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DENR MEMORANDUM CIRCULAR

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**SUBJECT: GUIDELINES IN THE PREPARATION OF
INTEGRATED WATERSHED MANAGEMENT
PLANS.**

Pursuant to Presidential Decree No. 705, otherwise known as the "Revised Forestry Code of the Philippines" as amended, Executive Order No. 318, otherwise known as Promoting Sustainable Forest Management in the Philippines, DENR Administrative Order No. 2005-23 entitled "Adoption and Implementation of Collaborative Approach to Watershed Management", and DENR Administrative Order No. 99-01 entitled "Adoption of Watershed and Ecosystems Planning Framework", and Joint DENR Memorandum Circular No. 2003-01 entitled "Strengthening and Institutionalizing DENR-DILG-LGU Partnership on Devolved and other Forest Management Functions", the following guidelines for the preparation of Integrated Watershed Management Plans (IWMP) are hereby promulgated for the information and guidance of all concerned.

Section 1. Basic Policies

The government has adopted sustainable development as a national policy for all environment and natural resources plans and programs. Towards this end, it has employed as one of its main strategies the integrated watershed management or the watershed ecosystem management (WEM) approach.

It is the policy of the Department of Environment and Natural Resources (DENR) to ensure the attainment and optimization of environmental, socio-cultural, economic benefits from all watershed programs and projects through holistic, participatory management and effective implementation of interventions to sustain their production of multiple goods and services for the present and future generations.

Sec. 2. Objectives

The objectives of this Memorandum Circular are:

2.1 To ensure that watershed management plans are consistent with the Watershed and Ecosystem Management (WEM) framework;

2.2 To strengthen convergence and collaboration between and among various agencies, and other stakeholders;

2.3 To develop and maintain an effective database management system for watershed information; and

2.4 To upgrade the technical and operational capabilities of the DENR, LGUs, and other stakeholders.

Sec. 3. Coverage

This Circular shall cover the preparation of integrated watershed management plans of all watersheds regardless of their classification, size, use, and administrative jurisdiction.

Sec. 4. Definition of Terms

4.1. Forest - land with an area of more than 0.5 hectare and tree crown (or equivalent stocking level) of more than 10 percent. The trees should be able to reach minimum height of 5 meters of maturity in situ. It consists either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground cover or open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent. Young natural stands and all plantations established for forestry purposes, which have yet to reach a crown density of more than 10 percent or tree height of 5 meters are included under forest.

4.2 Watershed - a land area drained by a stream or fixed body of water and its tributaries having a common outlet for surface run-off. This include small watersheds with area of 10,000 ha and below; medium scale watershed with area of more than 10,000 ha to 50,000 ha; and large scale watershed with area above 50,000 ha.

4.3 Watershed Characterization – the process of describing the biophysical and socio-economic characteristics and features of a watershed in order to have an understanding of the various processes therein.

4.4 Watershed and Ecosystem Management (WEM) – the holistic, collaborative, multiple use and sustainable management of all the resources within a planning unit known as watershed.

4.5 Watershed Management – the process of guiding and organizing land and other resource uses in a watershed to provide desired goods and services without adversely affecting soil, water and other natural resources.

4.6 Vulnerability – degree to which a system is susceptible to, or unable to cope with adverse effects of natural and man-made (anthropogenic) hazards.

4.7 Vulnerability Assessment – an analysis of the relationship between natural and anthropogenic hazards and recipient subject (watershed). The vulnerability assessment identifies the strength and weaknesses of the recipient subject in relation to the identified hazard.

Sec. 5. Watershed Characterization.

Watershed characterization shall involve the gathering of information describing the biophysical and socio-economic condition of a watershed and determination of issues, vulnerability, and opportunities for development interventions.

The characterization process specifically involves the following activities :

- 5.1.1 Gathering of the necessary primary and secondary data/information
- 5.1.2 Determination of the present state of the watershed
 - Geographical location
 - Physical, biological and socio-economic conditions
 - Vulnerability assessment
- 5.1.3 Identification of issues, problems, and opportunities in the various ecosystems within the watershed
 - Forest ecosystem
 - Upland ecosystem
 - Grassland ecosystem
 - Lowland/Urban ecosystem
 - Coastal and marine ecosystem

Refer to the annotated outline of the Watershed Characterization Report in Annex B.

Sec 6. Analysis of data and information gathered in the characterization phase

The data gathered shall be analyzed based on integrated and participatory management, development, and rehabilitation requirements of the watershed addressing the multi-dimensional issues from the forests down to the coastal areas, as the case may be. As such, the nature and extent of best watershed uses shall be based on the quantity and quality of stream flow, rate of sedimentation, level of biodiversity, and economic activities to be maintained by stakeholders under sustainable watershed management .

Any analysis tool could be used singly or in combination depending on the availability of information, the peculiarity of the watershed, and the capacity of the watershed management planning team.

Some of the tools often used are as follows:

a. SWOT Analysis

SWOT Analysis is a strategic planning tool used to evaluate the strengths, weaknesses, opportunities, and threats in a development initiative. It involves specifying the objective of the project in identifying the internal and external factors that are favorable and unfavorable to achieve that objective.

b. Problem Tree Analysis

Problem tree analysis or Situational analysis helps to find solutions by mapping out the cause and effect around an issue.

c. Geographic Information System (GIS)

A *Geographic Information System (GIS)* is a decision support system involving the integration of spatially- referenced data. The GIS output could be used as inputs for watershed planning purposes such as identifying areas needing immediate intervention.

d. Land Use Determination Matrix.

Land Use Determination Matrix is an analyses tool that uses data gathered during the characterization phase. It shall be based on the development and rehabilitation requirements of the watershed in relation to the problems on deforestation and soil erosion.

e. Other Analysis Tools

Other appropriate tools can provide additional analysis and determine several options for development interventions in a watershed.

