

# **Climate Change-Responsive Integrated River Basin Management and Development Master Plans for the 8 Clustered River Basins**

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Executive Summary for Cluster 6 River Basin  
(Catarman, Catubig, and Pambujan)

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Funded by:  
River Basin Control Office  
Department of Environment and Natural  
Resources

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## EXECUTIVE SUMMARY

### 1 RATIONALE

The River Basin Control Office (RBCO) was mandated through Executive Order Nos. 510, 816, and 50 to create and develop master plans for the country's river basins to solve environmental problems such as flooding, and to ensure sustainable water supply for the entire country. Since 2007, master plans have been prepared for the 18 major river basins in the Philippines pursuant to Executive Order No. 510. These 18 major river basins were identified in accordance with the Climate Change Adaptation and Mitigation (CCAM) Cluster's Program Budget and Approach (PBA) in CY 2013 and CY 2015.

The PBA also provided opportunities to cover other river basins outside these 18 major river basins. Thus, a total of 26 additional river basins were identified for master plan preparation, one of which is the Cluster 6 River Basin found in Samar Island. The river basins were selected based on the following criteria: (a) absence of Integrated River Basin Management and Development Master Plans (IRBMDMP) and appropriate institutional mechanisms; (b) environmental problems such as flooding, landslides, deforestation, and water quality degradation are present in the area; (c) high poverty incidence; and (d) contributes to high economic growth of the country.

### 2 PROJECT OBJECTIVES

The objective of this project is to formulate an Integrated River Basin Management and Development Master Plan (IRBMDMP) for the eight (8) Clustered River Basins taking into consideration biological diversity and their capacity to provide ecosystem goods and services. The plan incorporates the implications of the new climate normal in addressing the concerns of the river basin on the following critical areas of concern:

- 1) Water Resources Management;
- 2) Forest Ecosystem and Biodiversity;
- 3) Disaster Risk Reduction Management;
- 4) Wetland Management (to include rivers, river deltas, marshlands, and coastal areas);
- 5) Economic development; and
- 6) Institutional concerns

### 3 SCOPE AND LIMITATION

The project focused on the Formulation of the River Basin Management and Development Master Plan for the Cluster 6 River Basin. Potential climate change impacts were considered to provide a sound basis for management decisions in the sustainable management of the resource. The project consisted of two phases, the scope of which includes:

1. Profiling of the River Basin;
2. Formulation of vision, mission, and goals;
3. Identification of strategies, programs, and projects;
4. Evaluation of strategies, programs, and projects; and
5. Investment and implementation planning.

## 4 METHODOLOGY

The formulation of the Integrated River Basin Management and Development Master Plan for Cluster 6 involves various activities with corresponding desired outputs (Figure 1). Secondary data gathering, consultative workshops, focus group discussions (FGDs), and visits to various agencies were done to come up with a plan that is acceptable to all.

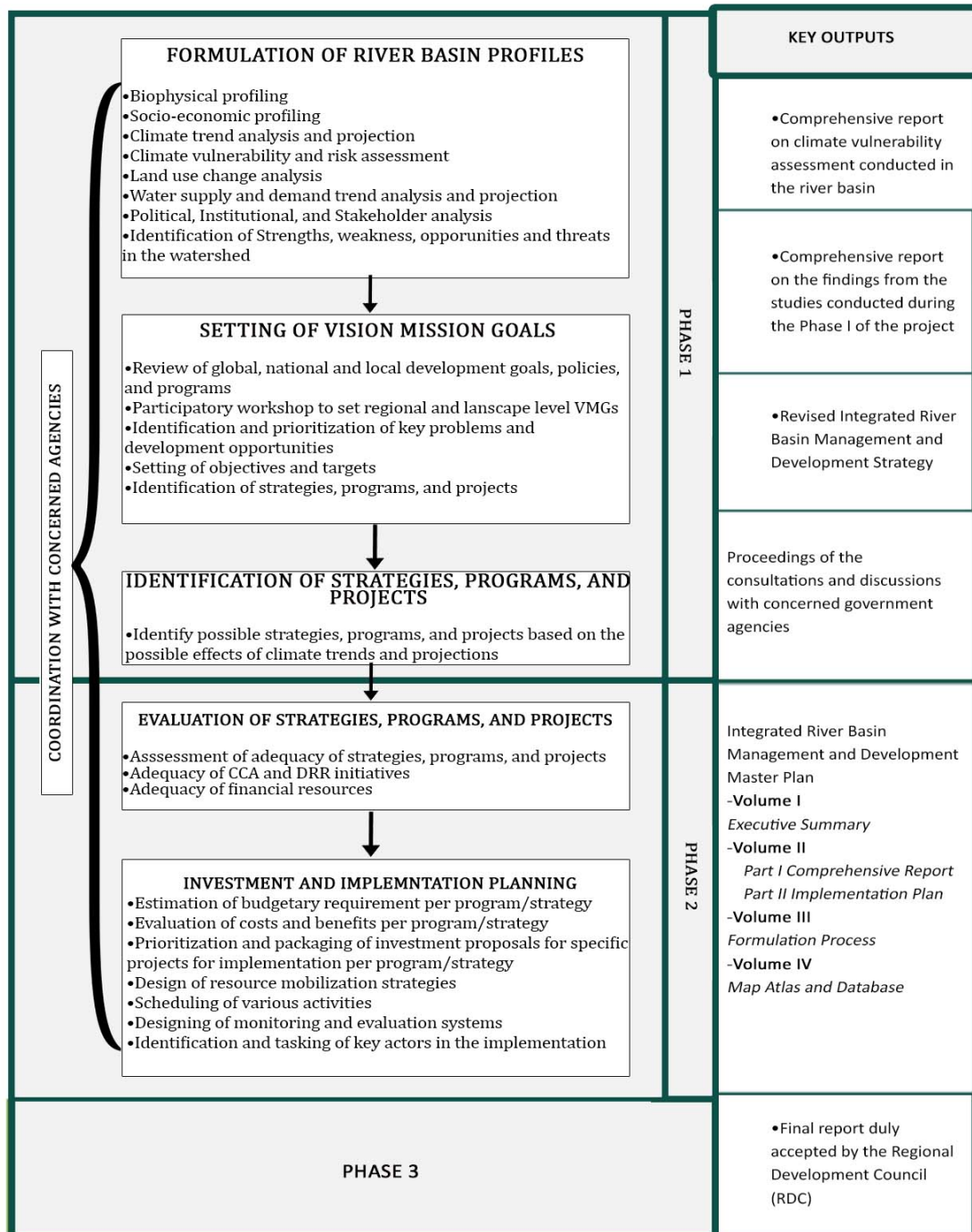


Figure 1. Methodological framework for developing a climate-responsive integrated master plan.

