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 3 River Basin
(Alag-Baco, Butas, Catuiran-Bucayao,
Mag-Asawang Tubig and Pula)

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1 Rationale

Pursuant to Executive Order (EO) Nos. 510, 816 and 50, the River Basin Control Office (RBCO) was created to develop, among others, a national master plan to address flooding and to provide sustainable water supply for the entire country. In connection with this, an integrated river basin management and development master plan was crafted in 2007 identifying eighteen (18) major river basins in the Philippines. On May 2, 2012, the Cabinet Cluster on Climate Change Adaptation and Mitigation passed Resolution No. 2012-001 adopting the eighteen (18) major river basins of the country as priority areas of the government. These eighteen (18) major river basins have likewise been identified as spatial focus of convergence under the CCAM Cluster's Program Budget Approach (PBA) in CY 2013 and CY 2015. Currently, the PBA has allowed the expansion of the program into other river basins aside from the eighteen (18) major river basins.

The sustainable management of river basins is critical as they are considered drivers of the Philippine economy. In line with the Philippine Development Plan, the preparation of the river basin master plan will use the integrated river basin management approach. The plan intends to address several concerns on watershed conservation, river basin rehabilitation, flood control/mitigation, water security for domestic, irrigation and industrial uses, and livelihood and economic opportunities in the area.

Eight clustered river basins were targeted for the preparation of the master plan. One of these clusters is the Cluster 3 with fiver principal river basins namely Butas, Mag-asawang Tubig, Alag-Baco (formerly Malaybalay-Baco), Pula and Catuiran-Bucayao (formerly Pulang Tubig) River Basins. The selection of these river basins was based from the following criteria prepared by the RBCO: (a) absence of an Integrated River Basin Management and Development Master Plans (IRBMDMP) and appropriate institutional mechanisms; (b) the area encounters environmental problems such as flooding, landslide, deforestation, and water quality degradation; (c) high poverty incidence; and (d) contributes to high economic growth of the country.

Climate change perspectives were incorporated and mainstreamed together with disaster risk reduction issues and measures. This is in relation with the passage of Republic Act (RA) No. 9729 or the Climate Change Act of 2009 and RA 10121 or the Disaster Risk Reduction Law of 2010. The importance of taking into consideration the new climate normals in management planning was also recognized.

2 Objectives of the Study

The objective of this project is to formulate the Integrated River Basin Management and Development Master Plan (IRBMDMP) of Alag-Baco, Butas, Catuiran-Bucayao, Mag-Asawang Tubig, and Pula Basins taking into consideration biological diversity and their capacity to provide goods and services. The plan incorporates the implications of the new climate normals in addressing the concerns of the river basin on:

1. Water Resources Management;
2. Forest Ecosystems and Biodiversity Management;
3. Flood Control/Mitigation, Disaster Risk Reduction and Hazards Management;
4. Wetland Management (including rivers, river deltas, marshlands and coastal areas);
5. Economic Development; and
6. Institutional Linkages and Organizational Structure for River Basin Management.

3 Scope and Limitation

The project formulated the Integrated Management and Development Master Plan of the Cluster 3 River Basin, taking into consideration potential climate change impacts to provide a sound basis for management decisions in the sustainable management of the resources therein. The project consisted of two phases, the scope of which includes:

1. Updating of river basin profile;
2. Revision of vision, missions, 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 project shall formulate the Integrated River Basin Management and Development Master Plan of the Alag-Baco, Butas, Catuiran-Bucayao, Mag-Asawang Tubig, and Pula River Basins, taking into consideration climate change impacts for sound investment decisions in the sustainable management of water resources therein. As stipulated in the Terms of Reference, it shall consist of three phases, as shown in Figure 1, which include the following major activities:

A. Phase I
   1. Coordination with concerned agencies
   1. Ecological profiling of the river basins
   2. Review of water policy and basin development plans
   3. Setting of vision, mission, goals (VMG), and targets
   4. Risk and vulnerability assessment
   5. Situational analysis
   6. Identification of strategies, programs and projects
B. Phase II
   1. Evaluation of strategies, programs and projects
   2. Investment and implementation planning
C. Phase III – Final report duly endorsed by the Regional Development Council

Presented in Figure 1 are the tasks undertaken in order to achieve the objectives of the project.

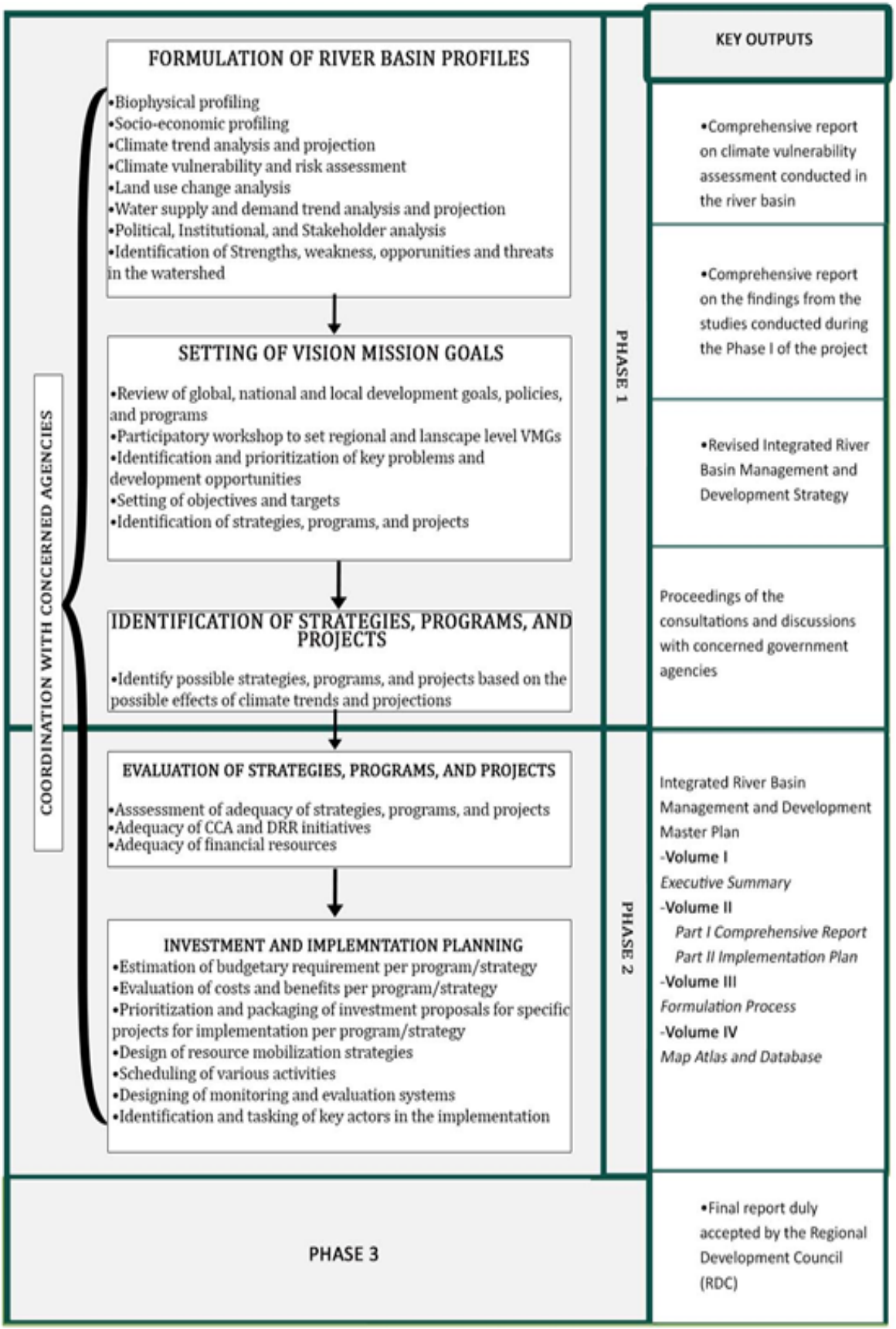

Figure 1. Framework for Developing a Climate Change-Responsive Integrated River Basin Master Plan.

