climate change, unsustainable resource utilization and pollution |
## Executive Summary

### Group Vision

**Extreme Climate Events**

A sustainably-managed Tagoloan River Basin with empowered stakeholders who are resilient to climate change.

- Reduce risks from floods, landslides and other geohazards

**Cross-cutting**

- Strengthen the present Tagoloan River Basin Management Council
- Culturally-sensitive environmental education at household, school and community levels
- Equally share bounties
- Translate national policies to local ordinances appropriate to concerns and conditions of the Tagoloan River Basin
- Promote science- and information-based decision making
- Promote good governance
- Harmonize conflicting tenurial instruments and rationalize access to Tagoloan River Basin land resources

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**VOLUME 1 – EXECUTIVE SUMMARY**
**Development Objectives**

Table 2. Development objectives per thematic component.

<table>
<thead>
<tr>
<th>Development Plan</th>
<th>Development Objectives</th>
</tr>
</thead>
</table>
| Water Resources Management               | 1. Increase water supply for domestic, agricultural and industrial uses;  
2. Increase access to safe water and strengthen the regulation of water.                                                                                     |
| Watershed Management and Rehabilitation  | 1. Rehabilitate the degraded portions of the watershed  
2. Introduce and implement sustainable farming practices  
3. Create a mechanism for stronger coordination among all stakeholders in the watershed  
5. Strictly implement all laws and regulations on mining and agricultural land conversions                                                                 |
| Biodiversity and Wetland Management      | 1. Assess, survey, delineate and diversity assessment of wetlands in Tagoloan River Basin;  
2. Raising the quantity and quality of water from the river for household, fisheries, irrigation and hydro-power generation purposes;  
3. Conservation of ecological security and biodiversity; and  
4. Improvement of the overall management of the river and the coastal areas through wetland management and policy formulations.                                    |
| Climate Change Management                | 1. Address Tagoloan River Basin degradation and encourage responsible utilization of its resources  
2. Engage active participation of stakeholders in all plans and programs of Tagoloan River Basin  
3. Develop a resilient community and environment within Tagoloan River Basin                                                                                       |
| Human Development                        | 1. Reduce poverty incidence  
2. Better health/sanitation condition  
3. Reduce land, land use and other conflicts  
4. Increase people participation or involvement in Tagoloan River Basin protection and rehabilitation efforts and develop sense of ownership in development projects  
5. Capture the benefits provided by the ecosystems in Tagoloan River Basin  
6. Set an efficient water pricing and allocation                                                                                                                   |
| Institutional Development               | 1. Create an inclusive, viable and functional Tagoloan River Basin Organization  
2. Formulate processes, systems and procedures towards good river basin governance                                                                                |
Integrated River Basin Management and Development

Formulated by RBCO in 2007, the Integrated River Basin Management and Development (IRBMD) Framework is the basic system for all strategies in the Philippines for sustainable river basin ecosystem management. Figure 4 shows the four principal frameworks and development strategies: Integrated Water Resources Management, Integrated Watershed Management, Wetland Management, and Flood Mitigation.

1. **Integrated Water Resources Management** – manages fresh water as an economic and public good while recognizing its vulnerability and limited supply.

2. **Integrated Watershed Management** – organizes land, people, and other resources in the watershed to provide goods and services without harming the soil and water.

3. **Wetland Management** – manages areas that are submerged or soaked by enough surface or groundwater to support ecosystems such as mangroves, coral reefs, swamps, rice paddies, estuaries, lakes and reservoirs.

4. **Flood Mitigation** – protects and enhances coping capacities of communities and the environment against water-induced hazards.
WATER RESOURCES MANAGEMENT PROGRAM

The general strategy to be employed aims for the rational balance among water resources utilization, development, and conservation. The local water districts shall endeavour to improve the domestic water supply of the surrounding communities by establishing piped water systems, tapping either groundwater or surface water. The funds can be sourced from the wealth share of the community from existing and planned power generation projects in the river basin.

For irrigation, existing national and communal irrigation systems (NIS&CIS) within the river basin shall be properly repaired and continuously maintained. The organization that funds these endeavours, whether the NIA or NPC, shall be properly resolved within the Council to be established. Case in point, a weir has been damaged during an earthquake, but since it was constructed using NPC budget, NIA refused to repair the system, to the detriment of the Irrigator’s Associations and farmers. NIA has several NIS and CIS projects proposed within the area, but due to limited budget and changing leadership in NIA, these have been shelved temporarily. These projects shall be pursued in the immediate future to attain food security and agricultural sustainability within the river basin. The construction of small scale irrigation systems such as small water impounding projects (SWIPs) or shallow tubewells (STWs) is recommended for the numerous patches of irrigable areas. SWIPs are recommended for areas with rolling hills and STWs for shallow aquifers.