Sec. 7 Integrated Watershed Management Plan

Watershed management plan shall be holistic, integrated, and participatory. It shall fully take into account the well-being of the affected communities, including indigenous peoples.

Among the activities in the preparation of the Integrated Watershed Management Plan shall be the following:

- 7.1 Creation of a multisectoral and multidisciplinary planning team
- 7.2 Preparation of Activity Plan.
- 7.3 Gathering and analysis of all identified primary and secondary data, including supporting maps.
- 7.4 Conduct of levelling-off workshops, meetings, and consultations.
- 7.5 Carrying out follow- thru surveys and validation
- 7.6 Preparation of Integrated Watershed Management Plan.
(long , medium and short term)

Refer to the annotated outline of the Integrated Watershed Management Plan in Annex C.

Sec. 8 Approval of the Plan

The Region shall approve the IWMP of watersheds within their jurisdiction. Should a watershed transcend more than one Region, this shall require approval of Central Office. IWMP approved by the Regions may be subject to review and affirmation by a Watershed Multisectoral Technical Evaluation Committee (WMTEC) at the Central Office. The necessary approval sheet shall form part of the Plan.

The plan may be legitimized for adoption through:

- Resolutions
- MOAs/MOUs
- Any formal endorsement by watershed stakeholders concerned.

Sec. 9 Human Resources Development

The capacity building strategies for the IWMPT and various stakeholders such as trainings, cross visits, and study tours shall be undertaken for the effective implementation of this Circular.

Sec. 10 Implementation of the Plan

The approved IWMP shall be implemented by the DENR local office/agencies/stakeholders concerned. Funding support shall be sourced from national appropriations, stakeholders, and Overseas Development Assistance.

Sec. 11 Monitoring and Evaluation

Monitoring and evaluation of the development and management activities shall be conducted by Central Office/Third Party on a periodic basis.

The reporting system will be undertaken taking into consideration the performance analysis in the management of the watershed vis-a-vis the approved integrated management interventions and activities, resources, time frame, and impacts.

Sec. 12 The Watershed Management Planning Team (WMPT)

12.1 Composition of WMPT

Watershed Management Planning Teams (WMPTs) shall be formed where a particular watershed is located to serve as the working groups in the conduct of watershed characterization and preparation of the integrated watershed management plan. The team shall be multidisciplinary and multi-sectoral. It shall be composed of representatives from the Regional Office(s), PENRO(s), CENRO(s), sectors, LGUs, and watershed stakeholders concerned.

When a particular watershed straddles two or more regions, the region which covers the largest portion shall lead in the preparation of the plan.

In cases where the Protected Area Management Board (PAMB) or a Watershed Management Council (WMC) already exists, the said PAMB or WMC shall be expanded to serve as the WMPT responsible in the preparation of the Integrated Watershed Management Plans.

To formalize and operationalize the creation of the WMPT, the stakeholders may forge any collaborative arrangement (e.g, MOA) indicating respective roles and responsibilities.

12.2 Roles and Responsibilities

The WMPT shall be guided by the activities enumerated in Section 7 of herein Circular.

12.3. Activity Plan of the WMPT

An activity plan indicating the sequence, schedule, timing, and duration of activities, data, information, and interventions required, including financial and logistical requirements, for the preparation of the integrated watershed management plan shall be prepared by the WMPT.

Refer to the Indicative Activity Plan Format in Annex A.

Sec. 13. Repealing Clause

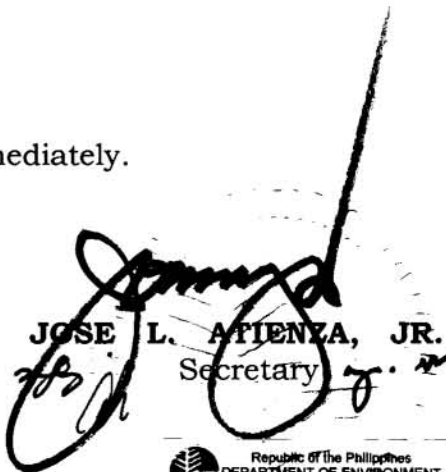
The provisions of any administrative order, memorandum, and other related issuances, which are inconsistent with this Circular are hereby repealed, superseded or amended accordingly.

Sec. 14. Separability Clause

If any clause, sentence or provision of this Circular shall be held invalid or unconstitutional, the remaining parts shall not be affected thereby.

Sec. 15. Effectivity

This Circular shall take effect immediately.


JOSE L. APIENZA, JR.
Secretary

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Annex “A”

INDICATIVE FORMAT ACTIVITY PLAN OF THE WATERSHED MANAGEMENT PLANNING TEAM FOR THE PREPARATION OF AN INTEGRATED WATERSHED MANAGEMENT PLAN

Activities	Expected Output	Financial Requirements	Focal Office	Time Frame	Remarks
<p>A . Preparatory/Initiation Activities (Cross-cutting)</p> <p>1. Creation of the Watershed Management Planning Team (WMPT)</p> <p>2. Identification of key stakeholders for the collaborative management of the watershed</p> <p>3. Orientation and leveling- off of WMPT</p> <p>4. Inter-agency meetings and consultations</p> <p>5. Information, Education and Communication</p>	<p>DENR S.O. creating the Watershed Management Planning Team</p> <p>Meetings</p> <p>List of identified issues and problems</p> <p>Meetings/ workshops/MOAs</p> <p>Specific strategies and activities/ media</p>		DENR		
<p>*B. Characterization work</p> <p>1. Secondary Data Gathering</p> <p>Gathering of available documents and materials including the digital maps of the collaborative partner agencies</p> <p>Inter-agency collaboration</p> <ul style="list-style-type: none"> - Consultation process - Problem tree analyses, etc - workshops and writeshops 	<p>Secondary data on bio-physical and socio-economic condition of the watershed.</p> <p>Data, maps (analogue or digital), plans</p>		DENR, LGUs,		