## 5 ASSESSMENT REPORTS

### 5.1 Geophysical Profile

#### *Geographic Location*

The Cluster 6 River Basin covers three Principal River Basins from the Samar Island located in Eastern Visayas Region or Region VIII. It encompasses 210,282 ha. The Principal River Basins (PRB) bounded are Catubig, Catarman, and Pambujan PRBs. The three Principal River Basins (PRBs) of Cluster 6 covers three provinces in Samar Island, such as the Eastern Samar, Samar, and Northern Samar. Northern Samar has the largest areal coverage in the Cluster (77.8%). Of all the municipalities in the cluster, the municipality of Catarman in Northern Samar has the largest area covered, while Santa Margarita in Samar Province has the smallest area coverage (0.04%).

There are two minor watersheds in between the three PRBs, which encompass about 39,675 ha of the Northern Samar Province. Of the six (6) municipalities it bounds, the municipality of Mondragon, Northern Samar has the largest area (58.2%). On the other hand, the minor watersheds encompass only 0.9% of the land area of Catarman, Northern Samar. The geographical location and code number of each PRB, and minor watersheds in Cluster 6 are presented in Table 1.

Table 1. Geographical location of Cluster 6 PRB and minor watersheds.

Principal River Basins	Code no.*	Geographical Location
<b>Principal River Basin</b>		
Catarman	08244	12°12'4" to 12°32'58" North latitude 124°30'22" to 124°45'54" East longitude
Catubig	08247	12°7'28" to 12°35'51" North latitude 124°52'21" to 125°9'56" East longitude
Pambujan	08246	12°8'21" to 12°35'55" North latitude 124°41'13" to 125°0'11" East longitude
<b>Minor Watershed</b>		
Minor Watershed 1	-	12°19'49.12" to 12°34'44.97" North latitude 124°41'26.45" to 124°54'35.67" East longitude
Minor Watershed 2	-	12°30'4.27" to 12°34'44.97" North latitude 124°55'54.62" to 125°0'32.54" East longitude

#### *Climate Trends*

Cluster 6 River Basin falls under the Type II (municipalities facing eastern seaboard) and Type IV (municipalities facing west) climate of the Modified Corona Climate Classification System. According to the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), Type II is characterized as having no dry season but has a pronounced maximum rainfall in November to December. Type IV, on the other hand, is characterized by more or less evenly distributed rainfall yearly. The cluster has an annual average rainfall is 3,556mm. The mean annual temperature is around 27.4°C.

The projected seasonal changes in rainfall in Cluster 6 (2036-2066) based on RCP 4.5 and RCP 8.5 carbon concentration pathways show a slight increase of 6.2% and 14%, respectively, for the months of December, January, and February (DJF). However, during the months of June, July, and August (JJA), and September, October, and November (SON), there is a projected decrease in the precipitation amount. On the other hand, by the year

2070-2099, there is a projected higher increase in rainfall during DJF in RCP 4.5 scenario (15.2%) and a slight increase in RCP 8.5 scenario (5.7%). Decrease in precipitation is expected during SON in both RCP 4.5 (18.2%) and RCP 8.5 (23.8%) scenarios.

### ***Topography***

The Cluster 6 River Basin mostly covers an elevation ranging from 0-100 masl. It comprises 62% of the cluster. The municipalities located in a low elevation are Catarman, Las Navas, and Silvino Lobos. Municipalities located in a very high elevation (500-1000 masl) are Maslog, Gandara, and San Jose de Buan. The dominant slope class in the PRB is 8-18% slope.

### ***Soil and Geology***

The soils in the Cluster 6 River Basin are diverse and represent a wide range of development stages. Eight (8) soil series were distributed in the river basin. These are the Bayho, Bigaa, Bugko, Catbalogan, Catubig, Faraon, Quingua, and San Manuel. Similarly, five (5) distinct geologic deposit formations were present. These are the Marine clastics, pyroclastics, Oligocene-Miocene, Upper Miocene-Pliocene, Recent deposits, and Sandstones, shales, reef limestone. In Cluster 6 provinces, 22,825 ha are covered by approved mining applications, while ~124,382 ha is still subjected to on-going applications.

### ***Water Resources***

Surface water is the water, which runs through the surface of the earth. Water runoff after precipitation goes to surface water bodies, such as rivers, lakes, ponds, reservoirs, etc. These bodies of water are classified according to use by the virtue of DAO 08 series of 2016 or the Water Quality Guidelines and General Effluent Standards of 2016

There are four major (Catarman, Gamay, Mawo, and Gandara) and one minor (Calbayog) river system in Cluster 6. The National Water Resources Board classified these rivers based on the previously released guidelines of DENR (DAO 1990-34) for water bodies. The only available streamflow records for Cluster 6 river basin is from Tenani River covering the periods 1985 to 2001 and 2005-2010. In 1995, the average stream discharge of Tenani River reached its highest of the 25-year period (147,074 l/s). Lowest stream discharge occurred in 2009 with an average of 6,640 l/s. During that year, below normal rainfall condition was experienced (PAGASA 2009). During the month of December, the river reaches its average peak flow of 43,537 l/s. Its lowest monthly average flow is during the month of May (11,498 l/s).

Fairly extensive and productive aquifers are found in Matuguinao, Northern Samar. The similar aquifer, but with flow to moderate potential recharge are located in Maslog, Eastern Samar; Las Navas Northern Samar; and San Jose de Buan and Matuguinao, Samar. These consist of sand and gravel layers, and impervious layers of clay or silt, that has enough magnitude, scale, and permeability to produce large quantities of groundwater. Local and less productive aquifers have lesser groundwater potential. Such aquifer formations are found in large areas of the three PRBs.

Overall, there are 148 water permittees in the Cluster, 31% of which use groundwater, while 69% utilizes surface water. Several water quality studies were done in the surface water and drinking water of the river basin. Results showed that the quality of both water resources are still within the standard set in DAO 2016-08 of the Environmental Management Bureau, and DAO 26-A of the Philippine Standard for Drinking Water.

However, only physical water quality was assessed in the two water quality studies. Biological water quality was not examined.

### ***Land Classification and Land Cover***

Most of the land areas in Cluster 6 River Basin is classified as forestland (65%). These forestlands are further subdivided into Communal Forest (0.2%), and Forest Reserves (64.3%). Thirty-five percent (35%) of the remaining areas of the PRB is classified as alienable and disposable land. These are areas that are not needed for forest purposes and are available for other uses.

The land cover identified in the river basins are the annual crop, brush/shrubs, built-up, fishpond, grassland, inland water, mangrove forest, marshland/swamp, open forest, open/barren, fish pond, perennial crop, shrubs, and wooded grassland areas. In the Cluster, the most dominant land cover is perennial crops, followed by an open forest.

### ***Natural Hazards***

Dry spell is defined as having three consecutive months of below normal rainfall condition (21-60% reduction of average rainfall. Drought is described as having three months of consecutive below normal rainfall condition (60% reduction of rainfall). In several months of 2015, dry spells and drought were experienced in the provinces of Samar, Northern Samar, and Eastern Samar (PAGASA). A 6-month SPI can be very effective in showing the precipitation over distinct seasons. Based on this, Cluster 6 will experience near normal wet and dry condition in year 2050 having SPI values ranging from -0.41 to 0.48 Agricultural drought. On the other hand, Cluster 6 will experience near normal wet and dry condition in year 2050 having SPI values ranging from -0.55 to 0.17 meteorological drought.