Irrigation continues to be a priority project of the government, but as previously mentioned, focus in the near future will be on rehabilitation and restoration (Razo 2014, personal communication). The remaining irrigable area that still need to be developed in the country, Region 10, and in the localities within the administrative boundaries of the Tagoloan River Basin were shown in Tables 1 to 3. About 35% in Tagoloan (1,666 ha) that are within the river basin watersheds still need to be developed for irrigation purposes.

At the variable rate of irrigation development in the country from 1951 to 2013 which averaged 1.9%, it will take about 15-20 years before all irrigated areas will be firmed up.

It should again be noted that the irrigable areas for development by NIA are those contiguous areas of 100 hectares or more with slopes not exceeding 3%. Considering the level to mountainous terrain of the river basin, considerable area has been left out for irrigation development by NIA.

The World Bank–Irrigated Agricultural Sector Review (1981) definition of irrigable lands includes those with 8% slopes or less. Assuming that there is no land use conflict (e.g., as timberlands), about 11,000 more hectares may be irrigated as part of the development strategy, using small-scale, privatized, cost-effective and efficient irrigation technologies appropriate for agricultural crops cultured. In the TRB, a total of 27,506 hectares of land have 0-8% slope. With only 4,772 hectares considered by NIA as irrigable, about 22,734 more hectares may possibly be irrigable.

Objectives

1. Increase water supply for domestic, agricultural and industrial uses, and;
2. Increase access to safe water and strengthen the regulation of water resource use.
### Table 3. Projects and Programs for Water Resources Management.

<table>
<thead>
<tr>
<th>Programs/Projects</th>
<th>Total Estimated Cost (P'000)</th>
<th>Location</th>
<th>Source of Funds</th>
<th>Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WATER PROGRAM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Agriculture</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic Irrigation Development for the Tagoloan River Basin (STRIDE)</td>
<td>1,748,500</td>
<td>Selected sites in Bukidnon and Misamis Oriental within the Tagoloan River Basin (TRB)</td>
<td>DA-BSWM., LGUs, JICA, NGOs, Public-Private Partnerships</td>
<td>LGU, NIA, NGOs, RBCO, Farmer/beneficiary groups</td>
</tr>
<tr>
<td><strong>Energy Development</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tagoloan Hydroelectric Power Project</td>
<td>4,000,000</td>
<td>Impasug-ong and Sumilao</td>
<td>PPP</td>
<td>LGU, First Gen Mindanao Hydro Power Corp.</td>
</tr>
<tr>
<td><strong>Pollution Control and Mitigation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design and Build Sewage Treatment Plant (STP) for domestic wastes</td>
<td>100,000</td>
<td>Tagoloan</td>
<td>ODA, DENR</td>
<td>LGUs, DENR</td>
</tr>
<tr>
<td>Establishment of Decentralized Wastewater Treatment System (DWATS)</td>
<td>100,000</td>
<td>ManoloFortich, Impasugong, Sumilao, Malitbog and Villanueva</td>
<td>ODA, DENR</td>
<td>LGUs, DENR</td>
</tr>
<tr>
<td>Establishment of Sanitary Landfill</td>
<td>25,000</td>
<td>Malaybalay City</td>
<td>ODA, DENR</td>
<td>LGUs, DENR</td>
</tr>
</tbody>
</table>
## Long-term data collection of water resources

<table>
<thead>
<tr>
<th>Programs/Projects</th>
<th>Total Estimated Cost (P'000)</th>
<th>Location</th>
<th>Source of Funds</th>
<th>Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation of gauging stations in major tributaries</td>
<td>8,500</td>
<td>1. At or near the mouth of Tagoloan River</td>
<td>DPWH, DOST-ASTI, DA-NIA, NPC-First Gen Mindanao</td>
<td>1. DPWH-BRS: major tributaries and at the mouth of Tagoloan river prior to Macajalar Bay;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. At selected locations in a river prior to water diversion, i.e. irrigation system</td>
<td></td>
<td>2. DA-NIA for river flows to National and Communal Irrigation Systems;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. At the downstream of rivers near mining concessions</td>
<td></td>
<td>3. NPC-First Gen Mindanao for flows to HEP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. At or near the mouth of rivers in the major watersheds/tributaries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation of piezometer wells</td>
<td>17,000</td>
<td>1. At or near local water district pumping stations</td>
<td>NPC, LWUA-local water districts, DA-NIA, LGU, DOH</td>
<td>LWUA-local water districts, LGU-DOH, NPC, DA-NIA</td>
</tr>
<tr>
<td>for groundwater level and quality monitoring</td>
<td></td>
<td>2. At the downstream side of major residential centers</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. At selected sites particularly downstream of large plantations and mining operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Siltation Study of Tagoloan River Basin</td>
<td>8,000</td>
<td>Tagoloan River Basin-wide</td>
<td>GOP, ODA</td>
<td>LGU, DPWH</td>
</tr>
<tr>
<td>Estimation of the demand for and supply of improved water and sanitation services</td>
<td>15,000</td>
<td>Tagoloan River Basin-wide</td>
<td>DENR-RBCO, ADB, World Bank, FAO, LGU, water districts, NIA, NWRB, NPC, private institutions</td>
<td>DENR-RBCO and proposed River Basin Management Council</td>
</tr>
</tbody>
</table>
WATERSHED MANAGEMENT AND REHABILITATION

Watershed degradation in the Tagoloan River Basin is perceived to be the results of unsustainable land uses. In the upper portions of the river basin, the conversion of forests into agricultural production systems which are often intensive and follow the destructive monocropping schemes have resulted to soil erosion and the consequent siltation of rivers. Poor dissemination of appropriate farming technologies to the upland farmers has further aggravated the problem. In addition, the conversion process is aggravated by the continuous influx of people from the lowlands and the lack of viable alternative livelihoods in the uplands.

