



**RIVER BASIN  
CONTROL OFFICE**

# **Formulation of Integrated River Basin Management and Development Master Plan (IRBMDMP) for Tagum-Libuganon River Basin**

## **FINAL REPORT VOLUME I EXECUTIVE SUMMARY**

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**WOODFIELDS  
CONSULTANTS, INC.**

*A Planning and Engineering Consulting Firm*



**ISO 9001 : 2008  
QUALITY MANAGEMENT SYSTEM**

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# **Executive Summary**

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## **1.0 RATIONALE**

Tagum Libuganon River for the past years and to date had experienced perennial flooding almost every year. Flooding is more frequent during the year 1990s and gradually declines only after the dredging and construction of Miranda Bridge at Libuganon river which connects the national highway of the Municipality of Carmen and Tagum City. However, there are really instances that flood occurs more frequently, more so, if the situation is aggravated by the presence of low pressure area (LPA) or due to continuous heavy rains. No doubt, it has caused untimely disruption in the economy of the TLRB in particular, in the Province, Region and the whole country in general.

Several issues need to be resolved and studied carefully to reach possible solutions or alternatives gearing towards a long term response. Likewise, socio-economic concerns, peace and order, and institutional linkages play a vital role in rooting out the real issues behind the macro-environment of the river basin.

Per news article of News desk dated January 12, 2014, there were at least 3,000 persons in the Provinces of Davao del Norte and Compostella Valley, were forced to leave their respective homes following nonstop rains brought by a low pressure are (LPA) affecting southern Mindanao. Records from PDRRMC, Davao del Norte revealed that there were 50 families living along the Libuganon River in Kapalong, Davao del Norte were rescued and some adjacent residents living close to the riverbanks were forcibly evacuated as waters on said river had continuously rising resulting to unfortunate swelling of major rivers.

Several studies in TLRB were already undertaken by the Government in collaboration with the private sectors were already undertaken relative to rehabilitation, protection, development and conservation of the Tagum Libuganon river basin. Among those Government Agencies are the DPWH, DENR, DOE, NIA, DA, Water Districts, Provincial, City and Municipal Governments. Sites for flood control and irrigation structures, dam, and hydropower infrastructures are taken into consideration without disrupting to the least the possible natural environment of the river basin.

Taking cognizance of the existing condition of the TLRB and the factors causing the flooding which continued to persist until to date thereby significantly affected the environment - socio - economic progress of the basin area despite several interventions made by Government and private sectors. Wherefore, it is imperative to conduct a study which shall serve as the primary basis in the formulation of a master plan for the rehabilitation, development and management of the Tagum Libuganon River Basin.

## **2.0 PROJECT OBJECTIVE/S**

Based on the Terms of Reference (TOR) issued by the DENR - River Basin Control Office (RBCO) the main objective of the Project is to formulate an Integrated River Basin Management and Development Master Plan for the Tagum Libuganon River Basin (TLRB) which will address 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