From January 2018 to January 2019, the Philippine Institute of Volcanology and Seismology (PhiVolcs) recorded 352 earthquake with magnitude ranging from 1.6 to 5.2 in Cluster 6 River Basin. Most of the quakes felt in the river basin are scarcely perceptible earthquakes. Eighty-eight (88) quakes range from “slightly felt” (Intensity II) to “strong earthquakes” (Intensity V). Moreover, there are two (2) very strong earthquakes recorded during the months of January and August in 2018.

There are no fault lines inside the PRBs, however, the Northern Samar lineament located in the Samar Island could affect its adjacent areas. The municipality of Catarman in Catarman PRB has the largest areal coverage susceptible to ground shaking. In the Catubig PRB, 26,814 ha of Las Navas is affected by ground shaking. About 35% of the Pambujan PRB is prone to ground shaking.

Flooding often occurs in about 22.1% of Cluster 6 river basin area. Twenty-seven percent (27%) of the areas in the Catarman PRB have low to very high flood susceptibility. Some areas in the municipality of Catarman and Lope de Vega has a very high susceptibility to flooding. In Catubig PRB, about 18% (per municipality) is observed to have a low to very high flood susceptibility. Very high flooding susceptibility is observed in some areas of the municipalities of Catubig, Laoang, and Las Navas. As for the Pambujan PRB, 27% have low to very high flood susceptibility.

Almost (99.5%) the whole Catarman PRB have low to very high landslide susceptibility. In Catubig PRB, 72.0% have low to very high susceptibility to landslide. Eighty-one percent (81.3%) of Pambujan PRB has low to very high susceptibility to landslide.



Liquefaction-prone areas of Catarman, Catubig, and Pambujan PRBs are 6%, 16%, and 6%, respectively. The municipalities of Catarman, Catubig, Laoang, Las Navas, and Pambujan have large areal coverage that is prone to liquefaction.

Two storm surge scenarios were projected—the A1 and A4 scenarios. In A1 scenario, water level surge as high as 3-meters is expected, while water level in A4 scenario surge is as high as 5-meters. Several coastal barangays are affected by both scenarios. In the level 4 storm surge scenario, almost 21 barangays are susceptible to storm surge in the PRBs. In Catarman and Catubig PRBs, barangay Cawayan (74 ha) and Talisay (247 ha), have the largest storm surge susceptible areas. Barangay Cabab-toan in Pambujan PRB has the largest areal coverage (306 ha) susceptible to storm surge.

## 5.2 Bioecological Profile

Samar Island's vast number of species is very evident. Species of high ecological importance, like the Philippine Eagle, are also found in the island. Biodiversity in the area is explained through its history. According to the Philippines Biodiversity Conservation Foundation (2014), Samar Island is one of the islands in the country that has a very high rate of endemism in the past.

The Catubig, Catarman, and Pambujan PRBs are home to immense plant diversity. In fact, plants with different growth habits could be observed in the PRB. The plant life forms in the PRB consists of epiphytes, ferns, grasses, herbs, lianas/vines, trees, and shrubs. Its normal ecological value/Shannon index range from 1.5- 3.5, it means moderate diversity in a community. Most of the species in the PRBs are in vulnerable category. Its distribution in the PRB and its category status based on DAO 2017-11 and IUCN.

Each PRB in the cluster has diverse faunal species. Four terrestrial faunal classes were identified. These are the amphibians, birds, reptiles, and terrestrial mammals. There are over 285 terrestrial fauna that were observed in Cluster 6. The faunal species were classified to its conservation status based on the IUCN classification. Of the 285 species identified in the PRBs, 1.04% are Critically Endangered (CE), 2.08% are Endangered (E), 92.71% of it are Least Concern (LC), and 4.17% are not yet classified due to Data Deficiency (DD).

By virtue of Proclamation No. 442, the Samar Island National Park (SINP) was declared as a Protected Area. It has an area of 333,300 ha and a buffer zone of 125,400 ha. It covers the Provinces of Eastern Samar, Northern Samar, and Samar. It is one of the most important biodiversity sites in the country. It is home to a vast number of organisms, both flora, and fauna that are endemic to the country. In fact, the famous Philippine Eagle resides in the SINP. In the PRB, areas in the municipalities of Lope de Vega and Mondragon, and in the City of Calbayog were encompassed by the protected area.

The identified wetlands in Cluster 6 is comprised of mangrove forests. There are observed fluctuations in between seasons. During the dry season, the trend is generally increasing from 2003 to 2010. However, wet season showed a significant decrease in mangrove area from 2003 to 2010 from 6,627.87 hectares to 5,925.86 hectares then an increase from 2010 to 2015 from 5,925.86 hectares to 6,736.10 hectares.

Other types of inland wetland areas are also found in the cluster, specifically in the Pambujan PRB. Nalucaban marsh (formerly Cayaocan lake) is situated in Brgy. Cabari-an, Pambujan, Northern Samar. It has a total area of 88 ha. The inland marsh contains various

species of fishes and crustaceans. According to the report done by the CENRO Pambujan Wetland Assessment Team, diverse floral species could be found in the marsh and many economically important faunal species are thriving in the marsh. The area also hosts both local and migrant avian species. Species, which are also set as vulnerable by the IUCN Red list were also found in the marsh, such as Philippine Duck, Bristle-thighed Curlew, and Chinese Egret

### **5.3 Demographic Profile**

Cluster 6 encapsulates portions of three provinces with 17 municipalities and one city. All in all, there are 304,524 people inhabiting the Cluster 6 municipalities. Of the three provinces encompassed by Cluster 6, the province of Northern Samar has the highest number of population (285,710), which comprises 93.8% of the total population of the cluster. It is followed by the provinces of Western Samar (18,307), and Eastern Samar (507), which comprise 6.0%, and 0.2% of the total population in the PRBs, respectively.

In the PRB provinces, the average crude rate of natural increase is 20.9 number of people per 1000 population from 2010-2015. The province of Northern Samar has the highest increase, while Samar Province has the lowest increase among the three provinces.

### **5.4 Socio-economic Profile**

#### ***Settlement Pattern***

The settlement pattern shows the population distribution in the rural and urban areas of the PRB. The cluster has a larger population size on rural areas (1,646,094) than urban areas (98,692).

#### ***Culture***

Many of the residents in the PRB are *Waray-warays*. However, most of the residents in Cluster 6 PRBs came from different places. According to a book published by Sellers (2014), most of the residents in the Island came from various parts of the Philippines, like Bicol, Leyte, Bohol, Cebu, and Palawan. For that matter, mix of various culture is evident in the area. Migrants from different parts of the country can be observed (DENR R08 2017). The National Commission on Indigenous People (NCIP) confirmed that there are no indigenous people dwelling in the Island of Samar.

#### ***Access to Land and Land Rights***

Catarman PRB has 67.1% of the population with no land owned, while 32.9% have land owned. In Catubig PRB, 51.5% of the population have no land ownership while 48.5% owns a land. Lastly, over 60.9% of the population of Pambujan PRB has no land owned while 39.1% owns land. Calbayog City has the highest number of households with at least one land owned among the Local Government Units in the river basin.