The unregulated extraction of forest resources has brought about the destruction of habitats and food sources for the wildlife ultimately leading to their displacement. The same holds true for the floral resources in the area. A problem too is the lack of sound baseline information that would allow for the implementation of prescriptions for the sustainable management of these resources. Finally, traditional farming practices which are oftentimes destructive in nature continue to proliferate due to the lack of alternative livelihoods for the communities and the lack of extension efforts to disseminate and encourage the use of sustainable farming technologies.

Objectives

1. Preserve and rehabilitate the watersheds.
2. Institutionalize transparent, accountable and predictable decision-making and actions of actors.
3. Harmonize conflicting tenurial instruments and rationalize access to TRB land resources consistent with the general framework of the basin.
4. Protect, preserve and restore biodiversity within Tagoloan River Basin.
5. Increase income/production of the deprived, disadvantaged and underserved households within the Tagoloan River Basin.
Table 4. Projects for Watershed Rehabilitation, Protection and Management.

<table>
<thead>
<tr>
<th>Programs/Projects</th>
<th>Total Estimated Cost (P'000)</th>
<th>Location</th>
<th>Source of Funds</th>
<th>Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WATERSHED PROGRAM</strong></td>
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<tr>
<td><strong>Biodiversity</strong></td>
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<tr>
<td>Tagoloan River Basin Biodiversity Long Term Ecological Assessment &amp; Monitoring Plots</td>
<td>8,000</td>
<td>Provinces of Bukidnon and Misamis Oriental in the municipalities of Claveria, Villanueva and Tagoloan</td>
<td>DENR, WWF, PTCF, Conservation, WWF, Birdlife International, Private-Public Partnership LGUs, ADB, World Banks, Conservation International, SCU’s, NPC, DOSt</td>
<td>DENR-RBCO-BMB, CMU, LGU, UP, Local Communities</td>
</tr>
<tr>
<td>Tagoloan Biodiversity Corridors Development and Management</td>
<td>12,000</td>
<td>Provinces of Bukidnon and Misamis Oriental in the municipalities of Claveria, Villanueva and Tagoloan particularly in the four major mountains in the Tagoloan River Basin</td>
<td>DENR, WWF, PTCF, Birdlife International Private-Public Partnership LGUs ADB, World Bank, Conservation International, SCU’s, NPC</td>
<td>DENR-RBCO-BMB, CMU, LGU, UP, Local Communities</td>
</tr>
<tr>
<td>Tagoloan River Basin Wildlife Rescue Center</td>
<td>10,000</td>
<td>DENR Regional Office or CMU</td>
<td>DENR, BFAR, WWF, PTCF, Birdlife International, PPP, LGUs, ADB, World Bank, Conservation International, SCU’s, Internal Revenue Allocation to Municipalities, Project funds from development agencies, GTZ, AUSAid, JICA, SIDA, CIDA, other international NGOs, etc., Water use fees from NPC for watershed management</td>
<td>DENR-RBCO-BMB, CMU, LGU, UP</td>
</tr>
<tr>
<td>Programs/Projects</td>
<td>Total Estimated Cost (P'000)</td>
<td>Location</td>
<td>Source of Funds</td>
<td>Implementing Agency</td>
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<tr>
<td><strong>Watershed</strong></td>
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</tr>
<tr>
<td>Forest Protection</td>
<td>96,270</td>
<td>Areas classified as forest lands in the Tagoloan Watershed Management Framework Plan</td>
<td>DENR, LGUs and NGOs within the River Basin</td>
<td>DENR, LGUs and NGOs within the River Basin</td>
</tr>
<tr>
<td>Forest Rehabilitation and/or Restoration</td>
<td>128,360</td>
<td>Open and marginal grasslands within the portions of the natural parks; watersheds within the different municipalities that are inside the Tagoloan River Basin</td>
<td>DENR, LGUs and NGOs within the River Basin</td>
<td>DENR, LGUs and NGOs within the River Basin</td>
</tr>
<tr>
<td>Agroforestry through the Conservation Farming Villages (CFV) Approach</td>
<td>138,230</td>
<td>Agroforestry and agriculture sub-zones as identified in the Draft Tagoloan Watershed Management Framework Plan</td>
<td>DENR, LGUs and NGOs within the River Basin</td>
<td>DENR, LGUs and NGOs within the River Basin</td>
</tr>
<tr>
<td>Forest plantations, Fire Protection and Control</td>
<td>64,180</td>
<td>Agroforestry and agriculture sub-zones as identified in the Draft Tagoloan Watershed Management Framework Plan</td>
<td>DENR, LGUs and NGOs within the River Basin</td>
<td>DENR, LGUs and NGOs within the River Basin</td>
</tr>
<tr>
<td>Regulating Small-scale Mining Operations</td>
<td>150,000</td>
<td>Municipalities within the river basin with existing and potential mining activities.</td>
<td>LGUs within the River Basin; Small Scale Miners</td>
<td>LGUs, Small Scale Miners</td>
</tr>
<tr>
<td>Regulation of Land Conversion to Agricultural Purposes or Uses</td>
<td>150,000</td>
<td>Timber production, timber regeneration, and forest restoration zones.</td>
<td>LGUs, Corporate Farmers</td>
<td>LGUs, Corporate Farmers</td>
</tr>
<tr>
<td>Developing and/or Enhancing Ecotourism Potential of the River Basin</td>
<td>200,000</td>
<td>Local government units with existing and potential ecotourism destinations in the river basin.</td>
<td>Local Government Units</td>
<td>LGU, RBC, DOT</td>
</tr>
</tbody>
</table>
Biodiversity and Wetland Management

