

Technical Bulletin No. 2A

Smart Forest Land Use Planning



June 2018

The Technical Bulletin

This technical bulletin is intended to provide enhancements to Forest Land Use Planning (FLUP) by integrating ecosystem service-based approaches in the planning process. The context, concept and principles of the FLUP remain the same but in addition, highlights the different ecosystem services (ES) derived from forests and forest lands (FFL). This document revises Step 1 (Data and Map Collection), Step 2 (Situational Analysis), and Step 3 (Prioritization of Sub-watersheds and allocation of Forests and Forestlands) of the seven (7) steps of FLU Planning; summarizes the outputs of each step; and describes the activities under each step.

Users of the Technical Bulletin

The users of the Technical Bulletin are personnel of the Department of Environment and Natural Resources (DENR), local government units (LGUs), forest communities and other stakeholders involved in planning, implementing and managing the country's FFL.

Smart Forest Land Use Planning

Forest Land Use Planning is a participatory process of allocating FFLs to bring these natural resource assets under the appropriate management, tenure arrangement and best uses, while harmonizing forest land uses and balancing production activities with forest protection and biodiversity conservation. It is referred to as "Smart" because it considers the impacts of climate change on the production of forest ecosystem services; recognizes the contribution of FFLs to water sustainability, maintenance of biodiversity, natural and cultural features and avoided erosion; reiterates the watershed as the unit of management and decision-making; and allows the quantification and valuation of ecosystem services to guide decisions in allocating forests and forestlands.

The Smart Forest Land Use Plan

The SmartFLUP is a document developed by the LGU in partnership with DENR and other stakeholders to ensure the sustainable management of forests and forestlands and ensure optimal production of forest ecosystem services. Forest land use planning is an integral activity of comprehensive land use planning to determine the optimum and balanced used of natural resources to support local, regional and national growth and development¹.

¹ Manual of Procedures for DENR-DILG-LGU Partnership on Devolved and Other Forest Management Functions

Importance of the SmartFLUP

The SmartFLUP provides the LGU, together with the DENR and stakeholders, a roadmap through which it can manage forests and forestlands within its jurisdiction, within the context of sustainable forest management, biodiversity management, climate change adaptation, disaster risk reduction and management, and the reduction of emissions from deforestation and forest degradation. The SmartFLUP facilitates the harmonized management of protected areas and ancestral domains/lands within FFL, and the integrated management of ecosystems.

Guiding Principles of the SmartFLUP

- a. The SmartFLUP covers all FFL within the territorial jurisdiction of a city/municipality regardless of tenure.
- b. The SmartFLUP embraces the watershed as the unit of management.
- c. All other plans required by tenure agreements shall be aligned to the SmartFLUP.
- d. The contribution of FFL in terms of ecosystem goods and services is recognized and the values thereof will guide decisions in allocating FFL.
- e. SmartFLUP is an instrument for collaboration among local and national government units and other stakeholders. It is not an instrument for boundary conflict resolution.

Purpose of the SmartFLUP

The purpose of the SmartFLUP is to recommend the best uses of FFL through a participatory and consensus-building approach. It provides the basis to allocate FFL among sustainable uses, identify appropriate management and tenure arrangements, and assign these to qualified and responsible stewards or managers with established responsibilities.