### 3.0 THE STUDY AREA

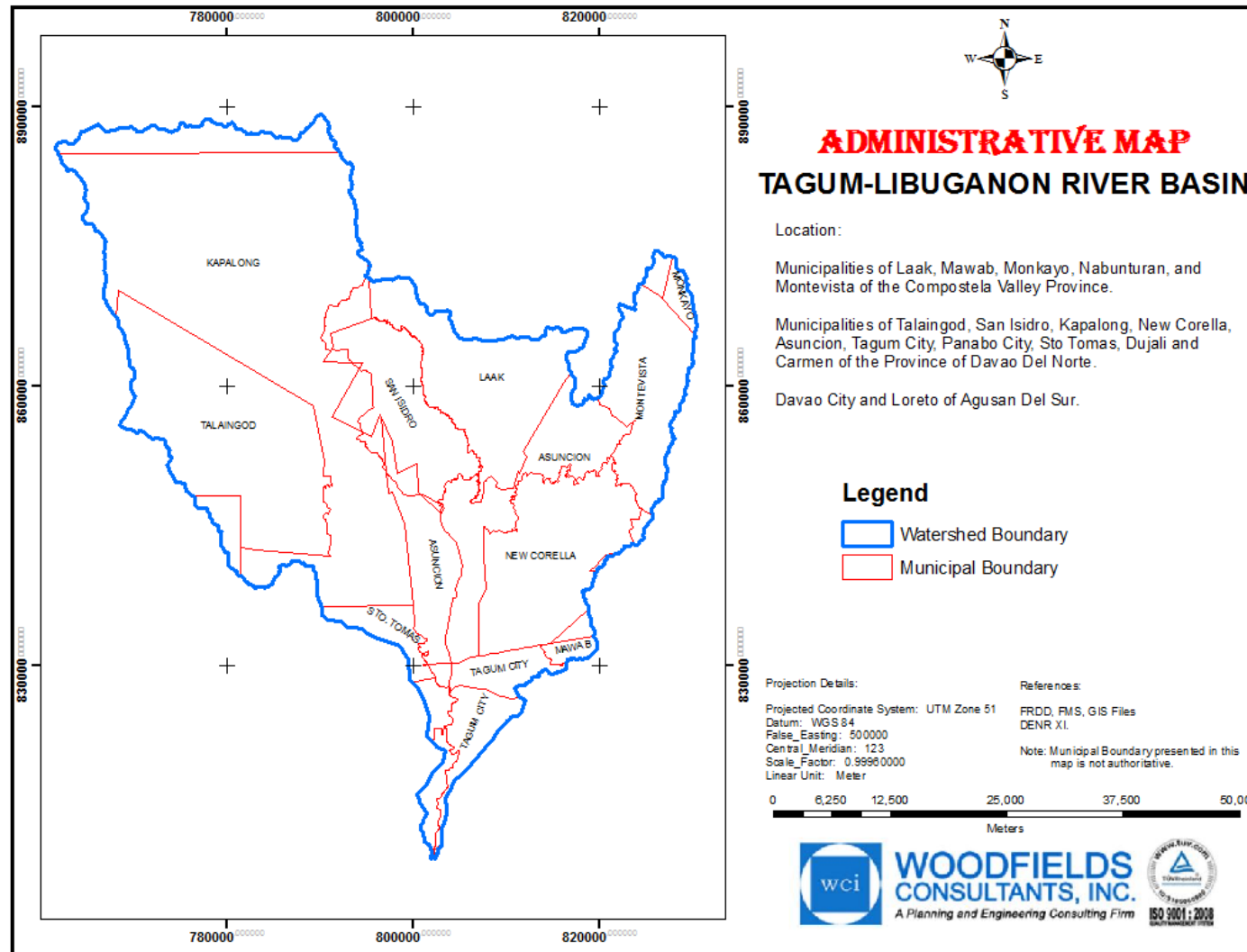
Tagum-Libuganon River Basin (TLRB) is located in the Northern part of Davao Region which geographically lies at a latitude of 7<sup>o</sup>10' N and longitude 125<sup>o</sup>20'E traversing portion of Regions XIII and meandering down to Region XI. It is the third (3<sup>rd</sup>) largest river basin in Mindanao and in 9<sup>th</sup> placed among the eighteen (18) major and priority river basins in the Philippines as per Resolution No. 2012 – 001 issued by the Cabinet Cluster on Climate Change Adaptation and Mitigation.

As per resolution of the said Cabinet cluster, Tagum Libuganon River Basin has a catchment area of 3,064 sq km. **Figure 1** shows the initial catchment area of TLRB. However, upon findings and verification of consultants, the stakeholders of the consultation forum endorsed the inclusion of the Tuganay River sub-basin which passes through the municipality of Carmen. Through the public forum and ground validation and verification by the technical consultants, it was found out that TLRB area includes three (3) upland barangays of Davao City as one of the headwaters of TLRB and a portion of Panabo City, Davao del Norte as its floodplains. Thus, the new coverage of the river basin is as shown in **Figure 2**, (see **Table 1** for the Administrative Jurisdiction of TLRB).