5 Assessment Reports

5.1 Geophysical Profile

Geographic Location

Cluster 3 River Basin is composed of five (5) principal river basins in the island of Mindoro. These include Butas River Basin, Mag-asawang Tubig River Basin, Alag-Baco (formerly Malaybalay-Baco) River Basin, Pula River Basin and Catuiran-Baco (formerly Pulang Tubig) River Basin. All the river basins in Cluster 3 drain along the Verde Island Passage and Tablas Strait located at the northeast of Mindoro Island. It spans MIMAROPA region, covering two provinces, one city and 11 municipalities, and a total of 258 barangays. Cluster 3 covers an area of around 2,258 km^2, bestriding the provinces of Occidental and Oriental Mindoro.

Climate Trends

Mindoro Island has Tropical Monsoon Climate based on Köppen-Geiger Climate Classification. Using Corona's climate classification, the island has two types of climate. Mindoro Oriental has Type III climate where seasons are not very pronounced and relatively dry from November to April and wet for the rest of the year. On the other hand, Mindoro Occidental has a Type I climate. There are two pronounced seasons. From November to April, the climate is dry and wet during the rest of the year

The climate here is tropical. During most months of the year, there is significant rainfall in Cluster 3. There is only a short dry season. According to Köppen and Geiger, this climate is classified as Am. The average temperature in Cluster 3 is 27.3 °C. The rainfall here averages 2,092 mm.

Topography

In Cluster 3 River Basin, most of the places are in low-lying elevation within 0-100 masl elevation (46.1%) including most of Baco, most of Calapan City, Naujan, Pinamalayan, Pola, Socorro, and Victoria and parts of Gloria, Sablayan and Santa Cruz. The highest points in the cluster is 2,586 masl and 2,364 masl at the peak of Mount Halcon and Mount Iglit-Baco, respectively. Meanwhile, most of the places in the river basin has 0-3% slope or level to nearly level covering 35.7% of the total cluster area.

Soils and Geology

Cluster 3 River Basin is composed of a variety of soil types with a wide range of development stages. There are about 16 different types of soil from eight different soil series in the river basin, with soil textures ranging from moderately coarse to fine. Likewise, the geological origin of the area is evident in the three distinct geologic formations in the area and the three two active fault systems traversing it. Given this situation, the river basin is rich in both metallic, non-metallic and subgrade mineral resources including some of the principal gold, iron, marble, sand and gravel, and copper deposits in the country.

Water Resources

There are six water resource providers in Cluster 3. The Environmental Management Bureau of the Department of Environment and Natural Resources classified these water resource providers based on the previously released guidelines of DENR (DAO 1990-34) for water bodies. Majority of the water resource providers are classified as class D. With 38,774 ha productive aquifers the area is abundant with surface water and groundwater resources. In general, the freshwater storage capacity and the high rate of precipitation would have assured the river basin with an adequate source of water to meet demands for multiple uses (i.e. domestic, industrial, agricultural, commercial). However, as early as the 1990's, the Japan International Cooperation Agency (JICA) has projected that increasing demand may begin to outpace available water supply by 2025. The NWRB granted a total of 173 abstraction permits in the two provinces of the Cluster, 83.2% for surface water extraction and 16.8% for groundwater. Irrigation demand is the largest consumer of water in the river basin comprising 87.3% of the total water use.

Meanwhile, the water quality in the Cluster is classified under Classification B and C based on the water quality assessments done by various government agencies. The estimated agricultural water demands for the year 2050 exceed the capacity of the surface water sources at 80% dependable flow and can be sufficed by groundwater source through pumping irrigation and installation of shallow tube well. Under such conditions, reservoir type irrigation systems should be studied for implementation to take advantage of the high streamflow during the rainy season. Implementation of rotational irrigation and water-saving techniques (e.g. Alternate Wetting and Drying or AWD) should also be considered.

Land Classification and Land Cover

In the Cluster, majority of the lands are classified under alienable and disposable lands constituting 41.6% of the total area of the cluster. It was followed by forest reserve covering about 33.7% of the total cluster area. There are also portions in the cluster with unclassified public forests comprising about 19.2% of the cluster. The remaining 3.6% and 1.9% are classified as lake and miscellaneous areas, respectively. The dominant land cover in the river basin is an open forest comprising 33.5% of the total cluster area. Followed by the agricultural-used lands for perennial and annual cropping covering 24.4% and 20.2%. The open forest area increased by 11.5% from 2003 to 2015. During the same years, the closed forest area, however, decreased by 14.0%. The same as forest plantation which decreased by about 14.9% of the total land cover of the cluster. Meanwhile, annual crops, built-up areas, grasslands, perennial crops and shrubs increased by 0.6%, 2.1%, 2.1%, 5.2%, and 5.8%, respectively. This implies that the Cluster needs immediate attention on enforcing reforestation, forest restoration, and rehabilitation and afforestation activities to assimilate the declining forestlands of the area.

Natural Hazards

Cluster 3 river basin is susceptible to different types of natural hazards including drought, earthquake, flood, landslides, liquefaction, storm surge and tsunami. For drought analysis of Cluster 3, 25 years of monthly rainfall values from year 1993 to 2017 were used for the drought analysis. Drought periods were then analyzed and determined using the computed Standard Precipitation Index (SPI). Moreover, using the projected changes in seasonal rainfall by PAGASA, the drought scenario in Cluster 3 for year 2050 was also

determined and predicted. Cluster 3 experienced moderate drought events having an average SPI value of -1.07 for 5 months duration starting April 1995 to September 1995. On January 1997 to June 1998, Cluster 3 experienced 17 months duration of extreme drought having the highest SPI value of -2.60 and an average of -1.65. The longest duration of the moderate to extreme drought was observed from June 2014 up to May 2017 having a peak SPI value of -2.30 and an average of -0.97. According to the meteorological drought forecast for 2050, the cluster will experience mild dryness the entire year 2050. This should be taken into consideration specially when dealing with crop production. This indicates that proper water management and soil moisture conservation should be observed to alleviate the effect of the prolong mild dryness. On the other hand, it is also expected to experience mild drought with SPI values ranging from -0.84 to 0.86. It can be seen that the mild agricultural drought will occur starting May with peak SPI values from September and October and will last until December 2050.