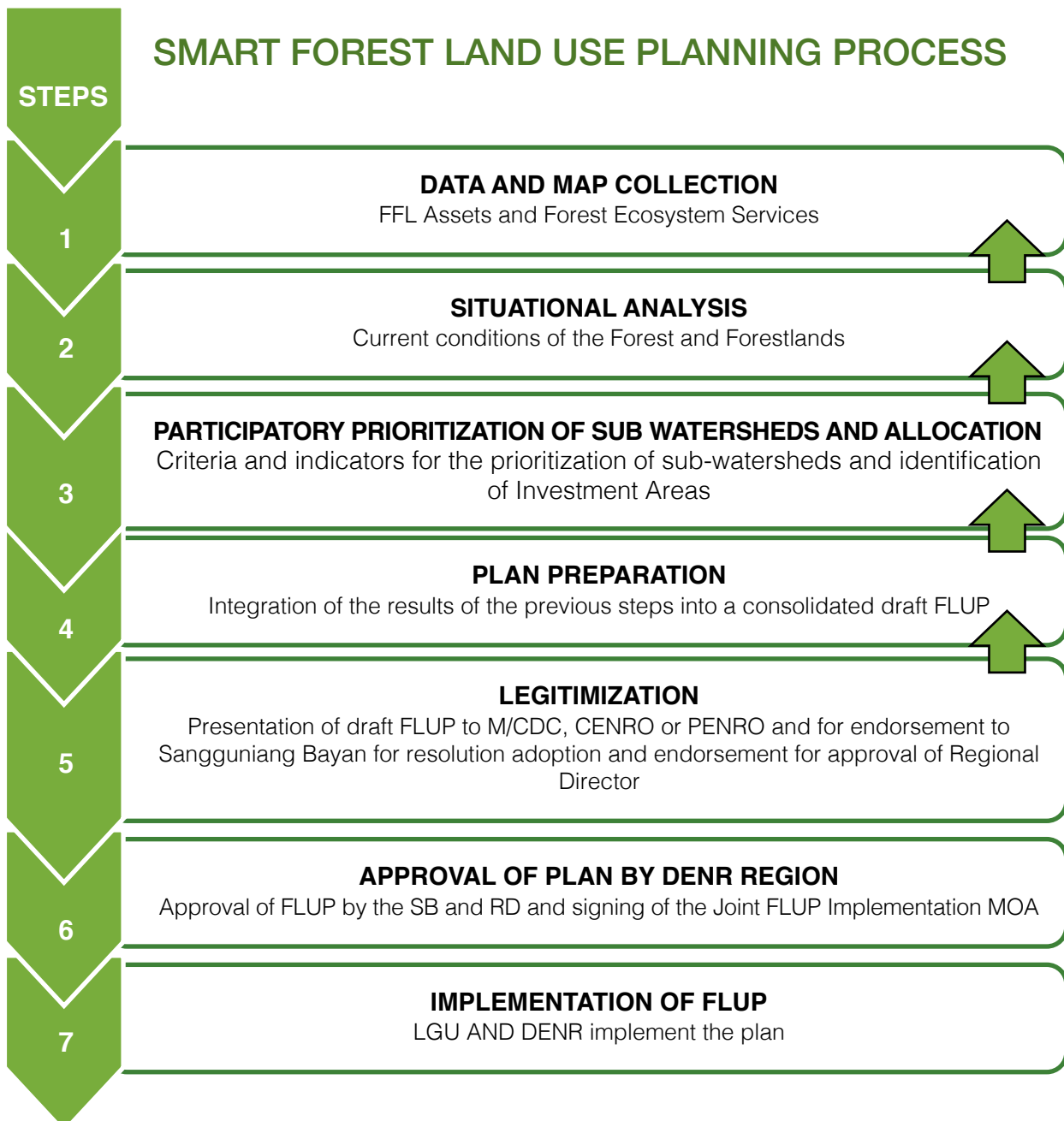
Proposed Composition of the City/Municipal Technical Working Group

A city/municipal technical working group (C/MTWG) shall be created to facilitate the preparation of the FLUP. The C/MTWG will be chaired by the Mayor with the following members if applicable: City/Municipal Planning and Development Coordinator (PDC), City/Municipal Environment and Natural Resources Officer (ENRO), City/Municipal Agriculturist, SB Environment, ABC President, and representatives from the DENR (CENRO, PENRO and Regional Office), NCIP, BFAR, DAR, non-government offices, civil society, and people's organizations.

Steps and Procedures

The seven (7) major steps of SmartFLUP are shown in Figure 1. The activities under these steps shall be undertaken in a participatory manner to reflect the needs, values and aspirations of the stakeholders and society.

Figure 1: Steps of Smart Forest Land Use Planning (SmartFLUP)



STEP 1: DATA AND MAP COLLECTION

A. Assessment of Data Needs

The MTWG will assess the availability and sources of the data needed in SmartFLUP formulation. Accordingly, the assessment will help determine the data gaps to be addressed. The checklist of requirements enumerated in Table 1 may be referred to during the data gathering. The MTWG may enhance the checklist if it finds new and relevant data.