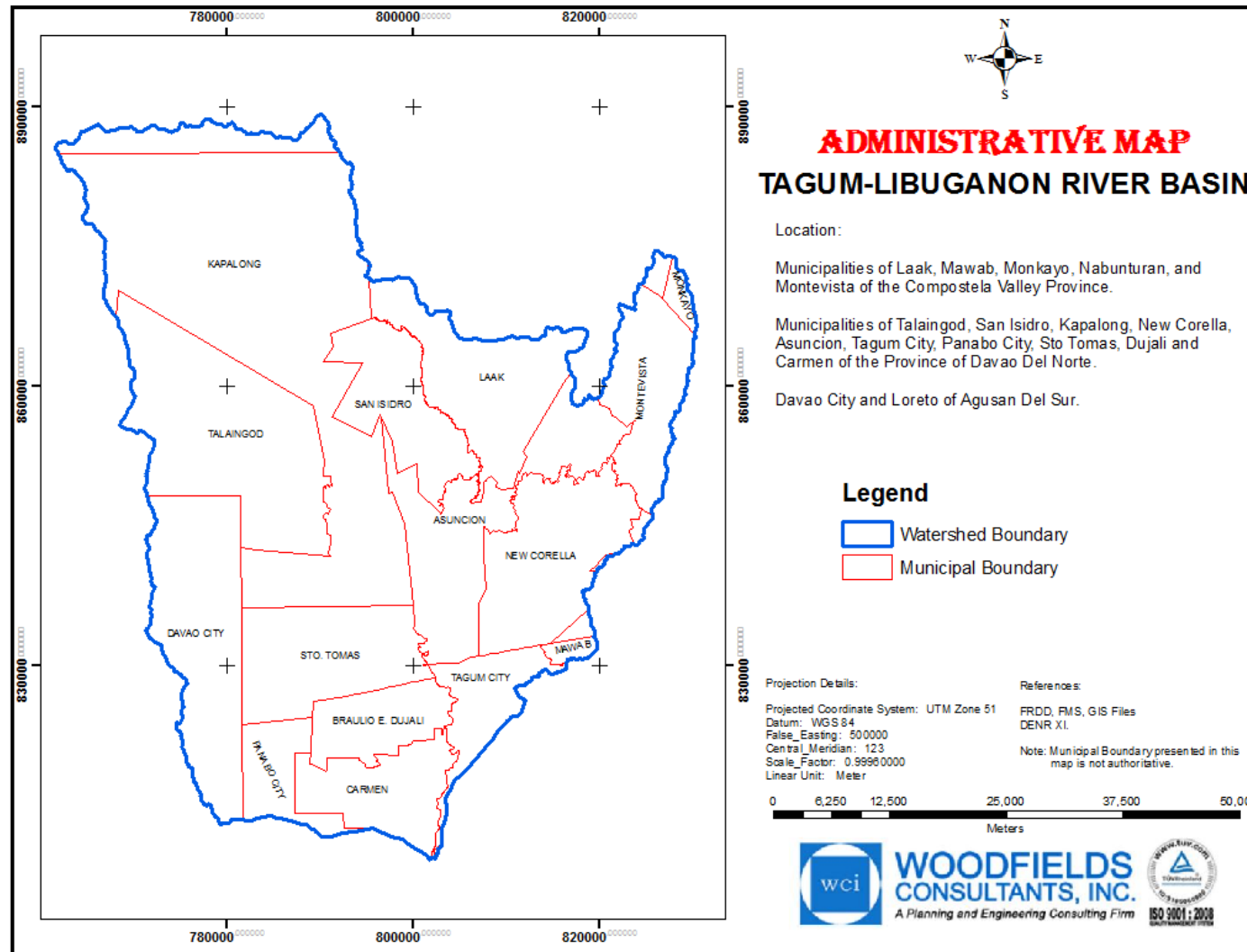
**Table 1**  
**Administrative Jurisdiction of TLRB Per Province/City**

Province/City/Municipality	Area (ha)	% Share
<b>Agusan del Sur</b>	<b>7,620.24</b>	<b>2%</b>
1. Loreto	7,620.24	
<b>Compostela Valley (COMVAL)</b>	<b>40,590.41</b>	<b>13%</b>
1. Laak	22,352.03	
2. Monkayo	1,391.61	
3. Mawab	1,138.37	
4. Montevista	14,544.49	
5. Nabunturan	1,163.33	
<b>Davao del Norte</b>	<b>240,029.49</b>	<b>76%</b>
1. Asuncion	24,369.66	
2. B. Dujali	10,025.42	
3. Carmen	13,233.68	
4. Kapalong	81,443.20	
5. New Corella	22,515.76	
6. Panabo City	7,553.47	
7. Talaingod	36,490.19	
8. Tagum City	9,049.09	
9. San Isidro	15,275.70	
10. Sto. Tomas	20,073.22	
<b>Davao City</b> (Mapula, Tapak and Paradise Embak)	<b>27,311.35</b>	<b>9%</b>
<b>Total</b>	<b>315,552.06</b>	<b>100%</b>

Source: DENRXI, GIS-2013



**Figure 1**  
**Initial Boundary of TLRB**



**Figure 2**  
**New Boundary of TLRB**



## **4.0 SECTORAL PER THEMATIC AREA**

### **4.1 Integrated Watershed Management**

The Tagum-Libuganon River Basin (TLRB) Integrated Watershed Management Plan (IWMP) has been formulated to protect, maintain and restore the ecological stability of the watershed and shall be managed under the concept of multiple use and sustained yield with the participation of the indigenous people (IPs), local population and communities.

The preparation of TLRB IWMP primarily anchored on the interrelationship of upland and lowland ecosystems and how the concerned agency like DENR in collaboration with the LGUs and various stakeholders could collaborate and effectively integrate various efforts in protecting and managing the watershed. The planning process considered the need to protect the remaining natural forest cover, rehabilitate denuded uplands, stabilize cultivated areas, and provide necessary support systems and incentives to sustain local watershed management initiatives. The plan highlights the vision, mission, goals and objectives in placing the entire watershed into effective management. It also highlights the recommendations and strategies in addressing current problems and issues raised by various stakeholders.