Meanwhile, in the Cluster, there were 117,135 ha area susceptible to earthquake-induced landslides (EIL). Majority or approximately 80.7% of the cluster has medium susceptibility to EIL bulk of this is located in Mag-asawang Tubig River Basin, Alag-Baco River Basin and Catuiran-Bucayao River Basin. Meanwhile, the high to very high susceptibility comprises 6.9% of the cluster area majority is in Butas and Pula River Basin. On one hand, only minor watershed 06 has areas susceptible to EIL with 320 ha area

Flooding often occurs in low-lying areas of the river basins. In Cluster 3, there were 55,796 ha susceptible to flooding, 49.1% of these areas are highly susceptible to flooding, while 26.8% are experiencing moderate flooding. The remaining 24.1% is subject to low flooding incidences. Among the areas (in ha) with flood susceptibility, 27.7% of these areas are in Catuiran-Bucayao river basin. While 24.9% are in Butas, then 19.9%, 19.8%, and the remaining 7.6% are in Mag-asawang Tubig, Alag-Baco, and Pula river basins, respectively.

Landslide is also one of the destructive hazards that cound lead to several damages to livelihood, income, lives of the community and infrastructures. A total area of 162,105 ha susceptible to landslides, 56.3% of these areas are highly susceptible while 19.4% are moderately susceptible. Then the remaining 24.3% have low susceptibility to landslides. Areas (in ha) with landslide susceptibility per river basin, 27.5% of these areas are in Alag-Baco while 23.2% are in Mag-asawang Tubig. Catuiran-Bucayao comprises 19%, whereas Butas and Pula River Basins constitutes 16.9% and 13.4% of the total areas susceptible to landslides.

In Cluster 3, a total area of 42,497 ha is prone to liquefaction. Large percentage of these areas are in Butas comprising 27.3%. While 25.6% is in Alag-Baco, 23.5% in Catuiran-Bucayao, 19.3% in Mag-asawang Tubig and 4.35 in Pula River Basin.

Storm surge is also one of the problems in coastal areas in the cluster. Among the principal river basins, majority of the susceptible areas are in Alag-Baco river basin with 15.1% susceptible areas. Per minor watersheds, minor watershed 01 have the highest covered area susceptible to storm surge with 16.9%.

In relation to storm surge, tsunami is also one of the concerns in the cluster. In the Cluster, 776 ha area are susceptible to tsunami. Majority of these areas are in minor watershed 01 comprising 66.1%

5.2 Bioecological Profile

Mindoro Island encompassing the Alag-Baco, Butas, Catuiran-Bucayao, Mag-Asawang Tubig, and Pula Principal River Basins is home to immense plant diversity. In fact, plants with different growth habits can be observed on the island. The plant life forms on the island consist of epiphytes, ferns, grasses, herbs, lianas/vines, trees, and shrubs.

In Cluster 3, 405 species belong to 135 families of plants identified according to Mindoro Biodiversity Conservation Foundation, Incorporated and the Mount Halcon Conservation and Management Plan (2012-2022). There were 231 terrestrial faunal species found in Cluster 3. According to IUCN Red List of Threatened Species (2019-1), the majority or 162 species, approximately 70.1% are considered least concern. Some of the important faunal species in the Cluster categorized as critically endangered includes Philippine Cockatoo (*Cacatua haematuropygia*), Black-hooded Coucal (*Centropus steerii*), Philippine Crocodile (*Crocodylus mindorensis*), Mindoro Bleeding-heart Pigeon (*Gallicolumba platenae*), and the famous Mindoro dwarf buffalo or Tamaraw (*Bubalus mindorensis*).

The biological diversity of the Cluster 3 River Basin is also evidenced by the presence of numerous conservation and special interest areas. This include Mount Iglit-baco National Park, Naujan Lake National Park and Mangrove areas along banks of Mamburao River, Buluangan River to Lagarum River, bank of Betel Creek, Sablayan Pt. to Bagong Sabang River, Labangan to Calalayuan Pt. Sukol River, Casiliga Rive and Island of Soguicay and the 33 marine protected areas within the cluster.

5.3 Demographic Profile

There are 425,179 people inhabiting the Cluster 3 municipalities. Of the two provinces encompassed by Cluster 3, the province of Oriental Mindoro has the highest number of populations about 408,191 individuals or approximately 96.0% of the total population of the cluster. On one hand, Occidental Mindoro has a total population of 16,988 (or 4%). The annual population growth rate in Cluster 3 was 2.59% in 1990-2000, 1.60% in year 2001-2010 and 1.39% in year 2010-2015. The annual growth rate in 1990-2000 is greater than the national average growth rate of 2.30%, while annual growth rate in 2000-2010 is lower than the average growth rate in the same period, which is 1.90%. The decreasing population of the river basin may be attributed to out-migration driven by preferences on settlement, livelihood, and employment in other places such as Metro Manila.

Among the cluster provinces, Oriental Mindoro has 13,764 births, which is comparably higher than Occidental Mindoro with 8,513 births. Comparing the number of births per sex, males have higher number of births as compared to females. In addition, the projected average birth rate in the Cluster 3 provinces is decreasing from year 2000-2015. On the average, the projected number of crude births for 2000-2005 was 34.29, 32.38 for 2005-2010 and 30.40 for the year 2010-2015

Provincial wide, Oriental Mindoro has 4,562 deaths as of 2015, which is comparably higher than Occidental Mindoro with 2,400 deaths. Comparing the number of deaths per sex, the males have higher number of deaths as compared to females. On the average, the projected number of crude deaths for 2000-2005 was 6.29, 5.71 for 2005-2010 and 5.24 death per thousand population for the year 2010-2015.

From 2000-2015, the crude rate of natural increase in the Cluster 3 River basin was decreasing from an average of 28.00 per thousand population per year to 25.17. this coincides with the decreasing growth rate observed during the period. Meanwhile, the rate of fertility from 2000 to 2015 is decreasing. From an average fertility rate of 4.82 in 2000 it declined to 4.18 in 2015. On one hand, the average life expectancy of men is 67 years old while women have an average life expectancy of 70 years old.

In addition, about 440,313 people in the cluster are married as of the population census last 2015, whereas, 417,388 people are single, and 95 people have an unknown marital status. Then, 88,908 people are live-in, 44,851 are widowed and 13,694 are divorced or separated.

The largest age population in the cluster is found within the pre-teen age group (10-14 years old), followed by 5-9 age group, the under 5, and the teenager group (15-19 years old). In addition, on average, the child dependency ratio for Cluster 3 is 63.1 while the adult dependency ratio is 6.8 and the average total dependency ratio 69.85. In the interim, the total number of households in Cluster 3 is 302,477, whereas the average household size is 4.4 as of 2015

According to PSA (2010), 99.7% of residents in Cluster 3 municipalities and city stayed in the same province/municipality even after five years. Almost 0.04% of the population moved in the same province, but different municipality and about 0.15% migrated to a different province.

5.4 Socio-economic Profile

Settlement Pattern

In Cluster 3, most of the residents live in rural areas than in urban areas in both 2007 and 2010. In 2007, rural areas are 756,311 residents higher than that of the urban, whereas in 2010 the gap of the number of residents living in rural to that of living in urban areas was decreased to 690,461. Nonetheless, the rate of increase in population from 2007 to 2010 is higher in urban areas than in rural. Urban areas have an increasing number of residents with about 73,351 individuals whereas in rural areas only 7,501 individuals were added from 2007 to 2010.

Indigenous People

Under IPRA Law (1997), Certificate of Ancestral Domain Title refers to a title formally recognizing the rights of possession and ownership of ICCs/IPs over their ancestral domains identified and delineated in accordance with this law. On the other hand, Communal Claims refer to claims on land, resources, and rights thereon, belonging to the whole community within a defined territory.