Table 1: Checklist of Requirements

Requirements	Data and Information
1. Background Information	<ul style="list-style-type: none"> • Brief history of municipality • Location, area and accessibility • Relation to a larger watershed (river basin, sub-watersheds that encompass the LGU, upstream and downstream uses and users) • Previous and current resource-extractive (logging, mining, quarrying, etc) activities in the area • Climate • Topography and slope • Land cover and land use • Strategic importance of the municipality
2. Land classification	<ul style="list-style-type: none"> • Alienable and disposable lands • Forest lands • Mineral lands • National park
3. FFL Assets (refer to Table 4 of FLUP Training Guide)	<ul style="list-style-type: none"> • Current status of the following land resources: <ol style="list-style-type: none"> a. Natural forests (area of closed canopy, open canopy, marginal forests and mangroves for at least two time periods) b. Plantations and orchards c. Water bodies and watersheds (rivers and uses; watersheds/micro watersheds and service areas) d. Biodiversity (rare/endemic, endangered species) e. Resources related to nature tourism including plans (caves, waterfalls, lakes, etc) f. Minerals • FFL-related programs
4. Tenure/Management Arrangements including tenure holders and forest occupants	<p>These include:</p> <ul style="list-style-type: none"> • all tenure instruments within FFL (IFMA, SIFMA, GBFMA, FLGMA, FLAg, FLAgT, SLUP, TLA, TFLA, CSCs, PACBRMA, MPSA, etc) • CADC/CADT • Other management arrangements (Protected Area, proclamations, communal forest, etc.)

Requirements	Data and Information
5. Physical features/ characteristics	These include: <ul style="list-style-type: none"> • slope • elevation • geological hazards • soil
6. Key stakeholders	Profile of the population <ul style="list-style-type: none"> • Barangay residents <ul style="list-style-type: none"> • Upland • Lowland/coastal • Indigenous cultural communities • Private sector • Forest occupants (with and without tenure)
7. Water users	These include: <ul style="list-style-type: none"> • Irrigators • Water districts • Domestic water consumers • reservoir dams (power and irrigation) • Navigators • Transient water users
8. Forest-based industries	These include: <ul style="list-style-type: none"> • Furniture makers • Wood processors • Handicrafts • Non-Timber Forest Products
9. Income and income sources (economic activities, including specific livelihoods aimed at improving women's economic status)	<ul style="list-style-type: none"> • Social services and infrastructure • Dependence on forest lands for food, water, wood, and NTFP etc. (e.g. charcoal-making)

Requirements	Data and Information
10. The institutional arrangements and how they participate and work together in managing the FFL	Role and responsibilities of: <ul style="list-style-type: none"> • Barangay, municipal and provincial LGUs (Internal Revenue Allotment or IRA, manpower/Municipal Environment and Natural Resources Office or MENRO, MPDC, budget, projects, etc.) • DENR (manpower, budget, projects, etc.) • NCIP (manpower, budget, projects, etc.) • Other institutions working in or dependent on the forest lands such as non-government organizations (NGOs), furniture makers • People's organizations • Indigenous Cultural Communities (ICCs) • Private sector • Academe and research institutions • Religious groups • Water utilities • Department of National Defense (e.g. Military reservations) • Government Owned and Controlled Corporations (GOCCs)
11. Sources of renewable energy (actual and planned)	These include: <ul style="list-style-type: none"> • geothermal • biomass • solar • hydroelectric • wind • biogas recovery
12. Relevant Plans and Reports	These include CDMP, CRMF, Tourism Development Plan, Protected area management plan, ADSDPP, River Basin Masterplan, etc.

B. Creation and Tasks of SmartFLUP Data Gathering Team

At least two SmartFLUP Data Gathering Teams should be organized: a) mapping team; and b) community profiling and IEC team. The teams may comprise members of the TWG, representatives from the DENR, other units/offices of the LGU (for the data gathering teams at the municipal level); and members of the barangay development council (for the barangay level data gathering teams).

The municipal mapping team initially collects available thematic maps at the offices of the DENR, LGU, NCIP and other agencies. The community mapping team, comprising barangay representatives and facilitators, with technical assistance from the DENR, conducts a reconnaissance survey of the area to be mapped. The mapping team can refer to the Mapping Guidebook (<http://forestry.denr.gov.ph/pdf/ref/mapping-guidebook.pdf>) for details of mapping procedures and standards.

The community IEC and profiling team conducts IEC on forest land use planning in the municipality and its barangays particularly in upland areas. The community IEC team undergoes training on IEC and formulates presentation materials for the community to emphasize the importance of FLUP in promoting effective management of the community's FFL and the roles of community members and other stakeholders in the formulation of FLUP. The community profiling team gathers secondary data such as the basic socio-economic and cultural data from appropriate offices of the LGU and other national agencies. For guidance on community profiling, the team may refer to the FLUP data collection guide in Annex A of the FLUP Training Guide.