Activities	Expected Output	Financial Requirements	Focal Office	Time Frame	Remarks
<p>2. Primary Data Gathering</p> <p>a. Physical resources (soil, water) * 5 days (4 staff) x 3 trips</p> <p>b. Biological resources (flora/fauna) * 6 days (4 staff) x 3 trips</p> <p>b. Biological resources (flora/fauna) *6 days (4 staff)x 3 trips</p> <p>c. Socio-economic * 4 days (3 staff)x 4 trips</p>	<p>Primary data on soil, hydrology, and water quality in at least 3 locations.</p> <p>Primary data on flora/fauna. Location of sampling plots reflected in the map. Results presented in biodiversity indices.</p> <p>Data on present socio-economic condition of people inside the watershed. To include the result of psychological, behavioral/attitudes of residents.</p>				
<p>3. Laboratory analyses</p> <p>4. Conduct workshops in the prioritization of activities, and role and functions of involved agencies</p> <p>5. Finalization of prioritized activities</p> <p>6. Report writing</p>	<p>Analyses of soil and water samples gathered during field works</p> <p>Work and Financial plan</p> <p>WFP</p> <p>Characterization Report</p>		All agencies involved and stakeholders	Every 5 years	
<p>C. Analyses of data and information on data gathered during the characterization phase</p> <p>- Workshops/meetings</p>	Analyses report				

Activities	Expected Output	Financial Requirements	Focal Office	Time Frame	Remarks
**D. Management Planning a. Participatory Consultation/Workshops b. Writeshops c. Legitimization of the plan d. Reproduction of the plan	Integrated Watershed Management plan				

*would depend on area & accessibility, population, presence of development projects, number of municipalities and barangays, lack of secondary data, insufficiency of funds of the other sectors (needed in the characterization report), technical capability of WMPT, and adequacy of watershed characterization report

** would depend on area, accessibility, population, presence of development projects, number of municipalities and barangays,

**WATERSHED CHARACTERIZATION REPORT
ANNOTATED OUTLINE**

I. INTRODUCTION AND BACKGROUND INFORMATION

Describe the importance of the watershed. Include watershed name, total area, location in terms of provinces, municipalities, and barangays covered (as appropriate) Include IWMP purpose of characterization.

II. PRESENT STATE OF THE WATERSHED

The narrative report on the present condition of the watershed shall be consistent with the thematic maps. Data shall as much as practicable be broken down by subwatersheds..

2.1 PHYSICAL ENVIRONMENT

2.1.1 GEOPHYSICAL LOCATION

Discuss the watershed area (in ha.), its administrative jurisdiction, relative geographical location, and coordinates supported by base map and location maps.

2.1.2 TOPOGRAPHY/GEO-MORPHOLOGICAL FEATURES

Describe the topography of the watershed (slope, elevation and land forms), exposure and drainage patterns; Include the geo-morphological features of the watershed.

Discuss how geo-morphological features influence the amount and velocity of water moving over land surfaces, their effects on soil erosion potential, suitability to various land uses.

In order to determine watershed vulnerability the following shall be presented:

A. Watershed-shape Parameters:

1. Area

Discuss the effects of peak flow and time for flood flow to reach a given station.

2. **Gravelius form factor** = $Gf = \frac{\text{Average width}}{\text{Axial length of basin}}$

Discuss the relationship of the basin form factor with intense rainfall.

3. **Bifurcation ratio**

Discuss the ratio of the number of streams (in the watershed) of any given order to the number of the streams in the next lower order and its influence on flood discharges.

4. **Elongation ratio**

Discuss the ratio between the diameter of a circle with the same area as the watershed and the maximum length of the watershed (which is the distance from the outlet to the farthest point in the watershed).

5. **Circulatory ratio** (compactness coefficient)

Discuss the ratio of the circumference of a circle of the same area, as the basin to the basin perimeter.

6. **Basin length.**

Discuss the measure from the outlet of basin to its drainage divide.

B. Watershed-Relief Features

1. **Relief ratio** = $\frac{\text{highest point} - \text{lowest point}}{\text{Maximum basin length}}$

Discuss the relief ratio together with climatic factors of erosion in relation to sediment yield.

2. **Relative relief** = $\frac{\text{highest elevation}}{\text{Perimeter of the basin}}$

3. **Elevation**

Discuss the variation in elevation, median elevation and mean elevation of a watershed in relation to temperature and precipitation.

4. **Slope**

Discuss the mean slope, slope maps, and maximum valley slope.

The following slope classification shall be used.

Sub-watershed	Slope	Area (Hectares)
	Level to gently sloping (0-8%) Moderate (8-18%) Steep (18-30%) Very Steep (30-50%) Severely Steep ($\geq 50\%$)	

C. Channel Morphology.

Describe the drainage net of a watershed and correlate the hydrologic and sediment characteristics within the watershed using Cross section and profile; Sinuosity index (SI); Stream ordering; and Stream length.

D. Discuss the drainage texture of the watershed using the following:

1. Drainage density

$$Dd = \frac{L}{A} = \frac{\text{Total length of stream}}{\text{area of watershed}}$$

Describe the efficiency with which a stream collects and discharges available water.

2. Discuss the stream density.

$$DS = \frac{N}{A} = \frac{\text{number of streams}}{\text{area of watershed}}$$

3. Length of overland flow

Discuss the distance over which runoff will flow before concentrating into permanent channels.

$$Fl = \frac{1}{2 Dd}$$

2.1.3 GEOLOGY

Indicate and discuss the general geological composition, formation, age and lithology relative to

map of Geo-hazard areas/Seismicity of areas near fault lines. Relate watershed geology to its hypsometry and its influence in the erosion cycle of the watershed.