In Cluster 3, a total area of 19,281 ha is under CADT. On one hand, 97,380 ha are under CADC. Mag-asawang Tubig covers 10,596 ha CADT areas, while Pulang Tubig covers 7,713 ha and Pula river basin covers 972 ha.

There were also CADC areas within the cluster. Butas river basin covers 4,563 ha under Alangan Mangyan and Sulodnon. Mag-asawang tubig covers 21,398 ha under Alangan Mangyan, Sulodnon, and Tao Buid Mangyan. Alag-Baco and Pulang Tubig covers 32,880.06 ha and 25,397 ha, respectively, both under Alangan Mangyan and Iraya

Mangyan. Pula river basin covers 13,092 ha area under Sulodnon, Tadyawan Mangyan and Tao Buid Mangyan. Lastly, minor watershed 06 covers 50 ha area under Alangan Mangyan.

Land and House Tenure

In Cluster 3 municipalities, there are 48, 870 households or about 34% of the total households have at least one land owned. Twenty-seven percent of these lands are allotted for agriculture, which is the primary source of income in the municipalities. Land owned are also allocated for residential, agricultural through CARP Agrarian Reform Beneficiary, and other purposes for about 10%, 2%, and 1% of the total households, respectively.

And then, there were 120,884 households or about 83.73% of the total Cluster 3 household population own their houses or being amortized. Meanwhile, the least 2.23% comprises of rent-free without consent of owner and not applicable which consists of 1,492 and 1,725 households, respectively. Furthermore, the renters entail 2.84% of the entire Cluster 3 household population, whereas a total of 16,165 or 11.20% are those who rent-free with consent of owner

Energy Consumption

In Cluster 3 municipalities, 71.58% of the households used electricity as the fuel for lighting, while 0.24% are using oil with 103, 340 and 348 households in total, respectively. Some of the households are also using Kerosene (gaas) and Liquefied Petroleum Gas (LPG) as their fuel for lighting purposes.

Furthermore, 49.73% of the total households are using wood as their fuel for cooking with 71, 797 households in total. Most of the households are also using charcoal and Liquefied Petroleum Gas (LPG) with 28.55% and 17.45% of the total households, respectively. Meanwhile, less than 2% of the total households are using electricity and kerosene (gaas) as their fuel for cooking.

Literacy and Education

The Cluster 3 has a relatively high literacy rate with an average of 97.1, Oriental Mindoro with 97.8 has higher literacy rate than Occidental Mindoro with 96.4. The Cluster also has a high level of education, with more than 38.72% of the population finishing elementary and 35.69% finishing high school.

Poverty and Subsistence

The poverty incidence in the cluster ranges from 7.1% Calapan City (2012) to 57.2% in Baco (2006). Provincial wide, Occidental Mindoro has the highest poverty incidence at (48.8%) in 2012 and subsistence incident of (37.0%) in 2015. While Oriental Mindoro only has 41.7% poverty incidence in 2006 and high subsistence 34.0% in 2012.

Human Development Index

The average HDI of Mindoro has increased from 1997 to 2012 by about 0.0745. The highest average HDI recorded in the cluster provinces was 0.5475 in 2012. The HDI for Occidental Mindoro has a decreasing trend of increase indicating the need for further development because in the future it would be lower and lower if not take into consideration.

Labor and Employment

In Cluster 3 municipalities, 417, 678 individuals are under the labor force category based on the PSA classification aging 15 years old and above. Among these individuals, 198,649 are employed, while 219,029 are unemployed. Amongst the employed, 153,180 are males and 45,469 are females. Meanwhile, among the 219,029 unemployed individuals, 58,560 are males while the other 160,469 are females. Municipality wide, Calapan City gained the highest number of employment and unemployment with 40,934 individuals employed and 41,516 unemployed. On one hand, San Teodoro has the lowest number of employment and unemployment with 5,266 employed individuals and 4,898 unemployed.

Natural Resource Dependent Livelihood

Rice is one of the major agricultural sources in Cluster 3. Mindoro province produced 2,256,626 metric tons of palay form 2015-2017. During these years, Oriental Mindoro produced higher palay yield than Occidental Mindoro by 135,946 metric tons. Meanwhile, palay production of Occidental Mindoro decreased by 22,525 metric tons whereas the palay production in Oriental Mindoro increased by 28,252 metric tons.

Banana is also one of the famous products in Mindoro, the total area planted per hectare for banana from 2015-2016 is 29,611 ha. Oriental Mindoro has a higher planted area/hectare by about 26,353 ha. In contrast, Occidental Mindoro increased the planted area from 2015 to 2016 by 15 ha whereas Oriental Mindoro has decreased planted area of about 8 ha.

Calamansi is one of the highly produced crops in Mindoro, in fact, it is the primary source of Calamansi in MIMAROPA region (PDPFP Oriental Mindoro). According to the PSA, Mindoro province constitutes 65.24 sq. km. out of the total 71.36 sq. km. area planted with calamansi in MIMAROPA region from 2011-2015. Meanwhile, the total production of Mindoro province is 83,287.3 metric tons (98.9%) of the total production in MIMAROPA region. Mindoro province also produced 179,988 metric tons of coconut from 2015-2016, 295,499 metric tons of corn from 2015-2017 and 3,533 metric tons of mango from 2015-2016.

In terms of livestock and poultry production, the combined carabao production of Cluster 3 provinces from 2016-2018 reached 225,573 individuals, while cattle has 137,649 individuals and goats about 211,340 individuals, while the total volume of production of chicken in the Cluster 3 provinces is 15,291 metric tons from 2013 to 2017. On one hand, the combined volume of production of chicken egg in Cluster 3 provinces from 2013-2017 is 9,101 metric tons while, duck egg is 2,045 metric tons. Chicken egg production increased from 2013-2017 by 581 metric tons. On the contrary, duck egg production decreased during the same years by 154 metric tons.

5.5 Infrastructure

Educational Facilities

Education plays vital role in the economic growth of the country. Thus, facilities that would further enhance the education of the people living in the community is a very important factor that affects the increase or decrease in literacy rate and implies the chance of the community increase their standard of living and improve their quality of life. According to the Department of Education SY 2015-2016, there were 466 schools available in Cluster 3, 394 of those were elementary while the remaining 72 were secondary.

Health Facilities

Health facilities are very important in addressing health problems and providing health care for the community. These include hospitals, rural health units, laboratories, clinics, and care centers. In Cluster 3 city and municipalties, there were 18 hospitals and 15 rural health units available, the name and location of these hospitals and Rural Health Units.

Road and Bridges

Roads and bridges play crucial role in economic development and growth of the country by bringing important social benefits. In Cluster 3, 50% of the bridges are in good condition while 32.5% is fair, 12.5% is bad and the remaining 5% need further assessment. In addition, there are 39 permanent concrete bridges and 1 permanent steel bridge in the cluster while there are 95 asphalt roads and 160 concrete roads, all of the roads are paved or with "smooth" surface.

Irrigation

According to the data gathered from the National Irrigation Administration (NIA), the estimated total irrigable area in Mindoro is 87,580.49 ha while the total service area for irrigation systems covers 79,090.81 ha. Majority of the service areas or approximately 42.3% is from other government agency assisted irrigation systems. Meanwhile, the communal irrigation systems constitute about 25.3%. While the national irrigation systems constitute about 18.7% and 13.7% is accounted for the private irrigation systems.