C. Gathering, Updating and Validating Existing Thematic Maps and Reports

Updated and validated thematic maps and reports are significant in establishing reliable baseline data for sound and informed planning and decision-making. It presents the existing conditions of FFL and trends in their uses as influenced by activities of the different stakeholders.

Preparation of thematic maps for FLUP

Thematic Maps to be collected include land classification, administrative (identification of lowland and upland barangays, BMIS), watershed hydrology and meteorology, climate change/disaster risk reduction (hazard, erosion), biodiversity, land cover, forest cover, land use, slope and elevation, soil, tenure allocation and natural features. These maps shall be gathered, organized, validated and corrected with the aid of various stakeholders. An initial POI map (Map showing Point or Polygon of Interest and/or Issues) may be prepared to show the key map themes as listed in Box 1 in one map. These map themes may include the following: LGU boundary down to barangays, land classification, road network, drainage network and sub-watersheds. The POI Map will be useful in subsequent steps (Step 2 and 3).

Quantitative Data from Thematic Maps

Quantitative data can be generated from the overlaying of Thematic Maps. The following data can be used to show the current status or condition of a specific area of concern that is essential for a sound, and informed planning and decision-making. The MTWG may add relevant data if necessary.

1. Area and Location of FFL per administrative and sub-watershed boundary
2. Number of households that fall within FFL
3. Number and location of households and infrastructure that are within or near geologic hazards
4. Number and location of households and infrastructure that are vulnerable to the impacts of climate change/disasters/hazards
5. Location and density of endangered and threatened flora and fauna
6. Number and total area of Tenure and Forestry Projects

7. Distribution of areas of thematic maps within administrative and sub-watershed boundaries
8. Others

Table 2 describes the thematic maps needed, description and sources. Maps may be obtained mainly from the local government units (LGUs), DENR, National Mapping and Resource Information Authority (NAMRIA), the Department of Agriculture (DA), Department of Agrarian Reform (DAR), Department of Science and Technology (DOST), Department of Public Works and Highways (DPWH), Bureau of Fisheries and Aquatic Resources (BFAR), Bureau of Soils and Water Management (BSWM), and the Mines and Geosciences Bureau (MGB).

Table 2: Checklist of Thematic Maps needed for FLUP

No.	Thematic Maps	Description	Source
1	Land classification map	Shows the location of timberland, agricultural land (alienable and disposable land).	NAMRIA, DENR
2	Administrative map	Shows the location of barangays and sitios and identifies the lowland, upland and coastal barangays.	LGU-BMIS, DENR-LMB
3	Watershed and drainage map (hydrology and meteorology)	Shows the watershed divide; Shows the rivers and creeks and the amount of water coming out of the rivers/creeks.	LGU-BMIS, DENR-LMB
4	Climate change/ disaster risk reduction (hazard, erosion)	Shows the area affected by climate change for disaster risk reduction.	PHIVOLCS, DENR-MGB, PAGASA
5	Biodiversity map	Shows the location of threatened and endangered flora and fauna.	DENR-BMB
6	Vegetative cover/ forest cover map	Old-growth forest; Second-growth forest (open and closed canopy forests), plantation, agricultural areas, etc.	DENR, to be updated through community mapping
7	Land use map	Shows agroforestry, built up, cultivation areas, etc.	Comprehensive Land Use Plans, field validation, DA-BFAR, NAMRIA
8	Slope map	Slope classification: 0-3%, 3%- 8%, 8%-18%, 18%-30%,30%-50%, and above 50%.	BSWM, DENR, NAMRIA