#### ***Housing Tenure***

In Cluster 6, 44.9 % of the population own their house and lot. Thirty-eight percent of the population owns the house, but the lot is freely rented to them. About 0.2% rents the lot for free without the consent of the lot owner (PSA).

#### ***Energy and Fuel Consumption***

Most of the households in the PRB are using fuel for cooking and lighting. As recorded by the Philippine Statistics Authority, most of the fuel consumption of the Cluster 6 residents

within the Cluster 6 is through electricity. It is followed by kerosene (*gaas*), and Liquefied Petroleum Gas (LPG)

### **Health**

In the Region VIII, the leading causes of morbidity are Acute Respiratory Infection, Acute Lower Respiratory Tract Infection (ALTRI) & Pneumonia, hypertension, Urinary Tract Infection, Bronchitis, Acute Watery Diarrhea, Acute Febrile Illness, Respiratory Tuberculosis (TB), Influenza, and other forms of TB.

### **Literacy and Education**

In Cluster 6, as the age group increases, the level of attendance in school decreases. Moreover, for all age groups, female tends to be more present in school than male. As of 2015, the average literacy rate of the country is 98.3%. In Region VIII, the average literacy rate is 93.6%. The municipality of Laoang has the highest literacy rate for both males (98.5%) and females (98.9%). Enrollment in both primary and secondary schools in Eastern Samar, Northern Samar, and Samar slightly decreased from the school year 2010-2011 to the school year 2015-2016.

### **Poverty and Subsistence**

The proportion of the population with income lower than the poverty threshold is called the poverty incidence (PSA 2018). As of 2015, among the three provinces of Cluster 6, the Province of Samar has the lowest annual per capita poverty threshold (PhP20,770.00 in Urban; PhP20,072.00 in Rural), while Eastern Samar has the highest (PhP24,020.00 in Urban; PhP22,886.00 in Rural). For poverty incidence, Northern Samar recorded the highest (47.9%), while Eastern Samar registered the lowest (37.4%).

According to PSA (2018), the proportion of the population per capita income below the per capita food threshold is called subsistence incidence. Northern Samar registered the highest (23%) subsistence incidence among the three PRB provinces, while the Samar province has the lowest (16.3%). In 2015, the annual per capita food threshold is highest in Eastern Samar (PHP 16,773.00 in Urban; PhP15,981.00) and lowest in Samar Province (PHP 14,503.00 in the Urban; PhP14,016.00 in the Rural).

### **Human Development Index**

Human Development Index (HDI) is a criterion to assess the development of a country. HDI is calculated based on three indices: life expectancy index, education index, and Gini index. Gini index represents the income or wealth distribution in an area. As of 2015, the country has an HDI of 0.7. In general, the HDI of the provinces covered by Cluster 6 is low. Of the three provinces, Eastern Samar registered the lowest HDI of 0.389.

### **Employment and Labor Force**

Region VIII has an employment rate of 95.5%, but the participating labor was just estimated to be 62.1%. The unemployment rate is estimated to be 4.5% and the underemployment rate is 29.7%.

In general, the employment rate in the three provinces covered by Cluster 6 is high. Samar province registered the highest employment rate (95.3%) while Northern Samar recorded the least (89.9%) among the three provinces.

Work-wise, it can be observed that there is a higher percentage of men in armed forces, plant and machine operating and assembly, craft and related trades, skilled agricultural,

forestry and fishery, and other elementary occupations. On the other hand, a higher percentage of women are involved in occupations such as service and sales, clerical support, technicians and associate professionals, professional and managerial jobs.

### ***Labor Force***

Labor force is those who are actually working or are actively looking for employment. In Cluster 6 provinces, more than 50% of the population belong to the labor force. Northern Samar has the lowest labor force, while Eastern Samar has the highest among the three provinces.

### ***Household Income and Expenditure***

Household income and expenditure represent the consumption pattern of the population in the PRB. A higher income means an increase in the consumptive capacity of the consumer. This economic variable could be used to measure the economic impacts of the suggested plans and programs to be implemented in the PRB.

The annual income class is classified into five (5). In Region VIII, 31% of the households belong to the income class of PhP60,000.00 to PhP99,999.00. On the other hand, 6% of the households in the region have an income under PhP40,000.00.

### ***Natural Resource Dependent Livelihood***

As of the second quarter of 2018, the total gross earnings of the region from agriculture (crops, livestock, poultry, and fisheries) amounted to 447.2 billion pesos (PSA 2018). Although the crops and fisheries subsectors in agriculture show a decline in its total output, the poultry and livestock subsectors show an increase in production. The output of the agricultural sector increased by 5.5% in 2018.

The forestry sector also contributes to the natural resources-based livelihood of the population in Cluster 6. Products from the forests include Timber Forest Products (TFPs) and Non-Timber Forest Products (NTFPs). Majority of the plant species are used for landscape work, which perhaps entails a higher economic benefit.

The Department of Tourism (DOT) monitors the number of visitors, both foreign and domestic, in various areas of the country. In the case of the provinces covered by Cluster 6, the majority of the tourists are locals. Yearly, there are 6,983 foreign visitors and 149,667 domestic visitors in the area. Overall, there are 156,650 visitors in the Cluster municipalities and city. In 2017, there are 41,009 domestic and 26 foreign visitors recorded in select municipalities of Cluster 6.

## **5.5 Infrastructure**

### ***Educational Facilities***

Facilities that would support proper education is a very significant factor towards the increase of population literacy rate. The number of schools and colleges, both public and private in Cluster 6 municipalities is 692 and 36, respectively. With the exception of two municipalities (Matuguinao and San Jose de Buan), schools are present in each municipality and city.

### ***Health Facilities***

According to the Directory of Health, Rehabilitation, and Disability Services (DHRDS) in Region VIII, there are five (5) identified hospitals that are both government-owned and are infirmary levels within the river basin. These are the Catubig District Hospital, Dr. G.B. Tan Memorial Hospital, Calbayog District Hospital, Our Lady of Porzuincola, and Gandara District Hospital.

### ***Evacuation Center***

There are 137 evacuation centers in the clusters, distributed within thirteen (13) municipalities of the river basin. However, most of the evacuation centers are classified as government buildings, gym, school, church, city hall, and health centers.

### ***Roads and Bridges***

Roads and bridges play a huge role in the overall economy of an area. Most of the goods and services pass through roads and bridges to reach the consumers. Fifty-eight percent (58%) of the roads in the cluster are concrete paved roads, while 41% are asphalt concrete roads. Of the total road length within the provinces, almost 2% are unpaved gravel roads.

Bridges are classified either as permanent or temporary. By material, it can be either concrete or steel bridges. In Cluster 6 provinces, there are numerous permanent concrete bridges. Temporary bridges also exist, but in limited quantities.