Waste and Sanitation

Nonetheless, there are households in Cluster 3 that get rid of their garbages through their personal efforts like dumping in an individual pit, composting, burying, feeding to animals and others. These households' efforts comprise 10.07%, 8.05%, 7.12%, 13.96%, and 0.08%, respectively of the total household population in Cluster 3.

It is observable that a large percentage of households have water-sealed sewer septic tank used exclusively by households constituting about 55.95% of the entire Cluster 3 household population. The least percentage are those using pail systems constituting about 1.10%. Additionally, water-sealed sewer septic tank shared with other households, water-sealed other depository used exclusively by household, water-sealed other depository shared with other households, closed pit and open-pit are also observed in

Cluster 3 communities. Nonetheless, there are also 15,058 households without sanitation facilities constituting about 10.43% of the entire Cluster 3 household population.

Communications

In Cluster 3 municipalities, 86.62% of the households do not have internet access, while 3.57% and 9.81% of the households have access to the internet from home and elsewhere, respectively. Among the municipalities in Cluster 3, Calapan City has the highest number of households with internet access, however, only 25% of the total households in this municipality have access.

Financial Institutions

As of 2015, there are a total of 156 existing banks in Cluster 3 and a total of PHP 24.65 billion worth of bank deposit liabilities. The total bank deposit liabilities increased by about PHP 6.48 billion since 2013. In the interim, there are 186 pawnshops available in the Cluster as of 2015.

Transportation

There are three (3) modes of transportation identified in Cluster 3; (1) Land Transportation; (2) Air Transportation; and (3) Sea Transportation. The means of transportation from Mamburao (Occidental) and Calapan City (Oriental) provincial capitals in Mindoro Island to other towns are buses, jeepneys and air-conditioned vans on a regular trip. Tricycles are the main mode of transportation from town propers to other barangays. "*Habal-Habal*" or rented motorcycles are being used as mode of transport in some remote barangays in the area in which big vehicles are inaccessible. Rental services are also available for professionals, businesspersons and tourists who visited the area.

There are two (3) existing airports in Occidental Mindoro; the Domestic Airports in Mamburao, San Jose and Lubang. Mamburao Domestic Airport. On one hand, the prepared mode of transport to Occidental Mindoro and Oriental Mindoro are through Roll-on-Roll off (RO-RO) vessels. Currently, there were seven existing seaports in Mindoro.

5.6 Land Capability Assessment

The Universal Soil Loss Equation (USLE) is the commonly used formula in determining soil erosion processes. Wischmeier and Smith developed this in 1978. The factors considered in this formula are rainfall erosivity, soil erodibility, slope length, slope gradient, cover, and the existing erosion control practice (SEP = RKLS). Soil erosion is considered as a good indicator of land capability. Using the USLE, the soil erosion potential was estimated, wherein rainfall, erodibility, slope length, and gradient were factored in.

Three rainfall scenarios were under the study of the river basin's SEP. This enables the evaluation of the impacts of rainfall activities present in the study area. This will essentially lead to land capability classification of the river basin. With the rainfall data from PAGASA, past records, as well as the projected, were included in coming up with the three rainfall scenarios. This included the observed, 2050, and 2085 scenarios.

The land capability classification applied to Cluster 3 River Basin is the methodology developed by Cruz (2010) based on the soil erosion index (SEI). This system of classification focuses on sustaining the productivity and stability of the forested area. This was developed in a more effective and responsive approach towards the non-forestland consumption that has taken over the forested land. The major biophysical factors included were rainfall, soil, topography, land cover and hazards. The classification then resulted in two major zones, namely Protection Zones and Production Zones. While there are four subzones under the Production zones (a) Agroforest Production (b) Unlimited Production (c) Limited Production and (d) Production Buffer; Protection zone is composed of two subzones, (a) Strict Protection and (b) Protection Buffer.

In the cluster, most of the areas for the three scenarios presented are for strict protection comprising 56.3% of the total cluster area for the combined three scenarios. Meanwhile, unlimited production follows with 25.5%. Then, the agroforestry production, protection buffer, production buffer and limited production comprises 8.1%, 7.1%, 1.9%, and 1.2%, 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 institutions, on the other hand, are institutions that 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. There are 79 stakeholders identified within the Cluster 3 river basin. Majority or approximately 41.8% are mediating institutions, 34.2% are external economic interest groups, and 24.1% are user groups.

Alliances among the stakeholders are formed in support of pursuing each other's task, such as management of the Protected Area by Protected Area Management Board (PAMB), capacity building for eco-Rangers/eco-Guardians and bantay-gubat; NGP and CARP projects by people's organizations/IPs and DENR/LGU; land improvement and River Basin management projects for DENR, DOST, LGU and Academe; support for farm to market roads and livelihood programs for LGU and DTI; delivery of Corporate Social

Responsibility (CSR) by Hydro and Mining Companies; and tourism economic activities for Tourism Enterprise and local communities.

The sources of conflict among stakeholders involve developmental and regulatory issues, use rights, or the negative impacts of one's activities. Some cases mentioned were land tenure conflict within tribal lots between DENR and DAR; Political Boundary disputes between LGU and NAMRIA; issuance of cutting permit for road development and expansion between DENR and LGU; unfair distribution of income and opportunities for tourism activities, implementation of solid waste management LGU and business groups; revolutionary tax by LGU and NPAs; non-compliance with environmental laws between DENR and resort owners.

The degree of importance and the level of influence of the different stakeholders were also determined. Stakeholders considered very important and with high influence are the different government agencies (LGU, DepEd, DENR, BFAR, DOT, DSWD, PNP), public and private financial institutions, and POs. NCIP is very important and highly influential but can also be considered as very important but low influence due to their lack of participation during meetings and public consultations with communities and other government agencies (NGAs) and non-government organizations (NGOs). Those deemed very important but with less influence are IPs, farmers, Micro, Small and Medium Enterprises (MSME), and fisherfolks as they have little influence when it comes to decisions or even policies. Intex mining companies and kaingeros are less important but with high influence for they can contribute to the destruction of the watershed.

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), Mindanao Strategic Development Framework (2010-2020), 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 the 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 Butas-Mag asawang Tubig-Alag Baco-Pula-Pulang Tubig 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 an initiative to come from NEDA VIII piggybacking on the Resiliency Plan to incorporate the parameters for the Integrated River Basin Management and Development 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 PAPs that are climate-resilient. Such initiatives are premised on evidence-based information and should be governed by governance principles.

5.9 Vulnerability Analysis

Hazard Vulnerability Assessment

Majority of the areas in Cluster 3, are classified with very low to low vulnerability to flooding covering 165,521 ha or approximately 76.1% of the total river basin area. Nevertheless, the high to very high class still covers about 14,144 ha (6.5%) of the total river basin area. As for landslide, majority have very low to low landslide vulnerability, covering 39.6% of the total basin area. Highly vulnerable zones still cover 51,469 ha (23.7%) of the total basin area. Majority of the areas in the cluster are classified with very low to low storm surge vulnerability comprising 95.6% (207,815 ha) of the total river basin area, while, the moderate class covers 5,818 ha (2.7%). Nevertheless, there are still areas in the cluster with high vulnerability to storm surge with 3,854 ha (1.8%).