No.	Thematic Maps	Description	Source
9	Elevation map	100 masl interval.	DENR, NAMRIA
10	Soil map	Shows all the soil classification/type and its extent.	BSWM
11	Tenure map	Shows the areas with CSCs, CBFMA, land grant, protected area, special agreements and other tenure instruments.	DENR, DAR, DA-BFAR, MGB, FMB, BMB
12	Infrastructure map	Shows the bridges, road network, communal irrigation system, power distribution systems, schools, hospitals, ports, dams, power generation projects including biomass and other infrastructures.	LGU-BMIS, DPWH, DOE, NIA, DA
13	Settlement/ barangay map	Shows the population density/distribution by barangay, and areas of settlements; location of sitios.	PSA, LGU-BMIS, barangays concerned, to be updated from community mapping
14	Geological hazard & risk map	Location of geological hazards (e.g. volcanoes) , faults, land slips, areas of liquefaction, highly erodible areas.	
15	Conflicts/issues map	Shows the location of existing and emerging conflicts in land use allocation plus other issues and concerns related to forest management (e.g. overlapping tenures/claim, identified boundary conflicts, location of new and old kaingin, location of cutting areas).	To be generated from map overlay analysis and community mapping, DA-BFAR, DENR
16	Forestry projects map	Shows forestry related development interventions by various agencies (e.g. reforestation projects).	Project documents
17	Mineral map, if any	Shows location of Mineral Production Sharing Agreements (MPSA), exploration permits, Financial or Technical Assistance Agreements, and mining claims.	DENR-MGB, LGU

No.	Thematic Maps	Description	Source
18	Points of Interest/ Issues (POI) Map	Shows the areas of interests and issues as identified by stakeholders.	To be derived during consultation with stakeholders
19	Ancestral domain claim or title	Shows the location and extent of land of Indigenous People.	NCIP

Other thematic maps that are not included in the list can be added if necessary. The checklist will only serve as basis in data collection.

Box 1. Expected Outputs for Step 1

Updated and validated socio-economic and cultural information on the concerned municipality enumerated below:

- Validated thematic maps.
- Status of FFL assets and their uses.
- Users of FFL or the stakeholders.
- Inventory of existing and planned development projects within the FFL; (e.g. Dams, irrigation system, reforestation, ecotourism area, infra projects, power generation projects including biomass).
- Institutional arrangements including their responsibilities in the management of FFL assets.
- Issues, problems, and threats affecting resource assets and opportunities or potential for development.
- Map showing points or polygons of interest and/or issues (POI Map).

STEP 2: SITUATIONAL ANALYSIS

The situational analysis phase builds on the results of Step 1 (Data and Map Collection). It provides preliminary findings on the current conditions of the FFL. The methods described below should be considered:

2.1 Map Overlay Analysis

Map overlays generate cross-tabulated information by barangay and sub-watershed that are used by the TWG to evaluate the overall picture of the FFL. Through map overlay analysis, simplified simulation techniques and other tools, current conditions and recent trends in FFL are generated. In addition, the conflicting and complementary interests and claims among stakeholders on the use of FFL are identified.

The results of the analysis are used during the plan preparation phase (Step 4) where stakeholders decide on the technical, organizational and financial strategies in consideration of the prioritized sub-watersheds, zoning and allocations (Step 3).

2.2 Conduct of Situational Analysis

2.2.1 Determining extent, locations and management arrangements of FFL Assets (see table 4 of FLUP Training Guide)

It also involves identification of the extent (in hectares) of untenured areas in FFL, improperly managed tenured areas and institutional gaps in the management of FFL, using GIS analysis. Watersheds shall be used as unit of analysis and planning to demonstrate the relationships of FFL with respect to the other ecosystems following the ridge to reef framework.

2.2.2 Ecosystem Services (ES) Modeling and Valuation

Ecosystem services are the contribution of ecosystems to benefits used in economic and other human activities (SEEA Central Framework, 2012). ES modeling and valuation for the current state of the FFL (business-as-usual scenario) will be undertaken. ES modeling involves combining spatial datasets (thematic maps and remote sensing images) to estimate ecosystem services capacity. ES valuation involves estimating monetary values of the services that can be derived from the FFL.

2.2.2.1 Identification of ES

Significant ecosystem services (provisioning, regulating and cultural) within the FFL will be identified through scoping activities like the forest use analysis. Forest use analysis can be conducted using the PROFOR Poverty-Forests Linkages Toolkit (see link: <http://www.profor.info/content/poverty-forests-linkages-toolkit-0>), which provides a set of fieldwork methods and analytical tools based on participatory assessment.