The development and management strategies included the following:

- *Management of Remaining Forest Cover* through preparation and/or implementation of Forest Land Use Plan, forest protection through the tenure holder, payments for environmental services, pest control and fire management, forest protection and law enforcement and soil and water conservation measures;
- *Management of Open Canopy, Brush land, Grassland, and Cultivated Areas* through reforestation/rain forestation, agroforestry, assisted natural regeneration (ANR), ecotourism development, collaboration with various stakeholder and closing open access areas, rehabilitation through the tenure holder;
- *Management of Water Sources and Water Bodies / Water Management;*
- *Management of Allocated Forestlands / Upland Ecosystems;*
- *Management of Freshwater Ecosystems* through Protection and rehabilitation of riverbank, Stream Bank Stabilization; and
- *Support Activities* through information, education, and communication, linking and networking, and research & development.

The overall impact of this Plan is deemed to favor the realization of a sustained, productive and protective river basin.

### **4.2 Biodiversity Conservation**

The biodiversity of flora within the Tagum-Libuganon River Basin have diminished over the years due to the clearing of natural forests to obtain raw material for houses, furniture and other timber products. The denuded areas were later converted to agricultural lands for a profitable livelihood and source of food. Agricultural lands on the low-lying municipalities of Asuncion, Sto. Tomas, Tagum City, B. Dujali, Carmen and the lower

portion of Kapalong are cultivated with rice and bananas. Other economic crops such as corn, sweet potato, vegetables, cacao and others are planted in the different areas within the river basin.

The remaining forests are found on areas with very steep slopes. Forest trees that can be found within TLRB are red and white lauan, yakal, narra, almaciga, ulayan, lanutan, molave and other dipterocarps. It should be noted that some of these trees which includes the yakal, red lauan and white lauan such as almon and bagtikan are critically endangered while narra is categorized under seriously threatened species.

Other flora species thriving within the TLRB areas are palm species including pandan, anibong and palasan and agro-forest tree like rubber. Fruit-bearing trees are also abundant in many areas of the river basin. Shrubs such as flemengia, dilang-aso and hagonoy and grass like cogon, data and bugang are the dominant species are spread out in the areas of TLRB.

Based on the Vulnerability Assessment Study conducted for Tagum-Libuganon Watershed, there are also species of mangroves that are found in the river mouth and coastal barangays of Tagum City.

For the faunal species, the Study entitled “Watershed Characterization and Vulnerability Assessment of Saug Watershed in Davao Del Norte and Compostela Valley Province” implemented by DENR-RDS-XI showed that there were 35 faunal species sighted by local residents, which include 2 species of amphibians, 14 species of birds, 6 species of mammals, 7 species of reptiles and 6 species of fishes. However, the destruction of the natural habitat of these organisms has put them into serious threat. Out of the 35 identified species, 7 species are categorized under endangered state such as owl, hornbill, quail, monkey, wild pig, flying lemur and monitor lizard); 6 species are threatened (freshwater crab, eel, hawk, tikling-rail, flying lizard and Philippine king cobra); and 3 species are considered rare (civet cat, king fisher and Philippine oriole) .

Other than the species mentioned earlier, marine species like turtles, whales and others are also in their critical state. The famous flagship of Bohol which is tarsier can also be found in the municipality of Kapalong. On the other hand, the municipality of Carmen is host to migratory bird species during the winter months in other countries. During the bird watching in 2012, DENR Region XI was able to identify that the dominant species include godwit, sand plover and common greenshank.

### **4.3 Water Resources**

National Water Policy envisages that water resources planning, development and management will have to be planned for a hydrological unit such as drainage basin as a whole or for a sub-basin multi-sectorally, taking into account surface and ground water for sustainable use incorporating quantity and quality aspects as well as environmental considerations.

It is therefore important to take into full account current and pressing management issues impacting the overall management of the riverbasin. TLRB lists the following issues affecting both the quality and supply of water resources. The result was based on the analysis of data and information gathered and during the conduct of environmental scoping mission.

#### **4.3.1 Wastes Management**

Many rural areas within the river basin specifically those in the upland areas are not connected to a sewerage system. Upland settlers tend to throw wastes unchecked. As

mandated in the Clean Water Act, establishment of the sewerage treatment plant is essential to control pollution.

#### **4.3.2 Sanitation and Pollution**

Surface and groundwater sources within TLRB are vulnerable to contamination from various sources of pollution. Potential sources of pollutants include market wastes, domestic sewages, garbage dumpsites, industrial and commercial discharge and agricultural run-off. This makes both surface and ground water sources vulnerable to contamination.

#### **4.3.3 Irregular Water Quality Monitoring**

Most of the water sources within the TLRB are not regularly monitored. The quality of surface and ground water is continuously threatened by relentless polluting activities within the basin.