### ***Water Supply Facilities***

In the Philippines, there are three levels of water systems: levels 1, 2, and 3. As mentioned by the Asian Development Bank (ADB), "level 1 is a stand-alone waterpoints, level 2 is the piped water with a communal water point, and level 3 is a piped water supply with a private water-point." Various level of water systems exists in the provinces covered by the PRB. In the case of Eastern Samar, the majority are of level 1 type. For Northern Samar, it is level 2, while for Samar province it is level 3.

### ***Dams***

Dams are used for various purposes, such as water supply, flood control, irrigation, sedimentation control, and hydropower. Cluster 6 has the potential to have eleven (11) dams in the Cluster 6 River Basin. Three (3) of the dams were already completed, one (1) is under construction, and seven (7) are proposed. Overall, there are two (2) types of dams in Cluster 6, these are the diversion dams, which are used for turning the river to a different direction aside from its natural course, and Water Impounding Projects, which provide water for irrigation and/or inland fisheries.

### ***Irrigation***

One of the sources of livelihood of the people in Cluster 6 is agriculture. One of the many requirements for agriculture is irrigation systems. According to NIA (2017), the Cluster has 82.3% of total irrigated area, most of which are Communal Irrigation System (13,873 ha).

### ***Sanitation***

To maintain the health of the river and other wetlands within the PRB, sanitation facilities are important to maintain. Within the cluster, the Province of Samar has the highest number of households with sanitary toilets (83.92%). Eastern Samar and Northern Samar have 71.44% and 63.78% of its households with sanitary toilets, respectively.

### ***Waste Disposal***

Waste disposal is one of the significant issues that need to be addressed if we want to ensure high water quality. According to DOH FHSIS (2016), among the three provinces, only Eastern Samar has the highest percentage of households practicing satisfactory waste disposal.

According to Environmental Management Bureau Region 8 (2016), there are two existing Sanitary Landfill (SLF) in the Island of Samar. It is located in Calbayog City, Samar Province. As of 2016, there is an ongoing development of Sanitary Landfills in Basey, Samar, and Guian, Eastern Samar. In the Northern Samar, there is an existing Sanitary Landfill in Sitio Balinghit, Brgy. Taliga, in Catarman. Some municipalities have a Materials Recovery Facility (MRF) for the separation, processing, and preparation of the recyclables. Others, like the municipality of Gandara, have no existing MRFs. Overall, 63.6% of the municipalities in Cluster 6 PRB have Materials Recovery Facilities (MRFs).

### ***Communication***

It was just in 2011 that the Globe Telecom, Inc. installed a cellular site/tower in Northern Samar. Currently, various network providers, such as Smart Communication, also installed cellular sites/towers in the province, making communication more accessible to the inhabitants of the PRB. However, there are areas in the PRB, which are difficult to reach via telecommunication for various reasons, like the presence of a mountainous terrain limiting cell signals.

As for the Information, Communication, and Technology services in the PRB, telephone and internet communications are also readily available. Telephone services of Bayan Tel, Globe, PLDT, and PT&T are presently providing the telephone services region-wide. However, there is still a need for improvement in the communication service in some areas of the PRB.

### ***Financial Institutions***

Financial institution is a channel for economic growth. In the three provinces, there are a total of 212 financial institutions. There are 67 banks and 145 pawn shops in the region. The total bank deposit liabilities are the amount of money placed in the bank. From 2013 to 2015, there is a 55.3% increase in total bank deposit liabilities in the region possibly indicating an improving economic condition.

### ***Energy***

Most of the population is dependent on energy for everyday activities. In the Visayas area, there are numerous on-grid and off-grid energy connections that are either oil-based or

run with a renewable energy source. There are 21 diesel-fired power plants present in Samar Island, but no power plant is located within the Cluster 6 boundary.

### ***Transportation***

Public utility vehicles and jeepneys are the mainland transport services available when going to the municipality of Catarman in Northern Samar Province. Private vehicles (vans), such as the one operated by Grand Tours and D' TURBANADA vans are also publicly available for those who want more comfort in their travel.

In addition to land transportation in the areas, air transportation, located in Catarman Airport are also available. There are several commercial flights operating in the airport, such as those operated by Air Phil Express, Cebu Pacific Air (Mactan, Manila, and Iloilo), Zestair (Manila), and Sea Air/Tiger (Manila). There are also seaports located near the PRB—the San Isidro Ferry and Allen terminal 1 (BALWHARTECO with private RORO ramps). These ports have roll-on, roll-off (RORO) ramps, which allow land travel from Northern Samar to Luzon.

## **5.6 Land Capability Assessment**

The land capability zones output for the observed rainfall scenario summarizes the basis for the allocation of lands. The strict protection areas in the river basin comprise about 65% of the total land area in the cluster. Agroforestry production accounts for 23% of the area of PRBs. Land capability derived for 2050 and 2085 have only little variation in the agroforest production (-1%), and a 1% projected increase in unlimited production. For the three scenarios, the municipalities that should implement strict protection are Lope de Vega, Las Navas, and Silvino Lobos from Catarman, Catubig, and Pambujan PRBs, respectively.

## **5.7 Stakeholder Analysis**

Stakeholders were further categorized into three—user groups, mediating institutions, and external economic interest groups. User groups are stakeholders who have a direct interest in the watershed resources. Mediating institution, on the other hand, are institutions who have a direct or indirect stake at the watershed resource management. This group is the implementers of policies for management. Lastly, the external economic interest groups are stakeholders who do not reside within the PRBs but has economic interests on watershed resources. Overall, there are 48 stakeholders identified within the Cluster 6 river basin. Of these, 40% are user groups, 44% are mediating institutions, and 17% are external economic interest groups.

Five (5) identified general categories of issues or motives create and cement stakeholder alliances in the Cluster. These are resource access, water extraction and distribution, agriculture, forestry and fisheries, economic purposes, natural resource conservation, and environmental protection. Economic purposes or reasons and motives that are directly economic in nature, are the main driving forces behind many of the alliances formed in the PRB.

Sources of conflicts among stakeholders in Cluster 6 include administrative conflicts, economic conflicts, conflicting resource use, resource access, pollution, and illegal activities. Illegal activities are identified as the most common source of conflict among stakeholders within the PRB. Economics, both direct and indirect, is the underlying source of conflict in the PRB. These include indirect economic sources of conflicts like conflicting resource use, resource access, pollution, and illegal activities. Pollution is an indirect

economic conflict source because it is an externality of economic transactions or activities due to the lack of or the ambiguity of property rights in common or open access resources.

## 5.8 Policy and Institutional Assessment

Many policies encompass the management of the river basin, including the Sustainable Development Goal (2015-2030), Philippine Development Plan (2011-2016), Sustainable National Action Plan (2009-2019), National Climate Change Action Plan (2011-2028), Philippine Strategy for Sustainable Development (1999), etc. These policies have a goal to improve the quality of life through poverty alleviation, sustainable development, capacity building, disaster risk reduction, and climate change adaptation.

The said frameworks basically evolved from the Water and Environment Summits and principles such as the Dublin Principle for water scarcity, Earth Summit in 1992, Agenda 21 and the adoption of IWRM by GWP. Its main objective is to promote sustainable development of water resources at all levels and sectors. It further expanded to the Integrated River Basin Development and Management (IRBDM), which is the focus of this project.