Discuss the geological feature (textural and structural) of the watershed in relation to soil and water. Support with a geologic map. Discuss also whether there are indications of underground water, seepage, and filtration. Indicate the effects of the geological feature on the watershed hydrology. Data may be accessed from the Mines and Geosciences unit of the DENR or from other concerned Offices.

2.1.4 SOIL

Indicate and discuss major soil type condition and characteristics, and erosion susceptibility based on soil map. Include the influence of soil characteristics and infiltration capacity of watersheds and subsequent surface runoff, groundwater recharge and related processes. Assess soil characteristics relative to the suitability of an area for crop production.

Essential features to be included are:

A. **Soil texture** = relative proportions of various size groups.

Clay = less than 0.002 mm in diameter.

Silt = greater than 0.002 mm but less than 0.05 mm.)

Sand = greater than 0.05 but less than 200 mm)

B. Soil structure

Discuss the aggregation of primary soil particles into compound particles or clusters, in terms of grade (structureless, weak, moderate, strong); size (very fine, fine, medium, coarse and very coarse); and shape (platy, prismatic, columnar, blocky, sub-angular, granular or crumb).

C. Bulk Density and Permeability

Discuss the quality of soil that enables it to transmit water or air (very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid).

D. Erosion Condition

Describe the area affected by various types of soil erosion prevailing in the watershed area such as:

- Non-slight erosion
- Moderate erosion
- Severe erosion
- Very Severe erosion

Each degree or type of soil erosion should be presented by areas (in hectares) and supported with maps.

Emphasize water quantity, quality and appropriate uses.

Identify priority area requiring immediate attention and relate erosion condition with the suitability of land uses and the effectiveness of various conservation strategies.

E. Soil fertility

Discuss pH, plant nutrient and organic matter content, and origin of parent material (e.g. limestone, volcanic, alluvial, etc..)

F. Soil Depth

Discuss the conduct of soil survey and analysis. Collect soil samples from the upper, middle, and lower elevations. Bring collected soil samples to the laboratory for analysis. Secondary data will suffice, if this information is available in other concerned agencies.

Indicate major soil type condition and characteristics and erosion susceptibility based on soil map. Include discussion on morphological characteristics and chemical properties of the soil in the watersheds.

2.1.5 LAND CLASSIFICATION/LEGAL STATUS OF LAND

Discuss the extent of Alienable and Disposable Lands (A&D) and forestlands in terms of area coverage within watershed. Present the extent of area in tables and land classification map.

2.1.6 LAND CAPABILITY

Discuss the capacity of land to support the production of a given combination of plants and animals and the allocation of different subwatersheds to the best uses.

The WMPT can use available system of land capability classification developed by the USDA Soil Conservation Service, or adopt the Land Management Unit (LMU) approach being employed by BSWM.

2.1.7 LAND USE

Make a survey of the land uses, either in the field or in the office using recently taken aerial photographs or satellite imageries. Most land uses, especially those that involve human interventions, affect soil properties of a watershed.

Discuss the prevailing and actual manner in the utilization of land, its allocation, development, and management. Discuss further its existing land – use type per municipality and extent (in ha.), supported by tables.

Obtain land-based maps from BSWM-DA and forest cover maps for the country from NAMRIA. If resources are sufficient, gather also past and recent satellite imageries from various concerned sources.

- ❖ Land Use Category:
 - Built –up areas
 - Barren Land
 - Lahar
 - Inland Water
 - Inland Water pond
 - Fishpond

- Agriculture areas
- Forest
 - Production
 - Protection
 - Other Uses/Special Uses

Discuss this portion based on existing land use, tenurial arrangements and existing/proposed foreign- assisted and locally funded projects in the watershed. Support discussion with the Municipal/Provincial land use map.

2.1.8 CLIMATE

Indicate the climate type where the area belongs. Include climatic data on actual precipitation (rainfall distribution, pattern, intensity, amount, and extreme rainfall events, air temperature, evaporation, relative humidity and wind direction or velocity, if available. Where a weather station does not exist within the watershed, inferences may be drawn from climatic data obtained from the nearest PAG-ASA weather station.

Discuss the indicative influence of climate on the different biophysical and socio-economic features and processes within a watershed.

2.1.9 HYDROLOGY

Include data on surface run-off, stream flow or discharge, soil erosion and sediment load.

Relate description with the drainage map. The following data are needed:

- ❖ Drainage pattern
- ❖ Stream flow rate (*daily/annual*)
- ❖ *Peak flow and minimum flow*
- ❖ *Sedimentation*
- ❖ Stream flow quantity / quality (dissolved chemical constituents such as Ca, nitrate, phosphate, etc and micro-organisms (fecal and total coliform) and physical and chemical properties of

water (temperature, conductivity, pH, salinity, COD).

- ❖ Location of springs including discharge
- ❖ Water Uses (irrigation, hydropower, domestic, industrial use, etc.) with an indication of the water yield in terms of quality (potability pollution level) and quantity (volume and flow regime).

Discuss the streamflow rate and quality by using a wide variety of methods and instrumentations. Data can be generated through various means, such as rainfall-streamflow relationship and modeling.

2.1.11 INFRASTRUCTURE

Describe all existing/proposed infrastructure facilities/projects to be introduced. Indicate this in the land uses map).

2.2 BIOLOGICAL RESOURCES

2.2.1 VEGETATION

Discuss the vegetation analysis in determining the composition, type and structure of plant communities, volume and density of trees, and percent ground and canopy cover in a watershed.

Use aerial photographs and remotely sensed imageries of vegetation distribution and quality information, as available.