Biodiversity is an important component of watershed. However, habitat degradation in watershed leading to biodiversity loss needs to be addressed through various complementary strategies. Tagoloan River Basin is subjected to anthropogenic disturbances and agro-industrial expansions that lead to habitat degradation and biodiversity loss. Mt. Kitanglad Range National Park, established as a protected area under the NIPAS as per RA 8978 dated 9 November 2000, is one of the headwaters of the Tagoloan River Basin. It is one of the few remaining rainforests in the Philippines, harbouring important diverse species of rare and endemic flora and fauna such as the Philippine Eagle. It is also categorized as a Key Biodiversity Area (KBA) in the Philippines. As a KBA, it will help the government and stakeholders prioritize conservation action and devise geographically specific strategies that protect the individual species and safeguard representative habitats (Edgar et al. 2008).

The River Basin Council should therefore conduct thorough biodiversity and ecosystem health assessment and monitoring in order to identify sites that need immediate conservation efforts and to identify specific drivers and culprits of degradation. Such information can also be transformed to IEC materials that will help spread awareness about the importance of wetlands, and more importantly to provide LGUs and other relevant government institutions with the scientific knowledge for crafting local policies and programs.

On the other hand, wetlands is the collective term for lakes, rivers, swamps, marshes, wet grasslands, peat lands, oases, estuaries, deltas, tidal flats, near-shore marine areas, mangroves, coral reefs and even man-made sites like fish ponds, rice paddies, reservoirs and salt pans. Wetlands are found in flat vegetated areas, in depressions on the landscape, and between water and dry land along the edges of streams, rivers, lakes, and coastlines. Inland wetlands receive water from precipitation, ground water and/or surface water. Coastal and estuarine wetlands receive water from precipitation, surface water, tides, and/or ground water. Surface water sources include runoff and storm water. More recently, society has begun to understand the functions of wetlands and the values humans obtain from them.

Wetlands help regulate water levels within watersheds; improve water quality; reduce flood and storm damages; provide important fish and wildlife habitat; and support hunting, fishing, and other recreational activities. Wetlands are important features in watershed management. Wetlands store precipitation and surface water and then slowly release the water into associated surface water resources, ground water, and the atmosphere. Wetland types differ in this capacity based on a number of physical and biological characteristics, including: landscape position, soil saturation, degree of decomposition of the organic soils, vegetation density and type of vegetation.

Wetlands help maintain the level of the water table and exert control on the hydraulic head. This provides force for ground water recharge and discharge to other waters as well. Ground water recharge occurs through mineral soils found primarily around the edges of wetlands. Wetlands are among the most productive ecosystems in the world (Mitsch and Gosselink, 1993).

Immense varieties of species of microbes, plants, insects, amphibians, reptiles, birds, fish, and other wildlife depend in some way on wetlands. Wetland plants play an integral role in the ecology of the watershed. Wetland plants provide breeding and nursery sites, resting areas for migratory species, and refuge from predators.
Decomposed plant matter (detritus) released into the water is important food for many invertebrates and fish both in the wetland and in associated aquatic systems. A wetland with more vegetation will intercept more runoff and be more capable of reducing runoff velocity and removing pollutants from the water and may also act to moderate temperature extremes in adjacent uplands. Although considered as the most generous ecosystem in terms of benefits, wetlands do not benefit from any policy or legislation that specifically aims to conserve wetlands sustainably.

Ecohydrology, a sub-discipline of hydrology, is a concept that can be used to enhance the carrying capacity of the ecosystem. However, there is a challenge to use eco-hydrology in protecting the natural ecosystem. Hydro-technical approaches that are focused on sewage treatment plants and regulation of hydrological processes such as floods and droughts will never be an effective and sustainable water management solution without understanding of terrestrial and aquatic biota.