Moreso, the absence of inadequate inventory of pollutant sources contributes to lack of awareness among settlers in TLRB as to the type of pollutants that contributes to contamination. Gasoline stations, markets, commercial livestock and fast food are the most problematic industries that need to be included in the inventory.

#### **4.3.4 Siltation of Rivers**

Erosion or downward movement of soil during rainfall events contributes to the gradual and continuous siltation of rivers and lakes within the basin. Other major contributors to the siltation of rivers and lakes include massive earth moving activities such as housing and settlement developments. As a result, landslides and soil erosion are common occurrence during heavy downpour of rain.

### **4.4 River and River Delta Management**

The Tagum-Libuganon River Basin has a complex river network as exhibited by its numerous creeks, streams and rivers. These surface waters flow down to the central alluvial plain before emptying into Davao Gulf. There are four major rivers traversing the basin which includes Libuganon River, Saug River, Tagum River and Tuganay River.

The rivers within the basin play an important role into the everyday living of the nearby communities. These rivers are generally utilized for domestic purposes such as bathing, washing clothes and an alternative way to transport people and goods. It is also being utilized for drinking and bathing for domesticated animals. In some municipalities like Kapalong, Asuncion and New Corella, the rivers are source of irrigation to rice fields and banana plantations within these areas. Some portions of Tagum River and Tuganay River are sources of high quality of sand and gravel, which is considered to be one of the major income generating industries in the province of Davao del Norte. Conventional fish cages can also be observed in some portion of Tagum River.

DENR-EMB-Region XI has established monitoring stations for the four major rivers mentioned above. The water quality of Libuganon River, Saug River, Tagum River and Tuganay River is being assessed through several parameters including dissolved oxygen (DO), biochemical oxygen demand (BOD), pH and total suspended solids (TSS). For Libuganon River and Tagum River, levels of nitrate, phosphate, total coliform, fecal coliform and heavy metals such as copper, lead, cadmium and zinc are also being monitored.

Based on the findings from the water quality monitoring by EMB-Region XI, all four rivers have a good water quality exhibited by high dissolved oxygen and low biochemical oxygen demand with an average of 6.7 mg/L and 2.1 mg/L, respectively. These average values are favorable for the survival of aquatic organisms.

In terms of pH and cadmium in these four rivers, the obtained values conform within the permissible criteria for their respective classification. However, the levels of total coliform for both Tagum River and Libuganon River are high as compared with the standards having a value of 18,857 MPN/100ml and 30,148 MPN/100ml, respectively. This is an indication that these two rivers are contaminated with pathogenic organisms, which maybe a result from direct discharge of domestic wastes into the water.

#### **4.5 Flood Control, Disaster Risk Reduction and Hazard Management, and Climate Change Adaptation and Mitigation**

The Tagum-Libuganon River Basin (TLRB) with an original catchment area of about 2,350.50 Km<sup>2</sup> falls under the Type IV of the Corona's Climate Classification System Rainfall Distribution, i.e. rainfall is more or less distributed throughout the year. In the course of the study, the Tuganay River Basin was found out connected to Libuganon River by a cut-off channel constructed by the Department of Public Works sometimes in 1984 to address the floodings particularly the municipality of Carmen and part of Tagum hence, the total catchment area for the TLRB becomes 3,199.51 km<sup>2</sup>.

Based from the Problem Tree Analysis made during the February 27 and March 27 of the first and second stakeholders' workshops, three core problems were identified namely; the insufficient water supply; second is the water pollution/quality, and lastly is the **frequent floodings**. The floodings was brought about by poor flood control and drainage facilities and was compounded by the effects of climate change i.e. too high flood discharges. From the technical point of view, the floodings was found out due to insufficient draining capacity of the waterways. Further, the decreased carrying capacity of these waterways, either natural or man-made is caused by watershed degradation i.e erosion and the natural phenomenon of land and river bank slides which contribute further more to sedimentation of the waterways or rivers.

To solve the three core problems a strategy was set based on the Integrated Water Resources Management (IWRM) pillars, that fresh water is a finite and vulnerable resource essential to sustain life for development and the environment, has an economic value in all its competing uses and should therefore be developed and managed collectively by all the stakeholders. Intervention measures are divided into structural and non-structural components in addressing the flooding problems. Engineering solutions like construction of bank protection or silt retention dams falls under the structural while institutional development as well as Information, Education and Communication (IEC) form part of the non-structural component. The total cost of the interventions totalled billions of pesos and still counting as identification of the proposed and continuing projects/programs is still on-going.

#### **4.6 Coastal and Aquatic Resources Management**

Davao Gulf is situated in the southeastern part of Mindanao. It is bounded by 4 provinces (Davao del Sur, Davao del Norte, Compostela Valley and Davao Oriental), 14 municipalities and 5 cities with a total length of 691 km. Among the 24 fisheries of the country, Davao Gulf ranks 10<sup>th</sup> making it a major fishing ground.