Present the existing forest cover, including species composition of the supported by vegetative cover map. Results shall be presented in terms of volume, biodiversity indices, and/or endangered/threatened status. Use FAO land/forest cover categories:

- ❖ Forest
 - Closed Broadleaved Forest
 - Open Broadleaved Forest
 - Closed Coniferous Forest

- Open Coniferous Forest
- Closed Mixed Forest
- Open Mixed Forest
- Closed Broadleaved Plantation
- Open Broadleaved Plantation
 - Closed Coniferous Plantation
 - Open Coniferous Plantation
 - Closed Bamboo/Boho Formation
 - Open Bamboo/Boho Formation
 - Closed Mangrove Forest
 - Open Mangrove Forest
- ❖ Other Wooded Land
 - Shrubs
 - Forest fallow system
 - Wooded grassland
- ❖ Other Lands
 - Grassland
 - Marshland
 - Annual Crop
 - Perennial Crop

2.2.2 FAUNA

Assess the faunal population in a watershed to determine species composition, density, distribution or occurrence, and diversity for proper management. Present results of faunal inventory in terms of volume, biodiversity indices and/or conservation status.

Enumerate the conservation status whether critically endangered, endangered, vulnerable, other threatened species, and other wildlife species.

2.3 SOCIO-ECONOMIC SURVEY AND DEMOGRAPHY

Describe and analyze the socio-economic features of the watershed. Discuss the roles of the various stakeholders within the watershed that influence the watershed sustainability.

The WMPT can use the following primary data collection tools: informal survey, direct observation, use of key informants, groups or individual interviews, iterative discussion/village-level participatory workshop, and formal verification survey.

2.3.1 POPULATION AND DENSITY

Gather information on the number of population segregated by sex, age, and their distribution in the watershed area, by barangay. Tabulate data by barangay and attach as appendix. These data may be taken from the office of the Barangay Captain or Office of the Mayor. Make appropriate graphs and tables. Relate discussion on the population map.

2.3.2 AGE STRUCTURE

Indicate age range and dependency ratio of the present population within the locality or affected areas. Classify according to age classes. Use this information to estimate the number of potential workers or participants in the watershed.

2.3.3 HOUSEHOLD/FAMILY SIZE

Indicate average number of persons per household. Gather data from the municipal office or the Barangay Captains. These data should be tabulated for presentation.

2.3.4 LIVELIHOOD AND INCOME/PROFILE/SOURCES

Present level of income of the occupants based on their present occupation. Discuss the average annual household income per municipality and primary sources of livelihood in the community. Validate these during the field visits.

These data can be gathered from existing municipal socio-economic profile.

2.3.5 SECTORAL PRODUCTION

Discuss the major source of livelihood in the community with respect to agriculture, fishery, forestry, mining and quarrying trade and industry, financing network and other industry type.

2.3.6 EMPLOYMENT PATTERN AND PROJECTION

Indicate current employment and unemployment status opportunities and projections up to next the 10 years.

2.3.7 SOCIAL, EDUCATIONAL, AND MEDICAL SERVICES

Discuss birth, mortality statistics, as well as the medical services in the community. Generate statistics on the educational level of the people, and social services available in the area. Tabulate the data.

2.3.8 TRANSPORTATION AND COMMUNICATION

Discuss the accessibility of the project area and the means of transportation available. Data on this may be taken from the roadmap of the municipality. Indicate also the frequency of trips per day. Gather data during field visits.

2.3.9 TOURISM AND RECREATION

Indicate the existing and potential eco-tourism and recreational spots in the locality and the number of visitors in the area's tourist spots.

2.3.10 RELIGIOUS SECTORS, POLITICAL, AND SOCIAL ORGANIZATION

2.3.10.1 Cooperative/NGOs/Social Organization

Discuss accredited or non-accredited NGOs within the area and the services rendered and extended to people in community development projects. Indicate dialects spoken by the people.

2.3.10.2 Religion

Indicate the religious affiliation of the various households in the community.

2.3.10.3 Political

Discuss the political units and boundaries of districts, municipalities, chartered cities, barangay and sitios. Associate this with the political map of the area affected.

2.3.10.4 Citizen Participation

Describe the participation of residents and private organization in decision-making, consultation, dialogues, election, etc.

2.3.10.5 Ancestral Domain Claims

Discuss areas with CALC/CADC issuances.

2.3.11 BEHAVIORAL AND CULTURAL PATTERNS

Discuss the activities and cultural patterns, motivation, reaction, perception, and folkways of the indigenous peoples and other occupants in the watershed. Include their positive and negative responses and attitudes, along with their reasons, towards projects and interventions.

III. VULNERABILITY ASSESSMENT

Determine and describe the vulnerability of the watershed to natural and anthropogenic hazards (landslide, flood, fire, deforestation, biodiversity loss, pollution, etc.) based on the results of numerical scores of the various factors used in the analysis. The following scales are recommended: 1 – slight (low vulnerability), 2 – fairly vulnerable, 3 – moderately vulnerable, 4 – highly vulnerable, 5 – very highly vulnerable.

Conduct consultations or workshops in coming up with mitigating measures to address the hazards and in coming up with policy recommendations.

Identify the Hazard and Critical Factor Analysis for the following: Landslide and Soil Erosion, Flood, Fire, Deforestation and Biodiversity Loss, Water Pollution, and others

Determine the hazards in terms of their impact to communities and present coping-up mechanisms, and gender sensitivity.

Discuss the mitigation and policy recommendations.

IV. ANALYSES OF ENVIRONMENTAL ISSUES, PROBLEMS AND OPPORTUNITIES

Discuss both the identified and potential environmental issues and problems, and opportunities for each ecosystems in the watershed, based on the analysis of the data presented earlier.

- Forest Ecosystem
- Upland Ecosystem
- Grassland Ecosystem
- Lowland/Urban Ecosystem
- Coastal and Marine Ecosystem

V. MAPS

The following maps (with the scale of 1:50,000) shall be submitted and be correlated along with the narrative discussion. The maps should be properly dated and referenced. Mapping conventions in terms of legends and colors, positioning as legends, etc. should be observed and followed.