There are three broad governance policies quintessential to the Philippine government; the provisions for localization, privatization, and good governance. These policies enable the government to extend, allocate, and enhance its services across the country, reaching up to the remote localities. The following are some of the laws falling under each governance policy, which shape the governance of the country.

The government was able to localize governance through Republic Act no. 7160 also known as the Local Government Code of 1991. It aims to decentralize certain frontline programs and services of the national government. This made the services more accessible to the public, facilitating the implementation of peace and order regimes, local development, and tapping of the private sector in delivering basic services.

Given that there is no existing watershed management council in the area, and in spite of a number of initiatives and groups of organizations for the protection of the watershed resources with weak governance and low social capital among them, it is imperative for the Catarman-Catubig-Pambujan PRB area actors to organize and establish a unique organization that would ensure the protection and development of the area. It might be plausible for such initiative to come from NEDA VIII piggybacking on the Resiliency Plan to incorporate the parameters for the Integrated River Basin Development and Management Council concerns on top of the initial concern on flooding events. Such a move enables the current set of players in the NEDA VIII grouping to engage with one another and develop strong social capital as they make way for area-wide and complex river basin undertakings.

This Council shall be tasked for the formulation of plans, approval of plans and perform oversight functions on the programs and projects (PAPs) that are climate resilient. Such initiatives are premised on evidence-based information and should be governed by governance principles.



## **5.9 Vulnerability Assessment**

### ***Hazard Vulnerability Assessment***

About 25,010 ha (10%) of the cluster 6 river basin have a high to very high flood vulnerability category. For landslide, about 83,544 ha (33.5%) of the cluster is highly to very highly vulnerable. And lastly, for storm surge, Majority of the areas in the cluster 6 river basin is classified as having very low (32.2%) to low (64.8%) storm surge vulnerability. Nevertheless, 3% of the cluster is still vulnerable to 5 meter storm surge.

### ***Water Resources Assessment***

#### **Surface Water**

There are no available stream flow records in any of the major streams within the Cluster. As such, the streamflow record of the Tenani River covering periods of 1985-2001 and 2005-2010 was used to estimate surface water resources in the Cluster. Tenani river is located in the Eastern Samar Province. It has a drainage area of 394.0 km<sup>2</sup>. Based on the available records, the annual average flow is about 24.7 m<sup>3</sup>/s. Using flow duration analysis, the 80% dependable monthly flow ranges from a low of 4.80 m<sup>3</sup>/s during May and a high of 13.90 m<sup>3</sup>/s during December with an annual dependable flow average of 8.67 m<sup>3</sup>/s.

#### **Ground Water**

The projected ground water amount for 2030 is projected to be 218 MCM/year. For 2050, the estimated projected annual rainfall is about 3,268.3 mm providing about 293 MCM/year of maximum extractable groundwater from the aquifers.

### ***Participatory Risk and Vulnerability Assessment***

Risk evaluation for the cluster considered the consequence and likelihood of the climate-related risk events. Five rating scale from negligible risk to extreme risk were used in the assessment of the risk event (ICT Risk Matrix, 2011).

An overall evaluation of risk events resulted in flooding and typhoon as the risk events that have a very high consequence and very high likelihood. The in-depth evaluation of the risk of flooding and typhoon falls under the extreme risk consequence, which requires immediate control measures. Landslide is identified as having a high consequence and high likelihood climate related-event. It fell under the high-risk consequence, which means that high priority control measures are required for the identified risk.

## 6 MANAGEMENT AND DEVELOPMENT PLAN

### 6.1 Vision

The cluster vision is stated as, “A resilient, diverse, sustainable, and well-managed Cluster 6 River Basin that provides goods and services to its empowered stakeholders.”

Table 2. Vision statement per PRB in Cluster 6 river basin

PRB	Vision
Catarman	“A Catarman watershed that is resilient, pollution-free and is providing sustainable goods and services for its stakeholders, who in return manages the watershed efficiently.”
Catubig	“A Catubig watershed that is resilient, sustainable, and well-managed by its empowered, responsible, and supportive stakeholders.”
Pambujan	“A resilient and sustainable Pambujan watershed that is well-managed by its empowered stakeholders”

### 6.2 Mission

The cluster mission is stated as, “To strengthen the cooperation and collaboration among stakeholders for the preservation and conservation of Cluster 6 River Basin area through sustainable use, development, and management of its resources.”

Table 3. Mission statement per PRB in Cluster 6 river basin.

PRB	Mission
Catarman	“Improve the resiliency and sustainability of watershed through establishment of sustainable watershed management for a well-balanced environment.”
Catubig	“Lessen the impact of disaster risks and climate change through sustainable watershed management and capacity building.”
Pambujan	“A safe and risk-free environment with capacitated communities achieved through sustainable watershed management.”

### 6.3 Development Issues and Challenges

Numerous issues and challenges in the management of the Cluster 6 river basin were identified during its characterization and vulnerability assessment. However, six (6) development issues were identified as the main problems. These are economic water scarcity, decline of forest resources, wetland habitat degradation, increasing number of people and infrastructure damages due to disasters, poverty, and poor watershed governance. The key issues served as guide to strategize measures, and Programs and Projects (PAPs) for the Cluster 6 River Basin (Table 4).

Table 4. Development issues in Cluster 6 River Basin.

Theme	Issue/Challenge
Water	Insufficient water infrastructure (Economic Scarcity)
Forest Ecosystem and Biodiversity	Decline of forest resources
Wetland Management	Wetland habitat degradation

Theme	Issue/Challenge
DRR	Increasing number of people and infrastructure damages due to disasters
Economic	Poverty
Institution	Poor Watershed Governance

## 6.4 Implementation Plan

### *Selection of Key Indicators*

An indicator is a parameter that characterizes the state of the PRBs in the past, present and future. A key indicator is an indicator that characterizes comprehensively two or more important thematic features of a watershed e.g., forest cover that is a good indicator of biodiversity, health of soil and water, and stability of ecosystems. In order to facilitate the identification and selection of preferred measures and PAPs, key indicators were chosen from many possible indicators. From a list of 11 indicators, a total of 9 key indicators were eventually chosen by a panel of experts and researchers who participated in a planning workshop based on a set of criteria. These are comprehensive representation or characterization of the state of a watershed, availability of baseline data for the base year (2015), and availability of tools or methods for estimating its values in the future. The key indicators were subsequently used in the evaluation of which measures and PAPs were the most preferred based mainly on how much these measures and PAPs will contribute to the attainment of set targets for each key indicator.

### *Identification of the current PAPs*

The current PAPs refer to those PAPs that are currently being implemented by DENR and other government agencies (e.g., NGP, 4Ps). If implemented fully and properly as planned by concerned agencies, these PAPs are expected to contribute positively in the attainment of the desired targets on improving forest cover, conserving biodiversity, improving water quality and availability, reducing poverty, DRR/CCA and other key targets of the government related to the PRB clusters.