The Gulf is home to 20 species of mangroves, 12 species of seaweeds, 9 species of seagrasses, an est. total length of 412.1 km of reef formation, birds and marine

organisms such as dolphins, whales, dugongs. Numerous invertebrate organisms are also found on the area which includes gastropods, molluscs, bivalves, echinoderms and crustaceans.

The coastline within the Tagum-Libuganon River Basin is approximately 9.77 km in length. The coastal areas, which belong to Barangay Taba in Carmen and Barangays Libuganon and Busaon in Tagum City are habitat of the mangrove, seagrass and coral reef communities.

The estimated area for seagrass and coral reef for the two municipalities are 6.0 has and 7.0 has, respectively. Mangrove areas for Tagum City are only around 3.0 during the previous study. Currently, the rehabilitation program being undertaken by the City have contributed to an additional 59 has of mangrove areas.

The municipality of Carmen, on the other hand, has an estimated mangrove areas of 60 has. An additional 5 has along the coastal barangays of Carmen have been reforested in 2012.

As for the fisheries sector, aquaculture and municipal waters are two mains sources for fish production. The aquaculture profile both from brackish and freshwater resources is around 1,645.6 has for the 8 municipalities and 2 cities within the TLRB. These municipalities/cities include Asuncion, BE Dujali, Carmen, Kapalong, New Corella, Panabo City, Sto. Tomas, Tagum City, Talaingod and San Isidro. Fish cultivated on brackish water includes bangus, shrimps, crabs and other fish species. On the other hand, fishes like tilapia and catfish are commonly raised on inland fishponds.

#### **4.7 Basin Geology and Mineral Resources Management**

Tagum-Libuganon River Basin is typical of most river basins in the country. It is generally low-lying or flat land underlain by soft sedimentary rocks like siltstone, claystone, shale and sandstone. These are in turn overlain or mantled by relatively thick loose, unconsolidated sediments of various lithology such as silt, sand, clay and larger detrital materials such as gravel and cobbles, most of which have been transported and deposited as soil atop these so-called sedimentary rock formations. It is these soils, classified pedologically as San Manuel, Babongan, Cabangan, and other soil series types, deposited or residually generated atop the vast flat lands that gives the edge to the river basin as a large track plantation for export bananas as well as other staple crops such as rice and corn.

However, the river basin is believed to be a seismically active zone due to the proximity, if not the presence itself, of the Philippine Fault or some of its branches/splays within the area. This presence is one of the deterrent to the construction of high reservoir dams across some of the rivers within, as it is thought that the risk of flooding due to dam rupture should a high-magnitude occur, is too great to ignore.

The river basin can never be mining district due to the absence of diorite pluton bodies which are indications of gold and copper mineralizations. The western flanks of the basin reportedly has ultramafic igneous bodies, but this are at best associated with chromite and iron mineralizations that are by large unconfirmed.

It is the production of non-metallic minerals such as sand and gravel and limestone materials that are largely documented, and are based mostly on the western towns of Kapalong and Talaingod. Still, the basin ranks only second in production in the region possibly next to ComVal Province.



#### 4.8 Community Participation

The Tagum-Libuganon River Basin (TLRB) sprawls over an area of 319,951 hectares and is located geographically between 7<sup>0</sup>20' N to 8<sup>0</sup>00' N and 125<sup>0</sup> 15'E to 126<sup>0</sup>00' E. It covers a total of 190 barangays located in four provinces, three cities and 15 municipalities. In 2010, a total of 830,717 individuals live in the basin of which 88.02 percent live in Davao del Norte. The others are from Compostela Valley (10.60 percent), Davao City (0.99 percent) and Agusan del Sur (0.39 percent). With regards to urban-rural disaggregation, 34.93 percent of the residents live in 38 urban barangays. The rest (65.07 percent) live in rural barangays. The Tagum-Libuganon River Basin has a population density of 259 persons per square kilometer as of May 2010.

The 2010 Census on Population and Housing (CPH) shows the average annual growth rate by province which is as follows: Davao del Norte (2.43 percent), Compostela Valley (1.71 percent), Agusan del Sur (1.61 percent), and Davao City (2.36 percent). Using this population growth rate, it is projected that the population in the TLRB will grow from 830,717 in 2010 to 1,342,754 by Year 2030. Using the same growth rate, the urban barangays will grow from 38 barangays in 2010 to 63 barangays by Year 2030.

Tagum City is the primary growth center in the TLRB. It is the seat of the provincial government of Davao del Norte and is the center of education, health, commerce and industry. Panabo City, the second growth center, is only 23 kilometers away and is between Tagum City and Davao City, the primary growth center in Mindanao. Other growth areas in Davao del Norte are Tibal-og (Poblacion), Sto Tomas, Maniki (Poblacion), Kapalong and Ising (Poblacion), Carmen.