5.1 Location Map

Map showing the location of the watershed coordinates

5.2 Political/Administrative Boundary Map

Map indicating boundaries of provinces and municipalities/barangays covered by the watershed including road network.

5.3 Climatic Classification Map

Map showing the climatic type of the watershed.

5.4 Topographic Map

Map showing the topography and elevations.

5.5 Slope Map

Map showing the slope category of the area.

<u>Slope Category</u>	<u>Slope Range</u>
Level to gently sloping	0 – 8%
Moderate	8 – 18%

Steep	18 – 30%
Very steep	30 – 50%
Severely steep	above 50%

5.6 Geologic Map

Map showing the geological features of the area.

5.7 Seismicity Map from Philvocs

Map showing the location of faultlines, if applicable.

5.8 Drainage Map

Map showing the drainage system of the area.

5.9 Soil Map

Map showing the soil physiological properties and location of soil sampling sites.

5.10 Vegetative Landcover Map

Map showing the land/forest cover of the area.

5.11 Land- Use Map

Land Use Category should include the following:

- Build –up area
- Forest
 - Production
 - Protection
- Agriculture
 - Ricefield
 - Cornland
 - Plantation
 - Other fruits
 - Livestock Farm
 - Fishponds
 - Prawn Farms
 - Saltbeds
 - Others
- Other Uses/Special Uses
 - Tourism/Outdoor Recreation
 - Memorial Park

5.12 Land Management Map

- Showing areas covered by TL's
- CBFMAs

- Development projects
- Foreshore leases
- Private lands
- NIPAS areas
- IFMA / SIFMA areas
- Forest land grazing leases
- Military reservation
- Watershed Reservations
- Communal forest
- Mineral reservations and areas covered by mining rights
- Others

5.13 Land Classification Map

Map showing the boundaries of permanent forest and identifying boundary conflicts between Land Classification (LC) and cadastral maps.

5.14 Soil Erosion Map

Map showing the erosion susceptibility of the area.

Description

Non-slight erosion

Moderate erosion

Severe erosion

Very severe erosion

5.15 Population Map

Map indicating the size of the population per settlement group within the watershed.

5.16 Infrastructure Map

Map showing the different infrastructures within the area

5.17 Land Capability

Based on the map prepared by the BSWM.

5.18 Map of Geo-Hazard Areas

Areas prone to landslides and floods.

VI. ANALYSES OF DATA AND INFORMATION GATHERED IN THE CHARACTERIZATION PHASE

The WMPT shall analyze data gathered based on the integrated and participatory management, development, and rehabilitation requirements of the watershed in relation to the interrelationships of problems and issues existing from the forests down to the coastal areas. As such, the nature and extent of best watershed uses shall be based on the quantity and quality of stream flow, rate of sedimentation, level of biodiversity, and economic activities to be maintained by stakeholders under sustainable watershed management .

The WMPT could use any analysis tool depending on the availability of information, the peculiarity of the watershed, and the capacity of the team.

Some of the tools often used are as follows:

1. SWOT Analysis

SWOT Analysis is a strategic planning tool used to evaluate the **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats involved in a development initiative. It is basic, straightforward model that provides direction and serves as a basis for the development of plans. It is the first stage of planning and helps decision makers to focus on key issues. It involves specifying the objective of the project and identifying the internal and external factors that are favorable and unfavorable to achieving that objective. The role of SWOT analysis is to take the information from the environmental analysis and separate it into internal issues (strengths and weaknesses) and external issues (opportunities and threats). Once this is completed, SWOT analysis determines if the information indicates something that will accomplish its objectives (a strength or opportunity), or if it indicates an obstacle that must be overcome or minimized to achieve desired results (weakness or threat).

Simple Rules for Successful SWOT Analysis

- Be realistic about the strengths and weaknesses when conducting SWOT analysis.

- SWOT analysis should distinguish between what is the condition of the area today, and what it could be in the future.
- SWOT should always be specific.
- Keep your SWOT short and simple, Avoid complexity and over analysis.
- SWOT is subjective.

2. Problem Tree Analysis

Problem tree analysis is central to many forms of project planning and is well-developed among development agencies. Problem tree analysis (also called Situational analysis or just Problem analysis) helps to find solutions by mapping out the anatomy of cause and effect around an issue. This brings several advantages:

- a) The problem can be broken down into manageable and definable categories. This enables a clearer prioritization of factors and helps focus objectives;
- b) There is more understanding of the problem and its often interconnected and even contradictory causes. This is often the first step in finding win-win solutions.
- c) It identifies the constituent issues and arguments, and can help establish who and what the political actors and processes are at each stage;
- d) It can help establish whether further information, evidence or resources are needed to make a strong case, or build a convincing solution;
- e) Present issues – rather than apparent, future or past issues – are dealt with and identified;
- f) The process of analysis often helps build a shared sense of understanding, purpose and action.

Discussion questions might include:

- a. Does this represent the reality? Are the economic, political and socio-cultural dimensions to the problem considered?

- b. Which causes and consequences are getting better, which are getting worse and which are staying the same?
- c. What are the most serious consequences? Which are of most concern? What criteria are important to us in thinking about a way forward?
- d. Which causes are easiest / most difficult to address? What possible solutions or options might there be? Where could a policy change help address a cause or consequence, or create a solution?
- e. What decisions have we made, and what actions have we agreed?

Steps:

- a. **List all the problems** that come to mind. Problems need to be carefully identified: they should be existing problems, not possible, imagined or future ones. The problem is an existing negative situation, it is not the absence of a solution.
- b. Identify a **core problem** (this may involve considerable trial and error before settling on one).
- c. Determine which problems are “**Causes**” and which are “**Effects**”.
- d. Arrange in **hierarchy** both Causes and Effects, i. e., how do the causes relate to each other – which leads to the other.