Vulnerability of Water to Climate-Change

To project the amount of available water, the water demand projections were subtracted from the water supply projections. It will be assumed that the domestic and industrial water demands will be sourced mainly from groundwater, while the agricultural water demands will be subtracted from the surface water supply. The estimated agricultural water demands for the year 2050 in Table 1 showed below exceed the capacity of the surface water sources at 80% dependable flow and can be sufficed by groundwater source through pumping irrigation and installation of shallow tube well. Under such conditions, reservoir type irrigation systems should be studied for implementation to take advantage of the high streamflow during the rainy season. Implementation of rotational irrigation and water-saving techniques (e.g. Alternate Wetting and Drying or AWD) should also be considered.

Table 1. Estimated Water Demands for 2030 and 2050 in Cluster 3.

Year	Surface Water Supply (MCM/yr)	Groundwater Supply (MCM/yr)	Agricultural Water Demand (MCM/yr)	Domestic and Industrial Water Demand (MCM/yr)	Total Available Water (MCM/yr)
2030	3,535.47	139.441	3,071.17	43.571	560.17
2050	3,535.47	144.183	3,582.05	50.607	46.991

Participatory Risk and Vulnerability Assessment

Based on the experiences of the FGD participants, climate risk events were identified and rated according to their likelihood and consequences. Flooding, typhoon, landslide, intense rainfall, were the hydro-meteorological hazards that pose risks to population, environment and economic activities in the three PRBs. Earthquake, tsunami, storm surge and siltation were also identified as risk events. All these risk events affect the different user groups identified.

Flooding was observed to occur frequently, once or more in a year. This happens not only when there is typhoon but when heavy rains occur. This event impacts the people, environment and economic activity by degraded water quality, damage to agricultural crops, heavy siltation and occurrence of diseases. This affects mainly the communities located in low-lying areas.

Typhoon happens every year. The country experienced an average of 20 typhoons every year, and at least 3 of these are strong typhoons. In extreme cases, typhoon leads to damage to infrastructures and properties, hampered implementation of programs, affects communications facilities and transportation, loss of documents in offices, loss of livelihood (destruction of agricultural and upland farms and fishponds), injuries to people and even loss of lives. Another risk posing risk in the Cluster 3 river basin is intense rainfall. This happens immensely during southwest monsoon or habagat which typically brings more moisture and rains.

Intense rainfall leads to flooding and damage to agricultural crops and fishery sector. The likelihood of the occurrence in the future and the corresponding consequences of the above-mentioned risk events is very high which means that it can happen once or more every year.

The occurrence of landslide is mainly due to typhoons and strong rains. This event is experienced in areas sloping upland areas. The risk event is likely to occur every 5-10 years. This event causes injuries and loss of lives. The incidence of landslide may lead to the siltation of farmlands and marine areas and making soil unproductive and habitat loss for fish. Though other risk events identified such as earthquake, and storm surge was not climate-related, these poses threats to the various groups.

6 Management and Development Plan

6.1 Vision

Vision Statement

"The Cluster 3 River Basin is envisioned to be a rich and abundant watershed that continues to care for its biodiversity for the present and future generations."

6.2 Mission

Mission Statement

"To participate in the genuine development and responsible use of watershed resources."

6.3 Integrated River Basin Management and Development

Formulated by RBCO in 2007, the Integrated River Basin Management and Development (IRBMD) Framework is the basic system used for all strategies in the Philippines on sustained river basin ecosystem management. It is further composed of four principal frameworks and development strategies, namely Integrated Water Resources Management, Integrated Watershed Management, Wetland Management, and Flood Mitigation (Figure 2).

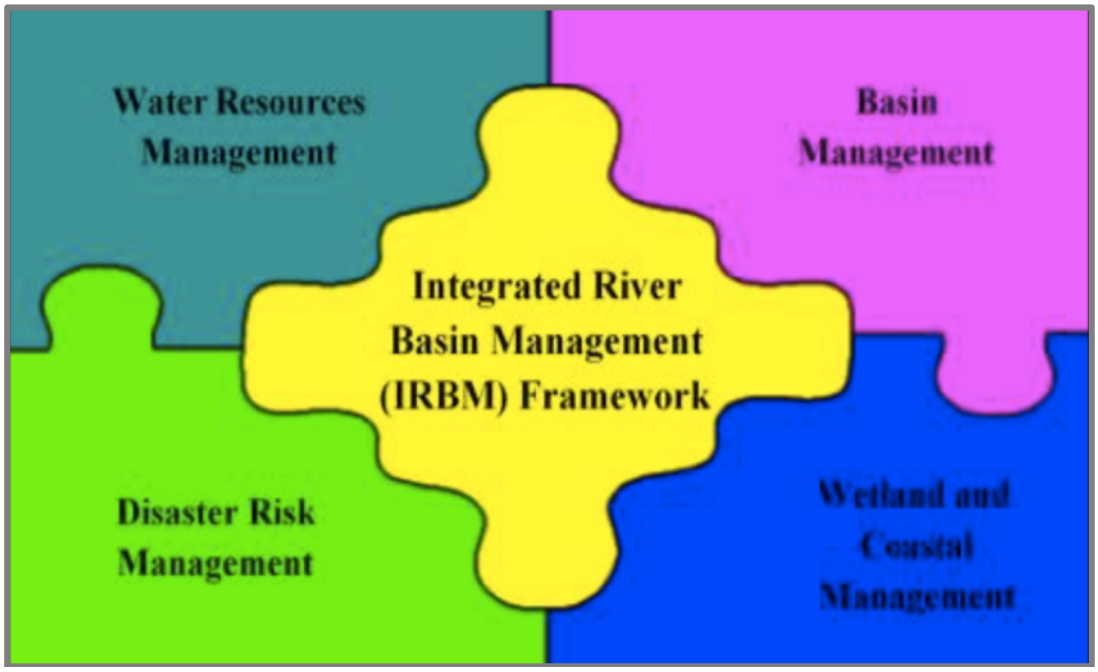

Figure 2. The Integrated River Basin Management and Development Framework.

1. Integrated Water Resources Management – manages fresh water as an economic and public good while recognizing its vulnerability and limited supply.
2. Integrated Watershed Management – organizes land, people, and other resources in the watershed to provide goods and services without harming the soil and water.

3. Wetland Management – manages areas that are submerged or soaked by enough surface or groundwater to support ecosystems such as mangroves, coral reefs, swamps, rice paddies, estuaries, lakes and reservoirs
4. Disaster Risk Management – protects and enhances coping capacities of communities and the environment against disaster risk and hazards.

6.4 Development of Issues and Challenges

There are several issues and challenges identified in the management of the Cluster 3 River Basin during its characterization and vulnerability assessment. However, six (6) development issues were identified as the main problems. These are low water quality, degradation of forest ecosystem and biodiversity, wetland degradation, excessive occurrences of disasters, poverty, and insufficient institutional coordination and assistance. The key issues served as a guide to strategize measures, and Programs and Projects (PAPs) for the Cluster 3 River Basin (Table 2).

Table 2. Development issues in Cluster 3 River Basin.