**Objectives**

2. Improve the quantity and quality of water from the river for household, fisheries, irrigation and hydro-power generation purposes;
3. Conserve ecological security and biodiversity; and
4. Improve the overall management of the river and the coastal areas through wetland management and policy formulations.
Table 5. Projects for Wetlands Program.

<table>
<thead>
<tr>
<th>Programs/Projects</th>
<th>Total Estimated Cost (P’000)</th>
<th>Location</th>
<th>Source of Funds</th>
<th>Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>WETLANDS PROGRAM</td>
<td></td>
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</tr>
<tr>
<td>Establishment of Decentralized Wastewater Treatment System (DWATS)</td>
<td>100,000</td>
<td>Settlement areas surrounding the wetlands</td>
<td>ODA, DENR</td>
<td>LGUs, DENR</td>
</tr>
<tr>
<td>Tagoloan River Basin Wetland Assessment, Development, Management, Protection Project</td>
<td>7,500</td>
<td>Riparian and coastal areas</td>
<td>DENR, BFAR, WWF, PTCF, Birdlife International, PPP, LGUs, ADB, World Bank, Conservation International, SCU’s, Internal Revenue Allocation to Municipalities, Project funds from development agencies, GTZ, AUSAid, JICA, SIDA, CIDA, other international NGOs, etc., Water use fees from NPC for watershed management</td>
<td>DENR-RBCO-BMB, BFAR, CMU, LGU, UP, Private companies and private individual</td>
</tr>
<tr>
<td>Coastal Resource Management Planning for Macalajar Bay</td>
<td>1,500</td>
<td>Macajalar Bay and nearby coastal areas</td>
<td>LGUs, NGOs, Donors</td>
<td>LGU</td>
</tr>
<tr>
<td>Establishment of Marine Protected Areas in Tagoloan and Villanueva</td>
<td>3,000</td>
<td>One on each municipal waters of Tagoloan and Villanueva where coastal habitats are in fairly good condition (i.e. coral reefs, seagrass and mangrove areas), at least 20 hectares in size.</td>
<td>LGUs, NGOs, PPP, International Donors</td>
<td>Local Community (PO), assisting NGOs or Academe and Barangay and Municipal LGUs</td>
</tr>
</tbody>
</table>
DISASTER RISK REDUCTION AND CLIMATE CHANGE ADAPTATION PROGRAM

The third largest flood-prone area in Misamis Oriental is Tagoloan. It is equivalent to 12.14% of estimated total area affected (at 27.45 square kilometers) (NEDA, 2012). The downstream stretch of the main Tagoloan River is prone to flooding. The flood may extend to areas located at least 500 meters from the main river. This includes human settlements and farm areas. Hazards identified within the river basin are earthquakes, landslides, and liquefaction. These can result to damages to property, life, and environmental resources. The following are socioeconomic challenges faced by communities in the Tagoloan River Basin: increasing population in the river basin; lower household income compared to national average; increasing poverty incidence; overlapping tenure; and, stakeholder conflicts such as political boundary disputes, income-sharing from mining, and water commercialization.

There is a need to harmonize the policies from different hierarchical level (e.g. national, regional, provincial) to reflect a clear interpretation of policies in terms of administrative and supervisory power in the watershed, such as those concerning political boundaries and jurisdictional overlaps. While there is sufficiency in policies governing the river basin, the more pressing concern is on the proper execution of institutional mandates and strict implementation of the pertinent policies.

There are multi-actor, multi-level, cross-sectoral organizations interacting, sharing powers and performing functions in the management of Tagoloan River Basin. With the current setup, development initiatives and interventions are fragmented resulting in less impact and inefficient approach. Worse, if actors intervene on their own without due consideration of attendant consequences to others, the commons dilemma is magnified. This could happen when there is no organizing principle and organizational arrangement that coordinates this panoply of actors.

Objectives

Based on the issues and challenges being confronted by the Tagoloan River Basin, development objectives that will ensure the strategies and interventions are consistent and contribute to the attainment of the development goals were crafted. The objectives were validated by various stakeholders during a series of consultations and meetings. The objectives are:

1. Develop, implement and maintain a flood management system in active collaboration with concerned national and local stakeholders
2. Develop and implement drought, landslide and earthquake management systems
3. Reduce compounding risk factors by strengthening institutional capacities of local government units and other basin stakeholders on disaster risk management
Table 6. Projects for Disaster Risk Reduction and Climate Change Adaptation Program.