3. Geographic Information System (GIS)

A Geographic Information System (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operation such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps (ESRI). Among other things, GIS is an information technology which stores, analyzes and displays both spatial and non-spatial data. It is a decision support system involving the integration of spatially-referenced data in a problem solving environment. Also known as geospatial technology, GIS is able to integrate spatial data into new analytical information.

For the DENR field Offices to perform GIS tasks, the following components are needed: (i) People – with background and/or

interested to work in GIS; (ii) Data – availability and accuracy of the data can affect the integrity of the produced thematic maps; (iii) Hardware – hardware capabilities can affect processing speed, ease of use, and the type output available; (iv) Software – different GIS softwares available could be used; this include not only actual GIS software but also various database, drawing, statistical, imaging, and other softwares; and (v) Procedure – analysis requires well-defined, consistent methods to produce accurate, reproducible results.

To prepare GIS-based thematic maps of the watershed, any of the following data sources could be used depending on what is available: hardcopy maps (sometimes referred to as analogue maps); aerial photographs; remotely sensed imagery; point data samples from surveys (e.g. GPS readings); and existing digital data files. However, it is important to use the Topographic Map of NAMRIA (with scale of 1:50,000) as reference in preparing the base map of the watershed.

There are several techniques for inputting spatial data into a GIS: manual digitizing; automatic scanning; entry of coordinates using coordinate geometry; and conversion of existing digital data.

The GIS output could be used as inputs for watershed planning purposes and bases for decision-making. Areas need immediate interventions could be identified through watershed modeling (e.g. hydrological, sedimentation or erosion modeling).

4. Land Use Determination Matrix.

The analyses of the data gathered during the characterization phase shall be based on the development and rehabilitation requirements of the watershed in relation to the problems on deforestation and the general loss of the soil fertility due to soil erosion or the rapid destruction of soil organic matter. These are as follows:

- a) For Open, cogonal, and degraded areas = Reforestation;
- b) For Brushland with sporadically growing forest trees = ANR;
- c) For Cultivated areas = Agroforestry;
- d) For Coastal areas = Plantation establishment (in areas without mangrove plantations) or Protection (in areas with mangrove plantation/naturally growing mangroves);
- e) For Inadequately stocked forest areas = enrichment planting;
- f) For A & D areas = Seedling production for distribution to assist in the rehabilitation of their areas;
- g) For River Banks and buffer zones of A & D = structural/vegetative measures;

- h) For Areas dominated by agricultural/swidden farms/kaingin = Agriculture (0-18% in slope)/Agroforestry (18-30% slope with slight erosion and 0-18% slope with severe or very severe erosion)/ Production Forest (18-30% slope with severe erosion or 30-50% slope with slight erosion)/Protection Forest (18-30% slope with severe erosion or 30-50% with severe to very severe erosion and all areas above 50% in slope);
- i) For Areas dominated by grasslands and shrublands = Agriculture (0-18% slope)/Agroforestry (18-30% with slight erosion)/ Production Forest (18-30 % slope with severe erosion or 30-50% slope with slight erosion)/Protection Forest (18-30% with very severe erosion or 30-50% slope with severe to very severe erosion and all areas above 50% in slope);
- j) For Areas dominated by brushlands = Agriculture (0-18% slope)/Agroforestry/Production Forests-ANR (18-30% slope)/Production Forests (all areas 30-50% slope)/Protection Forests (all areas above 50% in slope); and
- k) For Areas dominated by residual forests = Agriculture (all areas 0-18% slope)/Agroforestry/Production Forests – ANR/TSI (18-30% slope)/ Production Forests- ANR/TSI (all areas 30-50% slope)/Protection Forests – ANR/TSI (all areas above 50% in slope).

5. **Other Analysis Tools**

Should there be other appropriate tools made available, these would provide additional analysis and determine several options for development interventions in a watershed.

INTEGRATED WATERSHED MANAGEMENT PLAN ANNOTATED OUTLINE

1. Vision and Mission Statements

State the vision and mission statements for long term (25 years), medium-term (5 to 10 years) and annual- term period.

2. Goals and Objectives

State the goals and objectives (general and specific) and expected outputs of the IWMP.

3. Scopes and Limitations of the IWMP

Discuss the scope and limitation in the preparation of the development plan in relation to existing situation and capacities.

4. Processes and Methodologies

Discuss the processes and methodologies involved in the formulation of the IWMP.

A. Preparatory activities

- a. Formation of Planning Team
- b. Crafting of Activity plan
- c. Procurement of supplies and materials (logistics)
- d. Acquisition of secondary data (base maps etc.)
- e. Analysis and interpretation of secondary data to determine extent and data gaps
- f. Levelling-off workshops and meetings

B. Watershed Characterization

- a. Consultation and coordination meetings
- b. Focus group discussions
- c. Key informant interviews
- d. Transect walks
- e. Community mapping
- f. Socio-economic surveys and profiling
- g. Collection of soil samples for analysis (at least three sites)
- h. Collection of water samples for analysis

- i. Flora and fauna inventory

C. Analysis of data and information

- a. GIS analysis
 - i. Soil erodibility/susceptibility
 - ii. Rainfall distribution and pattern
 - iii. Vegetative maps
 - iv. Others
- b. Application of analysis/modeling tools
- c. Social and cultural analysis
- d. Economic analysis
- e. Financial analysis
- f. Others

D. Formulation of the IWMP

Describe the importance and show relationships among different activities and processes undertaken to justify decisions and recommendations.

The formulation of IWMP should conform with the annotated outline.

A more detailed descriptions of the methodology used in coming up with the IWMP may be written and could be included as an annex.

5. Main Strategies

Discuss the watershed and ecosystem management approach as a strategy in managing the watershed: that management intervention should be holistic, integrated, and participatory and fully takes into account the well-being of the affected forest communities including IPs, if present.