Theme	Issue/Challenge
Water	Low Water Quality
Forest Ecosystem and Biodiversity	Degradation of forest ecosystem and biodiversity
Wetland Management	Wetland degradation
Disaster Risk Reduction	Excessive disasters
Economic	Poverty
Institution	Insufficient institutional coordination and assistance

6.5 Implementation Plan

Selection of Key Indicators

An indicator is a parameter that characterizes the state of the watersheds 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, the health of soil and water, and stability of ecosystems. To facilitate the identification and selection of preferred measures and PAPs, key indicators were chosen from many possible indicators. From the complete list of 11 indicators, only eight shortlisted 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. After selecting the shortlist of key indicators, its latest values, some for 2012 and 2015 were determined based on available secondary data from DENR, PSA and other government agencies that hold the needed datasets. Likewise, the desired targets for each key indicator were determined based on related targets of the government (e.g., increase forest cover in 2022 and 2040 based on PDP and Ambisyon Natin).

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 watershed clusters.

Estimation of Gaps

Gaps here refer to the difference between the desired targets and the reference case values of the key indicators. Positive difference means that the current PAPs will contribute in 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. This implies that the amount of investments required to attain the adjusted target for a key indicator will be greater to implement enhanced current PAPs or new additional PAPs. On one hand, the gaps for the number of people affected per hazard, BOD and fecal coliform were compute in an absolute value since the targets for these indicators are to lessen them.

The target 2040 values for each indicator were obtained by the standardized values of DENR and assuming the most probable values that could be attained. For the forest cover, the open forest in 2015 and the closed forest in 2003 were added to be the target forest cover in 2040. For the soil erosion rate, the targeted value is based on the accepted soil loss tolerance. For the wetland area, the target value is computed by adding the 2015 area to 2015 area multiplied by the percent change in 2040. For the number of people affected per hazard, the target values are computed by subtracting the product of baseline value and 0.5 to the baseline value, the assumption is that by 2040 the people affected per hazard will be reduced by 50%. For the poverty incidence, since the future scenario is expected to be at 0% the target will be 0%. For the water stress index, the target value is the accepted water stress index. For BOD and Fecal Coliform, the target values are the standard values for Class AA waters classified by DENR.

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 were 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 were chosen based on minimum investment with the maximum contribution to the attainment of desired targets.

Identified Programs and Projects

For Cluster 3 River Basin, five thematic areas including the Water resources, Forest ecosystem and biodiversity, wetland management, DRR, Economic development and crosscutting PAPs are identified. Programs and Projects were proposed for each of the thematic areas of concern (Table 3).

Table 3. Implementation Plan of Cluster 3 River Basin.

Theme	Objective	Measure	PAP
Forest Ecosystem And Biodiversity Management	Well-managed, conserved and protected forest ecosystem and biodiversity of the Cluster 3 River Basin towards stability and productivity	Adaptive Forest Ecosystem Restoration (A-FORESTORE) Program	Project 1: Native Forest Ecosystem Restoration
			Project 2: Conservation Farming Villages (CFV) Project
			Project 3: Conservation Forest Villages (CFoV) Project
Water Resources	Objective: Improved quality and availability of water resources in the Cluster 3 River Basin	Measure 1: Supply side management program	Project 1: Rehabilitation/Restoration of Existing National and Communal Irrigation Systems (NIS & CIS)
			Project 2: Construction of Additional CIS
			Project 3: Establishment of Rainwater harvesting system
			Project 4: Deep wells and distribution systems project
			Project 5: Improvement of Infrastructure System (Domestic Water Supply Facilities)
		Measure 2: Demand side management Program	Project 1: Improvement of Irrigation Water Management
		Measure 3: Water quality monitoring and management Program	Project 1: Water Quality Monitoring System Project
			Project 2: Installation of centralized/decentralized treatment plants project
		Measure 4: Solid Waste Management Program	Project 1: Effective Ecological Solid Waste Management
			Project 2: Waste to Energy project

Theme	Objective	Measure	PAP
Wetland Management	Objective: Improved sustainability and resilience of wetlands within the Cluster 3 River Basin	Measure 1 : Biodiversity Conservation, Managementa nd Protection Program	Project 1: Wetland Protection and Restoration Project
			Project 2: Sustainable Funding for Existing Marine Protected Area
Disaster Risk Reduction And Management	Objective: Reduced and well-managed disaster risks within the Cluster 3 River Basin and an empowered community towards climate change adaptation and mitigation	Measure 1: Reduce exposure to hazards Program	Project 1: Relocation Project
			Project 2: Slope Stabilization Project
			Project 3: Flood Control Project
		Measure 2: Adaptive Capacity Development Program	Project 1: Alternative Livelihood Project
			Project 2: Capacity Building Project
			Project 3: Enhanced Evacuation Center Project
			Project 4: Mainstreaming of DRR and CCA in Local Development Plans
Economic Development	Objective: Inclusive economic growth in the Cluster 3 River Basin	Measure 1: Value Chain Enhancement Program	Project 1: Strengthening the Local Ecotourism Industry
			Project 2: Climate Resilient Agricultural Project
			Project 3: Establishment and Enhancement of post-harvest facilities
			Project 4: Sustainable Fisheries Project
			Project 5: Enterprise Development Project
			Project 6: Cooperative Development
Crosscutting Programs And Projects			Project 1: Induced River Basin coordinating council Formation
			Project 2: Creation and Institutionalization of the Cluster 3 River Basin Management Council
			Project 3: Institutionalization and Enterprise Development Project
			Project 4: Results-based management system

Theme	Objective	Measure	PAP
			development and MIS development
			Project 5: Sustainable Financing Mechanism Project
			Project 6: Comprehensive Natural Resources Assessment and Monitoring
			Project 7: Watershed Instrumentation Project
			Project 8: Feasibility Assessment of the Implementation of the Cluster 3 River Basin Master Plan
			Project 9: Cluster 3 Caravan/Roadshow project
			Project 10: Gender Equity and Social Inclusion Project
			Project 11: Development of Curricula for DepEd and CHEd
			Project 12: Cultural Impact Assessment

6.6 Investment Plan

The investment plan indicates the budgetary requirements of the various programs and projects that were developed under the Climate Change-Responsive Integrated River Basin Management and Development Master Plan for Cluster 3 River Basin, which is composed of Alag-Baco, Butas, Catuiran-Bucayao, Mag-Asawang Tubig and Pula River Basins. To pursue the objectives set forth in the Master Plan, five (5) component programs were developed: Forest Ecosystem and Biodiversity Management, Water Resources Management, Wetland Management, Disaster Risk Reduction and Management, and Economic Development. In addition to these five programs are six (6) other projects that are considered crosscutting in nature as they address concerns of more than one program.

The total investment requirement of the Plan over a 15-year period is PHP27.777 billion, as shown in Table 4. The Forest Ecosystem and Biodiversity Management thematic area has the highest funding requirement among the five thematic areas at PHP13.925 billion (50.1% of total), followed by Disaster Risk Reduction and Management (DRRM) at 9.516 billion (34.3%) and Water resources at 2.528 ha (9.1%). Wetland management has an investment requirement of 1.517 billion (5.5%), while Economic Development and Crosscutting have 101 million (0.4%) and 188.882 million (0.7%), respectively (Figure 3).