<table>
<thead>
<tr>
<th>Programs/Projects</th>
<th>Total Estimated Cost (P'000)</th>
<th>Location</th>
<th>Source of Funds</th>
<th>Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISASTER RISK REDUCTION AND CLIMATE CHANGE ADAPTATION PROGRAM</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Installation, Operation and Maintenance of Weather Monitoring Stations</td>
<td>35,000</td>
<td>Tagoloan River</td>
<td>ODA, GOP</td>
<td>RBCO, DOST, DENR</td>
</tr>
<tr>
<td>Establishment of early flood warning system</td>
<td>25,000</td>
<td>Tagoloan River</td>
<td>GOP, ODA</td>
<td>RBCO, DOST, DENR</td>
</tr>
<tr>
<td>Construction, Operation and Maintenance of Smart Flood Control Structures</td>
<td>300,000</td>
<td>Tagoloan, Villanueva, ManoloFortich</td>
<td>GOP, ODA, PPP</td>
<td>DPWH</td>
</tr>
<tr>
<td>River Channelization</td>
<td>150,000</td>
<td>Downstream reaches in the Tagoloan River</td>
<td>GOP, ODA, PPP</td>
<td>DPWH</td>
</tr>
<tr>
<td>Development of High Resolution Flood Model and Flood Hazard Maps of the Tagoloan River Basin</td>
<td>10,000</td>
<td>Tagoloan River Basin</td>
<td>ODA, DOST, DENR</td>
<td>DREAM, DENR</td>
</tr>
<tr>
<td>Capacity development of LGUs on DRR and CCA</td>
<td>642,000</td>
<td>Cities and municipalities inside the Tagoloan River Basin</td>
<td>Grant, Loan, Presidential Support Fund (PSF)</td>
<td>LGUs, DILG, CCC, DENR, DA, DOH, DOST, DPWH, DOE</td>
</tr>
<tr>
<td>Rapid Visual Vulnerability Assessment of Structures</td>
<td>15,000</td>
<td>Malaybalay City, ManoloFortich, Impasugong, Sumilao, Malitbog, Tagoloan</td>
<td>GOP, ODA</td>
<td>DOST, DPWH</td>
</tr>
<tr>
<td>Seismic Hazard and Risk Mitigation Planning</td>
<td>20,000</td>
<td>Malaybalay City, ManoloFortich, Impasugong, Sumilao, Malitbog, Tagoloan</td>
<td>GOP, ODA</td>
<td>DOST, DPWH</td>
</tr>
</tbody>
</table>
HUMAN DEVELOPMENT

The increasing population with average growth rate of 2.11 percent must be seen as an opportunity for more labor force in the coming years. The government must therefore provide skills development programs such as those being offered by Technical Education and Skills Development Authority (TESDA) and enterprising development assistances by DENR, DOST and Department of Trade and Industry (DTI). By doing so, livelihood and employment options will be more diversified thereby relieving some pressures on natural resource use particularly shifting cultivation, logging, illegal small-scale mining and agro-industrial farming.

In view of poor health conditions particularly of those families with low income, the river basin council together with LGUs, LWUA and DOH should collaborate in tapping private companies (e.g. power corporations and agro-industries) and GOCCs for financial assistances to improve IEC programs on health and sanitation management. In addition, these can also help improve health and sanitary services by constructing more public hospitals, health centers, water distribution facilities and sanitation infrastructures (e.g. material recovery and waste water treatment). Such assistance can be sought as corporate social responsibility (CSR) projects.

Political boundary conflicts among municipalities and overlapping tenure instruments in forestlands pose as a major concern in future river basin projects. The river basin council should conduct close consultations with concerned stakeholders to settle or clarify boundary and land rights issues. Multi-stakeholder discussions should be supplemented by factual records (e.g. historical maps, previous landuse development maps, census, tenure history, etc). In the case of water commercialization issue raised by the indigenous communities in Bukidnon, the river basin council and NCIP needs to further enforce existing laws that will require water administration and agro-industries with FPIC from getting water from ancestral domains. Incentives from water user’s fee should also be given back to indigenous communities for their efforts in protecting the watershed.

Objectives

1. Reduce poverty incidence
2. Improve health/sanitation condition
3. Reduce land, land use and other conflicts
4. Increase people participation or involvement in Tagoloan River Basin protection and rehabilitation efforts and develop sense of ownership in development projects
5. Capture the benefits provided by the ecosystems in Tagoloan River Basin
6. Set an efficient water pricing and allocation
Table 7. Cross-cutting programs for Human Development.

<table>
<thead>
<tr>
<th>Programs/Projects</th>
<th>Total Estimated Cost (P’000)</th>
<th>Location</th>
<th>Source of Funds</th>
<th>Implementing Agency</th>
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<tbody>
<tr>
<td>CROSS-CUTTING PROGRAMS</td>
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<tr>
<td>IP-based Development Program</td>
<td></td>
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<tr>
<td>Cultural Impact Assessment (CIA) for Tagoloan River Basin</td>
<td>30,000</td>
<td>Ancestral domains</td>
<td>GOP, project investors</td>
<td>Tribal council representatives, NCIP, DENR, private consultants</td>
</tr>
<tr>
<td>Enhancing Indigenous Peoples’ Well-being through Culturally-Sensitive Development Projects in Ancestral Domains of Tagoloan River Basin</td>
<td>-</td>
<td>Ancestral domains of Tagoloan River Basin</td>
<td>GOP, private industries occupying ancestral domains, ODA</td>
<td>Tribal associations, NCIP, DENR</td>
</tr>
</tbody>
</table>
INSTITUTIONAL DEVELOPMENT AND GOVERNANCE