### *Estimation of Reference Case Values of the Key Indicators*

The reference case values are the baseline values of the key indicators considering that there are current PAPs being implemented now and onwards. Through the panel of experts, the reference values of the key indicators were estimated.

### *Estimation of Gaps*

Gaps here refer to the difference between the desired targets and the baseline values of the key indicators. Positive difference means that the current PAPs will contribute to the attainment of the desired targets for the key indicators. This positive difference is used as the adjusted targets for each indicator and obviously is lower than the original desired targets and hence, will require lesser investments for enhanced current PAPs or new additional PAPs. On the other hand, negative difference represents the additional increase in the original desired targets for a key indicator.

### **Identification and Selection of Preferred Measures and PAPs**

After the adjusted targets for each key indicator were determined, potential measures with corresponding PAPs were identified by the panel of experts. The identified measures and PAPs were selected on the basis of how well these measures and PAPs have performed in past projects and programs of the government. Others were based on current state of knowledge on how a specific measure or PAP affects the state of a watershed. Each of the measures was then rated by the panel on how many percentage points each of these measures will likely contribute in attaining the desired targets for each key indicator. It is worth noting that most measures contribute largely to one specific target and also in varying degrees contribute to the attainment of the targets for a few other desired targets. A simple algorithm was used to quantify the likely impacts of a measure given certain level of investment. The preferred level of investments for each of the measures was chosen based on minimum investment with the maximum contribution to the attainment of desired targets.

## **6.5 Identified Programs and Projects**

The Programs and Projects proposed for each of the thematic areas of concern in Cluster 6 is presented in (Table 5).

Table 5. Implementation Plan of Cluster 6 River Basin.

<b>Theme</b>	<b>Key Indicators</b>	<b>Measure</b>	<b>Program and Project</b>
Forest Ecosystem and Biodiversity	1. Forest Cover 2. Shannon Biodiversity Index	Forest Ecosystem Restoration	<b>FORESTORE</b>
			Native Species Restoration Project
			Traditional Plantation Project
			Conservation Farming Village Project
			<b>River Basin Protection and Conservation Project</b>
Water Resources	Water Stress Index	Supply-side management	<b>Rainwater Harvesting</b>
			Rainwater Harvesting for Urban and Rural Communities
			Rainwater Harvesting for Agricultural Areas
			<b>New Irrigation System</b>
		<b>Deep Well Project</b>	
		Demand-side management	<b>Improvement and Rehabilitation of Existing Systems and Water Supply Facilities</b>
	Domestic Improvement and Rehabilitation of Existing Systems and Water Supply Facilities		
	BOD/DO	Waste management	<b>Effective Ecological Waste Management Program</b>
			Ecological Waste Management Project
			Establishment of Centralized/Decentralized Wastewater Treatment Facilities
<b>Water Quality Monitoring and Assessment Project</b>			
Wetland Management	Wetland Area (Land Cover)	Wetland Restoration and Protection	<b>Wetland Protection Program</b>
			Biodiversity and Ecological Assessment of Wetland Areas
			Harmonized wetland conservation strategy
			Strict and consistent protection of wetlands

Theme	Key Indicators	Measure	Program and Project
			Nalukaban Marsh Protection and Conservation Project
			<b>Wetland Restoration Project</b>
			<b>Integrated Coastal Zone Management Project</b>
Disaster Risk Reduction	Number of People Exposed to Hazard	Prevent People from Occupying hazard prone areas	<b>Relocation Program</b>
		Risk Reduction	<b>Slope Stabilization Project</b>
			<b>Flood Control Project</b>
		Improve Adaptive Capacity	<b>Adaptive Capacity Improvement Program</b>
			Capacity Building
			Livelihood Development
			Improve infrastructure system (Construction, retrofitting and rehabilitation of key facilities and transportation systems)
			Improvement of EWS
			Enhancement/Construction of Evacuation Centers
			Mainstreaming of DRR and CCA in local dev't plans
Economic	1. Poverty Incidence 2. HDI	Enhancement of Value Chain System	<b>Value Chain Program</b>
			Establishment and enhancement of post-harvest facilities (Establishment/Improvement of Agricultural Trade Center)
			Climate-resilient agriculture projects
			Sustainable fisheries projects
			Tourism Resources Assessment and Planning
			Community-based ecotourism projects
			Industry and enterprise development
			Cooperative development
Institutional Concerns/ Crosscutting			<b>Gender and Development Program</b>
			<b>Creation of River Basin Coordinating Council</b>
			Induced River Basin coordinating council Formation
			Establishment of River Basin Office
			Result based management system development and MIS development
			<b>Watershed Monitoring Program</b>
			Comprehensive Natural Resources Assessment and Monitoring
			Watershed Instrumentation
			<b>Sustainable Financing Mechanism</b>
			<b>Feasibility Study of the Cluster 6 River Basin</b>
<b>Cluster 6 River Basin Roadshow</b>			

## 6.6 Investment Plan

The investment plan indicates the budgetary requirements of the various programs and projects that were developed for Cluster 6 River Basin following the five thematic areas. In addition, programs and projects that are crosscutting in nature were also identified as they address concerns of more than one thematic area.

The total investment requirement of the Plan over a 15-year period is PHP27.11 billion (Table 6). Water Resources Management has the highest funding requirement among the five thematic areas at PHP8.94 billion (33% of total), followed by Wetland Management (31%), Forest Ecosystem and Biodiversity Management (23%), Disaster Risk Reduction and Management (12%), Economic Development (0.50%) and Crosscutting Programs (0.22%).

Table 6. Total cost of proposed Programs and Projects (PAPs) in Cluster 6 River Basin.

Programs and Projects	Total Cost	Target Year	Present Value (i=10%)
<b>FOREST ECOSYSTEM AND BIODIVERSITY</b>			
<b>A-FORESTORE</b>			
Native Species Restoration Project	3,621,423,600	1-15	2,319,706,855
Traditional Plantation Project	384,541,200	1-10	185,806,434
Conservation Farming Village Project	2,185,469,787	1-15	1,288,159,290
<b>Subtotal</b>	<b>6,191,434,587</b>		<b>3,793,672,579</b>
<b>River Basin Protection and Conservation Project</b>	50,000,000	1-15	25,353,598
<b>Subtotal</b>	<b>50,000,000</b>		<b>25,353,598</b>
<b>Total</b>	<b>6,241,434,587</b>		<b>3,819,026,178</b>
<b>WATER RESOURCES</b>			
<b>Rainwater Harvesting</b>			
Rainwater Harvesting for Urban and Rural Communities	2,800,000,000	1-15	1,454,736,900
Rainwater Harvesting for Agricultural Areas	680,000,000	1-15	367,448,352
<b>Subtotal</b>	<b>3,480,000,000</b>		<b>1,822,185,253</b>
<b>New Irrigation System</b>	537,000,000	1-15	331,750,913
<b>Deep Well Project</b>	8,000,000	1-8	5,101,367
<b>Subtotal</b>	<b>545,000,000</b>		<b>336,852,281</b>
<b>Improvement and Rehabilitation of Existing Systems and Water Supply Facilities Program</b>			
Domestic Improvement and Rehabilitation of Existing Systems and Water Supply Facilities	14,000,000	1-15	8,724,101
Irrigation Improvement and Rehabilitation of Existing Systems and Water Supply Facilities	60,000,000	1-15	30,424,318
<b>Subtotal</b>	<b>74,000,000</b>	-	<b>39,148,419</b>
<b>Effective Ecological Waste Management Program</b>			
Ecological Waste Management Project	18,000,000	1-3	14,921,112
Establishment of Centralized/Decentralized Wastewater Treatment Facilities	5,400,000,000	4-15	2,354,289,206
<b>Water Quality Monitoring and Assessment Project</b>	45,957,965	1-15	23,357,450