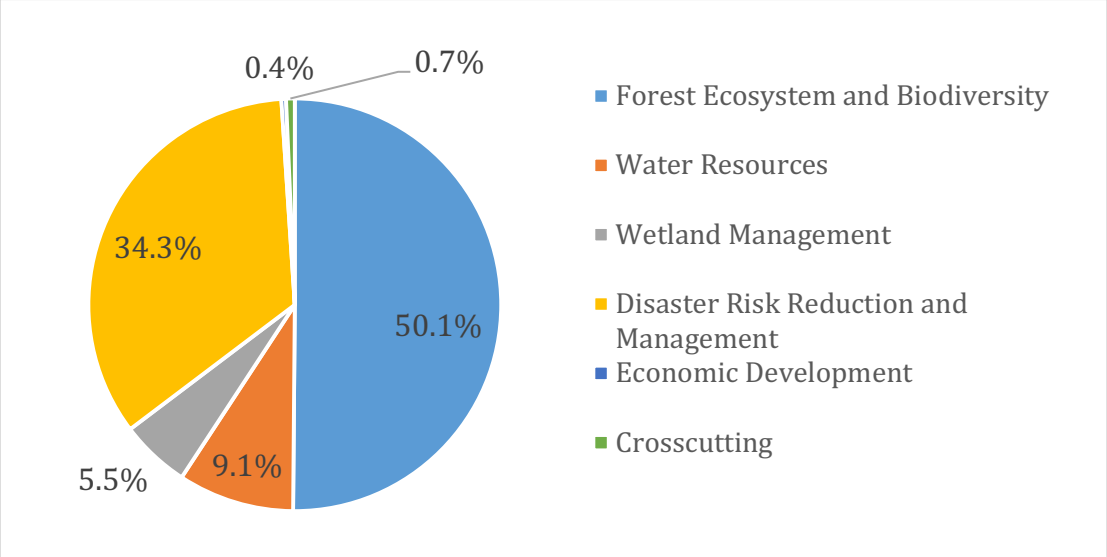

Figure 3. Funding Requirements by Theme, % of Total (PHP 27.777 billion).

Table 4. Cost requirements of programs and projects for a climate-responsive integrated master plan for the Cluster 3 River Basin.

PAP	Total
FOREST ECOSYSTEM AND BIODIVERSITY MANAGEMENT	
Adaptive Forest Ecosystem Restoration (A-FORESTORE) Program	
Native Forest Ecosystem Restoration	5,769,338,400
Conservation Farming Villages Project	987,795,000
Conservation Forest Villages Project	7,168,350,000
Subtotal	***13,925,483,400***
Theme Subtotal	***13,925,483,400***
WATER RESOURCES	
Water Supply Management Program	
Rehabilitation/Restoration of Existing National and Communal Irrigation Systems (NIS & CIS)	1,149,562,000
Construction of Additional CIS	480,000,000
Rainwater harvesting Project	36,000,000
Installation of deep wells and Distribution Systems Project	28,000,000
Improvement of Infrastructure System and Domestic Water Supply Facilities Project	14,000,000
Subtotal	***1,707,562,000***
Irrigation Water Management Project	10,000,000
Subtotal	***10,000,000***
Water Quality Monitoring and Management Program	
Water Quality Monitoring System Project (Monitoring Wells and River Water Quality Network, including databasing and analysis)	42,000,000
Water Treatment Plants Proejct	48,000,000
Subtotal	***90,000,000***

PAP	Total
Waste Management Program	
Enhanced Solid Waste Management Project	21,000,000
Waste-to-Energy Project	700,000,000
Subtotal	***721,000,000***
Theme Subtotal	***2,528,562,000***
WETLAND MANAGEMENT	
Wetland Protection and Restoration Project	*122,080,286*
Subtotal	***122,080,286***
Sustainable Funding for Existing Marine Protected Area	*1,395,360,000*
Subtotal	***1,395,360,000***
Theme Subtotal	***1,517,440,286***
DISASTER RISK REDUCTION AND MANAGEMENT	
Adaptive Capacity Development Program	
Alternative Livelihood Project	240,000,000
Capacity Building Project	19,200,000
Enhanced Evacuation Center Project	403,200,000
Mainstreaming of DRR and CCA in Local Development Plans	30,000,000
Subtotal	***692,400,000***
Hazard Prevention and Adaptation Program	
Relocation Project	609,728,000
Flood Control Project	1,505,911,061
Slope Stabilization Project	6,708,000,000
Subtotal	***8,823,639,061***
Theme Subtotal	***9,516,039,061***
ECONOMIC DEVELOPMENT	
Value Chain Enhancement Program	
Strengthening the Local Ecotourism Industry	20,000,000
Climate Resilient Agricultural Project	30,000,000
Establishment and Enhancement of post-harvest facilities	9,000,000
Sustainable Fisheries Project	30,000,000
Industry and Enterprise Development Project	6,000,000
Cooperative Development	6,000,000
Subtotal	***101,000,000***
Theme Subtotal	***101,000,000***
CROSSCUTTING PROGRAMS AND PROJECTS	
Institutionalization Program	
Induced River Basin coordinating council Formation	700,000
Creation and Institutionalization of the Cluster 3 River Basin Management Council	7,000,000
Institutionalizing Collaborative and Integrated ENR Management Project	1,300,000
Result based management system development and MIS development	12,000,000
Sustainable Financing Mechanism Project	20,000,000
Subtotal	***41,000,000***
Watershed Research and Monitoring Program	

PAP	Total
Comprehensive Natural Resources Assessment and Monitoring	23,200,000
Watershed Instrumentation Project	29,182,880
Feasibility Assessment of Cluster 3 River Basin	25,000,000
Subtotal	***77,382,880***
Participatory Development Program	
Cluster 3 Caravan / Roadshow Project	12,000,000
Gender Equity and Social Inclusion Project	8,500,000
Development of Curricula for DepEd and CHEd	20,000,000
Cultural Impact Assessment	30,000,000
Subtotal	***70,500,000***
Theme Subtotal	***188,882,880***
GRAND TOTAL	**27,777,407,626**

6.7 Prioritization of PAPs

The process of Multiple Criteria Decision Analysis (MCDA) was applied in the prioritization of PAP in the cluster. Six (6) criteria were chosen for all the Programs and stand-alone projects of the cluster. Each PAP is scored based on each of the identified criteria, such as contribution to indicators, social acceptability, policy constraint, technical capability/readiness, CCA-DRR, and cost. Each of the criterion, except for cost (actual cost was used). Ten (10) proposed PAPs were scored against six (6) chosen criteria for prioritization. Results from the methodology shows that top 5 PAPs were Adaptive Capacity Development Program, Wetland Protection and Restoration Project, Hazard Prevention and Adaptation Program, Value Chain Enhancement Program, and A-FORESTORE.

Table 5. 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	Cost		
A-FORESTORE	19	13	10	10	29	0	80	5*
Water Supply Management Program	16	19	10	10	14	4	73	8
Irrigation Water Management Project	16	19	7	10	14	5	71	9
Water Quality Monitoring and Management Program	19	19	10	10	14	5	76	6

PAP	Criterion						Grand Total	Rank
	Contribution to Indicators	Social Acceptability	Policy Constraint	Technical Capacity/ Readiness	CCA-DRR	Cost		
Solid Waste Management Program	19	19	7	10	14	5	73	7
Wetland Protection and Restoration Project	24	19	8	10	21	5	87	2*
Sustainable Funding for Existing Marine Protected Areas	10	13	7	10	21	4	65	10
Adaptive Capacity Development Program	23	19	10	10	29	5	94	1*
Hazard Prevention and Adaptation Program	19	13	7	14	29	2	84	3*
Value Chain Enhancement Program	19	19	10	14	14	5	81	4*