This section shall present the extent of the remaining forest cover, types and forest categories. It should also reflect how the forest will be managed and protected, potential in restoring forest cover in denuded forestlands as well as the roles and responsibilities of stakeholders in the management of forests and forestlands.

The presentation of any or combination of, but not limited to the following management interventions and strategies be made per sub-watershed basis and in the order of priority.

A. WATER MANAGEMENT

Discuss the potential for maximizing water yield, quality and security (i.e.) for the benefits of the downstream users.

- Measures to restore forest cover
- Land suitability assessment to serve as basis for improved water resource management

Show scope of increased water usage within the watershed area

- Provision of appropriate technologies to the on-site users of the watershed resource

Discuss conflicts of interest over water use between upstream and downstream users within the watershed areas. How can such conflicts be resolved?

- Adherence to water code, clean water act and other related legislation and issuances.

Show scope in improving water use efficiency

- Adoption of water conservation measures
- Establishment of water impounding structures
- Enhancement of springs utilization

Restoration of polluted and silted river systems

B. MANAGEMENT OF VULNERABLE AREAS

- Flood prone areas
- Landslide prone areas
- Erodible areas
- Fire prone areas
- Biodiversity hotspots areas

C. ALLOCATION OF BEST LAND USES

1. Management of Forest and Upland Ecosystems

a. Tenured Areas

Discuss the areas under existing tenure instruments. State whether all tenure instrument holders subscribe to the sustainable management of the forestlands and resources under their stewardship.

Discuss the proposed interventions, documentation of best practices, sustainability strategy, and impacts.

a.1) Protection Areas

State all areas to be placed under protection as mandated under existing rules and regulations, such as areas 1000 meters above sea level, areas 50% in slope and above, wilderness areas, mangrove areas, 20 meters both sides of the river, established buffer zones, identified watershed areas which are initial components of NIPAS, geologically hazardous and vulnerable areas.

Discuss the watershed management interventions to be implemented in areas for protection purposes:

- Forest control and Fire management
- Forest Protection and Law Enforcement
- Infrastructure Development
- Creation of Multi-Sectoral Watershed Management Council
- Soil and water conservation measures
- Rehabilitation/protection of riparian zones
- Conservation of flora and fauna of economic value

a.2) Production areas

Identify areas to be utilized for production purposes. State any, or combination of the following management prescriptions to be implemented in areas for production purposes:

1. Assisted Natural Regeneration
2. Enrichment Planting
3. Agroforestry
4. Tree plantation establishment
5. Industrial Tree Plantations
6. Eco-tourism and recreation
7. Special uses of forestlands
8. Soil and water conservation measures
9. Grazing & pasture development

b. Untenured Areas

Discuss all forestlands without existing tenure instruments to be placed under appropriate management schemes. Indicate any or combination of the following instruments that can be issued in the watershed:

1. Community Based Forest Management Agreement
2. Integrated Forest Management Agreement
3. Socialized Integrated Forest Management Agreement
4. Co-Management Agreement
5. Joint Venture Agreement
6. Co- Production Sharing Agreement
7. Memorandum of Agreement
8. Adopt- a- Mountain
9. Grazing management/ Pasture

2. Management of the Lowland and Urban Ecosystems

Discuss the management practices of the lowland occupants relative to resources, including downstream demand and utility of water and other watershed resources.

3. Management of Freshwater/Coastal or Marine Ecosystems

Discuss the management interventions in the coastal areas to address issues and concerns.

6. Support Activities

a. Information, Education and Communication

Indicate IEC tools to enhance general awareness and appreciation for watershed management concept, principles and practices; and build-up technical capability of all stakeholders and sectors involved in the watershed management. This could be done thru:

- Consultations;
- Workshop;
- Training;
- Brochures, handouts, primers;
- Broadcast media; and
- Cross-watershed visits.

b. Linkaging and Networking

Indicate collaboration strategies and initiatives to be undertaken and adopted with other agencies and offices to ensure successful implementation of the IWMP.

c. Research and Development

Include a comprehensive baseline survey and assessment as an initial activity prior to the start of any kind of development planning and major project interventions.

d. Human Resources Development

Discuss the capacity building strategies for the IWMP and various stakeholders within the watersheds such as trainings, cross visits and study tours.

e. Monitoring & Evaluation (M&E)

Indicate the M&E system to be adopted. The M&E system to be used shall show the progress of project (performance) with regard to the development and management activities and impacts.

Discuss the main development strategies that will gauge the success and failure of the project. Indicate the level of coordination, cooperation and involvement of the different stakeholders in the project implementation.

f. Information and Database Management

Discuss the integrated database building and management system as source of accurate and reliable data and tool for policy and management planning.

g. Reporting

Discuss how the reporting system will be undertaken taking into consideration the analysis on the performance in managing the watershed vis-a-vis the approved integrated management interventions and activities, resources and time frame.

h. Administration and supervision

Discuss the formation of the organization that will implement the management plan, including the organizational functions and responsibilities and the manpower requirement.

7. IWM IPLEMENTATION PLAN

A. Legitimization of the Plan

The Regional Office shall approve the plan. However, this shall be subject to review and affirmation by a Watershed Multisectoral Technical Evaluation Committee (WMTEC) in the Central Office .

The plan may be legitimized for adoption through:

- Resolutions
- MOAs/MOUs
- Any formal arrangement endorsed by the watershed stakeholders

B. Institutional Arrangements

Identify partner government agencies, institutions and organizations, their involvement and commitments in plan implementation, review and updating.

Discuss the roles and responsibilities of each organization

C. Work and Budgetary Requirements

Discuss the different activities to be undertaken, when these will be undertaken, including the resources needed to implement them.

- Long-term (25 years)
- Medium term (5-10 years). Out of the 25 years WFP
- Annual plan or short term plan

8. ANNEXES

The necessary maps indicating proposed management interventions shall be appended. Likewise, the assumptions used shall be attached to serve as bases for monitoring future planning and management activities.