Nabunturan, in Compostela Valley Province is also a secondary growth center being the capital town of the province. The town of Laak, also in Compostela Valley, is an emerging growth area owing to the concreting of the road from Tagum City to Veruela in Agusan del Sur.

There are several important considerations in these growing settlements. One is the possible encroachment of housing and other building constructions into waterways, which will lead to flooding. Another consideration is both solid waste and septage management that may contaminate ground water as well as waterways. Transportation infrastructure (roads) connecting these growing settlements is another important consideration. Road constructions that cut across environmentally critical areas will hasten the degradation of these areas since they will be opened up for access to the general population.

With regards to dependency ratio. Agusan del Sur has the highest dependency ratio where for every 100 working population, 71 persons are dependent on them for support. The dependency ratio in the other provinces are: Davao del Norte, 58 dependents for every 100 working population; Compostela Valley, 66 dependent persons for every 100 working population; and Davao City, 54 dependents for every 100 working population.

On the language, Cebuano and its variant Visaya is the most spoken language in the TLRB. Visaya is the most common language for broadcast media and print media while Tagalog (Filipino) is most used for the TV media. English is understood in most areas of the basin being taught in the school system. The Indigenous Peoples languages spoken in the TLRB are Dibabawon, Mandaya, Ikalahan, Ata-Manobo, Kalagan, Sama, Mansaka and Manguangan.

Basic elementary education is accessible to residents of the TLRB. There are at least one basic elementary school for every barangay. On the other hand, there is one

secondary basic education school for every four barangay in the basin. With regards to school attendance, most elementary and secondary school students in the TLRB remain at school as can be seen in the drop out rate of 0.69 percent and 1.71 percent for elementary and secondary schools in Davao del Norte, respectively. The drop-out rate in Compostela Valley is quite higher at the elementary level (6.90 percent) while its is almost the same at the secondary level (1.72 percent). Most of the students get promoted to the next level of education and most of the Grade Six and 4<sup>th</sup> Year High School students finished their respective level of schooling.

Access to health services in the TLRB is more pronounced in the province of Davao del Norte where there are 172 Barangay Health Stations in the 137 barangays of the province. There is, however, the need to improve access to basic health services in the areas covered by Compostela Valley Province where the ratio of BHS to every barangay is 0.68:1. This translates to an average of two barangays for every Barangay Health Station. All LGUs in the TLRB have their respective Rural Health Units. There are also 30 hospitals strategically located in the TLRB.

On potable water, data from the 2012 Provincial Health Situationer of Davao del Norte shows that 66.14 percent of its population have access to potable water supply. It is noted that the gap in the access to potable water from established facilities are filled in by water peddlers who trucked in potable water from outside sources. On the other hand, almost all the population (90.69 percent) of Compostela Valley have access to potable water.

Roman Catholic is the major religion in the TLRB. The other major religions are Iglesia ni Cristo, Evangelicals, Aglipay, and Islam.

There are 15 ICC/IP tribal groups in Davao del Norte and eight (8) ICC/IP tribal group in Compostela Valley. In Loreto, Agusan del Sur, Manobo tribe is the majority ICC/IP tribe in that municipality. There are also five CADTs awarded to ICC/ IP communities in the TLRB. These CADTs cuts across both TLRB and non-TLRB areas. Another two proposed CADTs are in the final process of approval.

#### **4.9 Economic Conditions**

One indicator of the economic situation in an area is the poverty incidence. In 2012, poverty incidence in the three provinces within the TLRB, i.e., Davao del Norte, Compostela Valley and Agusan del Sur, was 26.7, 30.7% and 37.3%, respectively, all of which is higher than the regional average. In Davao Norte, which accounted for about 80% of the population of the TLRB, poverty incidence has slightly increased from the 2006 level. This is a reflection of the deteriorating economic situation in the province.

As almost the whole of Davao del Norte is within the TLRB area, the economic activities in the province define the economic activity for the Basin. The primary economic development activity in the province is agriculture as agricultural land use accounts for 47.30% of its total land area.

Banana is one of the major crops grown in the province with 46,950 hectares devoted to the cultivation of the crop, both for local consumption and export market. Cavendish banana, which is for export, is most popular and extensively grown in plantation scale in most municipalities and cities. Total production of banana in 2012 is 1,537,831 MT valued at PhP10.90 billion which significantly contributes to the income of the province. In addition, some 39,650 hectares are devoted to coconut production with a total production of 239,635 MT valued at PhP6,988 million. The Island Garden City of Samal devotes the largest area for coconut production at 16,488 hectares, contributing almost half of the total area planted to coconut in the province. On the other hand, paddy rice

cultivation was undertaken in 19,769 hectares, of which 81.61% (16,134 hectares) are irrigated. Total production in 2012 was 133,471 MT valued at PhP1,982 million. Mono-crop cultivation of corn occupies around 17,221 hectares which are usually the white variety. Total production in 2012 amounted to 21,648 MT valued at PhP267 million.