Programs and Projects	Total Cost	Target Year	Present Value (i=10%)
<b>Subtotal</b>	<b>5,463,957,965</b>		<b>2,392,567,768</b>
<b>Total</b>	<b>9,562,957,965</b>		<b>4,590,753,720</b>
<b>WETLAND MANAGEMENT</b>			
<b>Wetland Protection Program</b>			
Biodiversity and Ecological Assessment of Wetland Areas	1,052,856,060	1-15	620,663,025
Harmonized wetland conservation strategy	1,052,856,060	1-15	618,596,777
Strict and consistent protection of wetlands	2,105,712,120	1-15	1,265,916,446
Nalukaban Marsh Protection and Conservation Project	66,000,000	1-15	33,466,750
<b>Subtotal</b>	<b>4,277,424,239</b>		<b>2,538,642,997</b>
<b>Wetland Restoration Project</b>	4,083,241,172	1-15	2,605,836,585
<b>Subtotal</b>	<b>4,083,241,172</b>		<b>2,605,836,585</b>
<b>Integrated Coastal Zone Management Project</b>	200,000,000	1-15	110,363,876
<b>Subtotal</b>	<b>200,000,000</b>		<b>110,363,876</b>
<b>Total</b>	<b>8,560,665,411</b>		<b>5,254,843,458</b>
<b>DISASTER RISK REDUCTION MANAGEMENT</b>			
Relocation Project	2,852,486,560	1-15	1,426,688,377
Slope Stabilization Project	6,153,846,154	1-15	421,470,927
Flood Control Project	2,752,205,245	1-15	1,884,958,557
<b>Subtotal</b>	<b>11,758,537,959</b>		<b>7,526,356,206</b>
<b>Adaptive Capacity Improvement Program</b>			
Capacity Building	12,546,110	1-15	6,066,992
Livelihood Development	17,700,000	1-15	10,422,645
Infrastructure Improvement system (Construction, retrofitting and rehabilitation of key facilities and transportation systems)	300,000,000	1-15	152,121,590
Improvement of EWS	45,000,000	1-15	22,818,239
Construction of Enhanced Evacuation Centers	90,000,000	1-15	45,636,477
Mainstreaming of DRR and CCA in local dev't plans	45,000,000	1-15	26,498,249
<b>Subtotal</b>	<b>510,246,110</b>		<b>263,564,191</b>
<b>Total</b>	<b>12,268,784,069</b>		<b>7,789,920,397</b>
<b>ECONOMIC MANAGEMENT</b>			
<b>Value Chain Program</b>			
Establishment and enhancement of post-harvest facilities	10,120,000	1-15	5,027,939
Climate-resilient agriculture project	31,600,000	1-15	15,962,238
Sustainable fisheries project	31,600,000	1-15	15,962,238
Tourism Resources Assessment and Planning	15,000,000	1-5	11,372,360
Community-based ecotourism project	31,600,000	1-15	15,962,238
Industry and enterprise development	7,480,000	1-15	3,670,427
Cooperative development for Natural Resources-based Enterprises	7,480,000	1-15	3,670,427
<b>Subtotal</b>	<b>134,880,000</b>		<b>71,627,870</b>
<b>Total</b>	<b>134,880,000</b>		<b>71,627,870</b>
<b>CROSSCUTTING</b>			
<b>Gender and Development Program</b>	7,480,000	1-15	3,670,427

<b>Programs and Projects</b>	<b>Total Cost</b>	<b>Target Year</b>	<b>Present Value (i=10%)</b>
<b>Subtotal</b>	<b>7,480,000</b>		<b>3,670,427</b>
<b>Creation of River Basin Coordinating Council</b>			-
Induced River Basin coordinating council Formation	700,000	1	636,364
Establishment of River Basin Office	72,000,000	1-15	35,303,125
Result-based management system development and MIS development	27,000,000	1-15	13,690,943
<b>Subtotal</b>	<b>99,700,000</b>		<b>49,630,432</b>
<b>Watershed Monitoring Program</b>			
Comprehensive Natural Resources Assessment and Monitoring	21,960,000	1-15	12,571,979
Watershed Instrumentation	29,182,880	1-15	15,142,369
<b>Subtotal</b>	<b>51,142,880</b>		<b>27,714,349</b>
<b>Sustainable Financing Mechanism</b>	20,000,000	1-15	10,141,439
<b>Subtotal</b>	<b>20,000,000</b>		<b>10,141,439</b>
<b>Feasibility Study of the Cluster 6 River Basin</b>	30,000,000	0	30,000,000
<b>Subtotal</b>	<b>30,000,000</b>		<b>30,000,000</b>
<b>Cluster 6 River Basin Roadshow Project</b>	12,000,000	1-3	10,428,249
<b>Subtotal</b>	<b>12,000,000</b>		<b>10,428,249</b>
<b>Total</b>	<b>220,322,880</b>		<b>131,584,896</b>
<b>GRANDTOTAL</b>	<b>36,989,044,912</b>	<b>-</b>	<b>21,657,756,519</b>



## 6.7 Prioritization of PAPs

The process of Multiple Criteria Decision Analysis (MCDA) was applied in the prioritization of PAP in the cluster. In the Cluster, Ten (10) PAPs were scored against Six (6) chosen criteria for prioritization. According to the results of the methodology applied, the top 5 PAPs were Climate Adaptive Hazard Mitigation Infrastructure, Adaptive Capacity Improvement Program, Wetland Restoration Project, A-FORESTORE, and Rainwater Harvesting.

Table 7. Total Score and Rank of PAPs in each criterion.

PAP	Criterion					Grand Total	Rank
	Contribution to Indicators	Social Acceptability	Policy Constraint	Technical Capacity/Readiness	CCA-DRR		
A-FORESTORE	216	133	67	133	333	882	4*
Rainwater Harvesting	201	200	48	133	250	832	5*
Deep Well Project	99	200	48	67	250	663	10
Improvement and Rehabilitation of Existing Systems and Water Supply Facilities Program	175	200	67	133	167	742	7
Effective Ecological Waste Management Program	175	200	48	133	167	723	9
Wetland Restoration Project	267	200	57	133	250	907	3*
Integrated Coastal Zone Management Project	197	133	48	133	250	762	6
Climate Adaptive Hazard Mitigation Infrastructure	208	200	48	133	333	923	1*
Adaptive Capacity Improvement Program	183	200	67	133	333	916	2*
Value Chain Program	157	200	67	133	167	724	8