The existing Tagoloan River Basin Management Council (TRBMC) is proposed to be retained but has to be expanded structurally and capacitated organizationally. This is necessary because beyond the current Memorandum of Agreement that binds and expresses the commitments of various groups for managing the Tagoloan River Basin, different issues and concerns poses critical challenges for the present TRBMC which cannot be addressed under the current structure. Overlaps and duplications, not only in the roles and mandates of governance bodies such as BWPDC and LGUs but also in development approaches (i.e., INREMP) occur which must be addressed.

Part of the organizational strengthening is the creation of a Working Committee of the TRBMC composed of permanent representatives and an alternate. This is essential for practical reasons that the Council members do not have the time to engage in numerous meetings. Under the TRBMC is the River Basin Coordinating Office (RBCO) which is a permanent office with full-time staff coordinating and ensuring the execution of the operations plan specifically the River basin Programs, Projects and activities by the LGUs. The RBCO is headed by a RB Director. The Director oversees the coordination and facilitation of delivery of goods and services by the stakeholders, harmonizes the initiatives in the river basin, as well as provide mechanisms for conflict resolution among stakeholders. The RBCO has four thematic programs namely, Water Resources, Watershed, Wetlands, and DRRM each headed by a program coordinator. The Program Coordinators in turn are supported by five units of the RBCO, namely, the Communications, Management Information System, Stewardship, Partnerships/Linkaging, and Admin & Finance.

An independent Scientific and Technical Advisory Group (STAG) shall assist the TRBM Council to provide objective advise through the Working Committee. Specifically, it provides technical assistance to the Executive Council in the approval, updating and development of river basin plans and approaches/technologies and setting of environmental standards and targets through the concerned thematic program coordinators.

M&E is undertaken at three levels, namely, internally-local through the RBCO, externally-national through the National DENR-RBCO and externally-independent 3rd Party Reviewer. The RBCO internal monitoring is part of sound administration to ensure that goals are met effectively and efficiently and corrective actions taken.

Objectives

1. Creation of an inclusive viable and functional Tagoloan River Basin Organization
2. Formulation of processes, systems and procedures towards good river basin governance
Table 8. Cross-cutting programs for Institutional Development.