Fish production consists of aquaculture production and production from municipal waters. Brackish aquaculture, producing bangus, shrimps, crabs, and other fish species dominate the aquaculture industry occupying a total of 1,265.80 hectares. On the other hand, livestock inventory in the province has remained stable from 2003 to 2014. In January 2014, the province has a total of 23,681 heads of carabao, 14,097 heads of cattle, 47,470 heads of goat and 136,410 heads of swine. In addition, the inventory for poultry in 2014 registered a total of 1,057,980 native chicken, 354,210 broilers, 47,635 layers and 221,468 ducks.

The banana industry being the most important player of the economy of the province of Davao del Norte dictates the location and type of investments on services and support industries in the province as well as the strategic alliances and infrastructure facilities needed to sustain its growth. Banana chips has become part of Davao Region's top exports. At present, there are 26 processing plants for banana chips in Mindanao; 16 of these plants are located in Davao Region, of which six are in Davao del Norte.

Wood processing plants operate to address the demand of wood by the banana industry. It was noted that the demand of the banana industry alone could not be supplied by the existing forest production in the province, hence nearby provinces also participated in the market.

Davao del Norte is also endowed with rich deposits of non-metallic minerals like guano, marble, limestone and others. The province has a total reserve of 8,626,200.00 metric tons of non-metallic minerals. Similarly, the province has an abundant source of high quality grade sand & gravel. The extraction of sand & gravel is one of the major income generating industries in the province.

## **5.0 INSTITUTIONAL FRAMEWORK**

The institutional framework and physical structure for the Tagum-Libuganon River was crafted as a result of the Consultation Meeting On The "Formulation Of Integrated River Basin Management Policy Guidelines" held in the Office of the Governor, Government Center, Mankilam, Tagum City, Davao del Norte on May 20, 2014.

As a basis in deliberation on the formulation of the institutional framework and physical structure to be adapted in the Tagum Libuganon River Basin, the WCI Project Team Leader and the IDM Specialist/Sociologist presented in this consultation meeting a paper and a power point presentation titled "THE URGENT NEED FOR LOCAL GOVERNMENT UNITS TO ACTIVATE ITS CORPORATE ENTITY AS A REQUISITE TO BE THE PRIMARY IMPLEMENTOR IN THE TAGUM LIBUGANON RIVER BASIN: Emphasis On the Application of the Principles of Ownership and Good Governance in the Institutional Framework and Physical Structure for the Proper Implementation of the Integrated Tagum Libuganon River Basin Master Plan".

The output of the aforementioned consultation meeting was presented and deliberated, in plenary during the 2<sup>nd</sup> Public Synthesis and Consultation Forum held at the BIG 8 Corporate Hotel, Tagum City, Davao del Norte on June 17-18, 2014. Additional enhancement to the presentation was introduced by the Stakeholders, after which they accepted the ownership of the institutional structure.



The institutional structure was presented to various committees, namely, the Technical Working Group of the Tagum-Libuganon River Basin Management Council, the National Steering Committee of the River Basin Control Office, and the Economic Development Council of the NEDA Region XI. Several comments on how to improve the structure were given. This report incorporated the comments from the various committees.

Further discussion of the framework is on Volume II, the Main Report of the TLRB Master Plan.

## **6.0 INVESTMENT PLAN**

The investment plan for the TLRB is a consolidation of the proposed programs and projects for each thematic area to be able to attain the goals and objectives of the theme and the river basin as a whole. These programs and projects are based on the results of the stakeholders' consultations and the experts' analysis of local conditions and the critical needs of the basin. These programs and projects are segregated into four (4) thematic groups: Watershed Resources Management, Water Resources Management, Environment and Climate Change Management, and Social and Community Participation.

The proposed programs and projects for the TLRB will require a total of PhP12.77 billion in the next 15 years. More than one third of the investment is accounted for by the proposed water resources management projects amounting to PhP4.41 billion. These consist of short gestation projects but require big investments as they address urgent concerns of flooding and are mostly structural remedial measures. As expected, most of the proposed projects for watershed resources management are long gestating projects to rehabilitate the denuded areas of the water shed and riverbanks with provision for projects which will provide income to the stakeholders. The investment requirements for the proposed watershed management projects accounted for about 27% of the total or PhP3.44 billion. The proposed programs and projects for environment and climate change management accounted for 12% of the total or PhP1.54 billion. Social and community participation projects are mostly concerned with the enhancement of the social services, health and sanitation, education, skills enhancements and livelihood accounting for 26% of the total investment amounting to PhP3.38 billion.