<table>
<thead>
<tr>
<th>Programs/Projects</th>
<th>Total Estimated Cost (P’000)</th>
<th>Location</th>
<th>Source of Funds</th>
<th>Implementing Agency</th>
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</thead>
<tbody>
<tr>
<td><strong>CROSS-CUTTING PROGRAMS</strong></td>
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</tr>
<tr>
<td><strong>Institutional/ Organizational Development</strong></td>
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</tr>
<tr>
<td>Setting-up of the River Basin Coordinating Office</td>
<td>220,050</td>
<td>Housing of office in one of the State University or College</td>
<td>Grant, PES, Loan, Cost Sharing, Convergence of Gov’t Programs, Presidential Support Fund (PSF)</td>
<td>LGUs, DILG, DENR, DA, DOH, DOST, DPWH, DOE, Sectorial Representatives, namely: Agricultural farmers, agro-industrial, fisherfolks, household water consumers, institutional water users, industries</td>
</tr>
<tr>
<td>Formulation of procedures and guidelines, methods, tools, systems for RBMO</td>
<td>2,500</td>
<td>River Basin</td>
<td>Grant, PES, Loan, Cost Sharing, Convergence of Gov’t Programs, Presidential Support Fund (PSF)</td>
<td>Tagoloan River Basin Organization</td>
</tr>
<tr>
<td><strong>Capability Building</strong></td>
<td></td>
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</tr>
<tr>
<td>Capacity Building for RBCO</td>
<td>15,000</td>
<td>River Basin-wide coverage and localized capacity building and organizational development efforts and activities of the RBCO</td>
<td>General Appropriations Act (through RBCO, DILG, MinDA, Office of the President), Official Development Assistance (ODA), LGU Funding, NGO and International Financing Institutions, Grants</td>
<td>DENR-River Basin Coordinating Office, DILG, LGUs</td>
</tr>
<tr>
<td>Capability building on IRBM for LGUs</td>
<td>15,000</td>
<td>2 Provincial Governments (Bukidnon and Misamis Oriental) 9 Municipalities/City Governments in Bukidnon (Baungon, Impasug-Ong, Lantapan, Libona, Malaybalay)</td>
<td>General Appropriations Act (through RBCO, DILG, MinDA, Office of the President), Official Development Assistance (ODA), Payment for Ecosystems Services (PES),</td>
<td>DENR-River Basin Coordinating Office, DILG, LGUs</td>
</tr>
<tr>
<td>Programs/Projects</td>
<td>Total Estimated Cost (P'000)</td>
<td>Location</td>
<td>Source of Funds</td>
<td>Implementing Agency</td>
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<tr>
<td>Mainstreaming science-based economic analysis in river</td>
<td>5,000</td>
<td>River basin</td>
<td>DENR-RBCO, ADB, World Bank, FAO, LGU, water districts, NIA, NWRB, NPC, private</td>
<td>DENR-RBCO and proposed River Basin Management</td>
</tr>
<tr>
<td>basin project planning and implementation</td>
<td></td>
<td></td>
<td>institutions</td>
<td>Council</td>
</tr>
<tr>
<td>Technical Education and Skills Development Scholarship</td>
<td>40,000</td>
<td>Misamis Oriental and Bukidnon</td>
<td>GOP, PHIVIDEC, private CSRs</td>
<td>TESDA, RBCO and LGUs</td>
</tr>
<tr>
<td>for Poor Upland Families</td>
<td></td>
<td></td>
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<tr>
<td>Entrepreneurial skills upgrading for farmer</td>
<td>10,000</td>
<td>Misamis Oriental and Bukidnon</td>
<td>GOP, ADB, private CSRs</td>
<td>LGU and DTI</td>
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<tr>
<td>associations and cooperatives</td>
<td></td>
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<tr>
<td>Feasibility study on cottage-based industries using</td>
<td>5,000</td>
<td>Misamis Oriental and Bukidnon</td>
<td>GOP, private CSRs</td>
<td>DOST, DA, DENR, DTI and LGUs</td>
</tr>
<tr>
<td>agro-industrial wastes</td>
<td></td>
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<tr>
<td>Validation of Forest Land use Maps of Tagoloan River</td>
<td>5,000</td>
<td>Misamis Oriental and Bukidnon</td>
<td>GOP</td>
<td>DENR, NCIP</td>
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<tr>
<td>Basin</td>
<td></td>
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<tr>
<td>Organizational development and Capacity Building of</td>
<td>6,000</td>
<td>Misamis Oriental and Bukidnon</td>
<td>GOP, USAID, DFID, ODA</td>
<td>LGU, RB Council, civil society and NGOs</td>
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<td>existing women’s, elderly and youth groups</td>
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<tr>
<td>Livelihood development for marginalized women, elderly</td>
<td>60,000</td>
<td>Misamis Oriental and Bukidnon</td>
<td>GOP, private companies</td>
<td>LGU, RB Council, TESDA, DTI</td>
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<tr>
<td>and youth groups</td>
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<tr>
<td>Mainstreaming Climate</td>
<td>8,000</td>
<td>Tagoloan River Basin</td>
<td>GOP, ODA, private companies</td>
<td>LGU, DENR, DA, DPWH, NIA,</td>
</tr>
<tr>
<td>Programs/Projects</td>
<td>Total Estimated Cost (P’000)</td>
<td>Location</td>
<td>Source of Funds</td>
<td>Implementing Agency</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
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<tr>
<td>Change Adaptation in Watershed Management and Farming in the Tagoloan River Basin</td>
<td></td>
<td></td>
<td>(CSR)</td>
<td>power companies, tribal associations</td>
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<tr>
<td><strong>Information, Education Communication</strong></td>
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<tr>
<td>Information Education and Communication for RB</td>
<td>22,500</td>
<td>Misamis Oriental and Bukidnon</td>
<td>General Appropriations Act (through RBCO, DILG, MinDA, Office of the President), Official Development Assistance (ODA), LGU Funding, NGO and International Financing Institutions</td>
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<tr>
<td>Information Education and Communication campaign on gender roles in RB management</td>
<td>3,000</td>
<td>Misamis Oriental and Bukidnon</td>
<td>GOP</td>
<td>LGU, RB Council, civil society and NGOs</td>
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<tr>
<td><strong>Policies</strong></td>
<td></td>
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<tr>
<td>Harmonization of policies along hierarchal levels and policy monitoring in a river basin context</td>
<td>5,000</td>
<td>River basin-wide</td>
<td>RBCO (DENR), Office of the President</td>
<td>RBCO</td>
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<tr>
<td>Issuance of Executive Order creating the Tagoloan River Basin Council</td>
<td>1,000</td>
<td>River basin-wide</td>
<td>RBCO (DENR), Office of the President</td>
<td>RBCO</td>
</tr>
</tbody>
</table>
## Programs/Projects

<table>
<thead>
<tr>
<th>Programs/Projects</th>
<th>Total Estimated Cost (P'000)</th>
<th>Location</th>
<th>Source of Funds</th>
<th>Implementing Agency</th>
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</thead>
<tbody>
<tr>
<td>Development of Payment for Ecosystem Services (PES)</td>
<td>15,000</td>
<td>All watersheds within the river basin</td>
<td>DENR-RBCO, ADB, World Bank, FAO, LGU, water districts, NIA, NWRB, NPC, private institutions</td>
<td>DENR-RBCO and proposed River Basin Management Council</td>
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</tbody>
</table>