Examples of ecosystem services that can be modeled and valued are presented in Table 3 below:

Table 3: Examples of Ecosystem Services that can be modeled and valued

Ecosystem Service	Description
Water Regulation	Regulate water supply (based on irrigable area)
Water Provision	Supply of water: domestic water use by households
Sediment Control	Reduce sediment load in waterways
Erosion Control	Avoided soil erosion
Timber Provision	Supply of timber traded in market or for subsistence
Carbon Sequestration	Average amount of carbon sequestered of standing forests per year

2.2.2.2 Quantification of ES

ES modeling results will provide the quantities of ES identified in Item 2.2.2.1 (e.g. total water yield, sediment retention capacity, avoided floodwater, additional irrigable area, etc.). Landscape simulations can also be developed to assess ecosystem services under

different land cover extent and spatial arrangements within the FFL (e.g. forested, bare, business-as-usual, and desired forest management scenarios etc.). These simulations do not advocate a land development trajectory, but can instead be used to illustrate the impact of changes in forests (extent and location) on ecosystem services, and the potential effects of these changes on watershed resilience (see ES Technical Guidelines).

2.2.2.3 Valuation of ES

ES values provide estimates of the monetary values of the benefits derived by society from FFL. If valuation will be undertaken in the context of the System of Environmental and Economic Accounting (SEEA 2012), then the exchange value concept should be used. This “entails obtaining valuations of ecosystem services and assets that are consistent with values that would have been obtained if a market for the ecosystem services or assets had existed”. Examples of valuation approaches that may be used are market prices, market price equivalents (proxy market prices) unit resource rent, replacement cost, cost of treatment, damage cost avoided, and the production function approach.

2.2.3 Identification of trends and changes in key FFL Areas

Trends and changes in key FFL areas can be determined by reviewing existing descriptive statistics, and comparing vegetative and forest cover maps using GIS analysis. These information can also be verified through the conduct of key informant interviews and focus group discussions among stakeholders (see Module 3 of TG 3.4 Trends/Changes in Key FFL Assets).

2.2.4 Valuation and enhancement of POI Map

A POI Map is a map showing point locations or areas (i.e. polygons) that are of interest or issue/conflict (for example, water spring, nesting area, mother tree, cave, waterfall, site of collection of NTFP, burial site, kaingin, poaching, encroachment, conversion). The validation and enhancement of the POI Map will be done through community mapping followed by digitizing to produce the enhanced POI map incorporating ES such as biodiversity, hydrological, economic, ecotourism or aesthetic, infrastructural and cultural values (see procedure on GIS overlay of the Mapping Guide) .

2.2.5 Identification of threats to FFL Areas (e.g tenured area that have been cancelled, terminated or abandoned)

Based on the results of map overlays and considering the current trends and changes in FFL areas, threats to proper use of FFL areas and appropriate management interventions or strategies are identified and recommended.

2.2.6 Opportunities for improved forest management

Opportunities for improving management of FFL such as potential areas for expansion of rehabilitation, investment, payment for ecosystem services etc., are to be elaborated based on the results of SWOT analysis.

2.2.7 Zoning FFL into Production and Protection Areas (PPAs)

Production areas are lands designated for producing commercial wood, agroforestry goods and services, grazing lands, and other special forest land uses. Protected areas on the other hand are lands classified as national parks/areas covered by NIPAS law, forest reservations, proclaimed water reservations and old growth forests (see Module 3 of TG 3.7).

The steps involved in the zoning of FFL into Production and Protection Areas are as follows:

- Primary and Secondary Data Acquisition
- Data Integration, Overlays and Analysis
- Preliminary Indicative Mapping
- Field Validation and Verification
- Consultation/Review and Approval by the FLUP Regional Technical Working Group (RTWG)
- Consolidation and Finalization of the Production and Protection Map FLUP Regional Technical Working Group (RTWG)
- Editing and Final Mapping

Zoning of FFL is crucial in providing appropriate management interventions.

2.2.8 Stakeholder Analysis (see Module 3 of TG)

A systematic process of identifying the key individuals, groups, organizations and sectors who have significant/legitimate interests in specific forestlands. Stakeholders comprise those who make, influence, and affected by decisions.

2.2.9 Institutional Analysis (see Module 3 Table 7 of TG)

Identification of stakeholders and institutions involved in the management of FFL by virtue of their mandates and interests in FFL. It gives an indication of their capabilities for their involvement for FFL management.

Box 2. Expected Outputs for Step 2

- Map showing extent, location and management arrangement of FFL assets.
- ES quantities and values.
- Current situation and recent trends in FFL (in map and/or tables).
- Relationship of FFL with other ecosystems using the ridge to reef approach.
- Map showing threats to FFL areas including improperly-managed or abandoned allocated FFL.
- Identified opportunities to improve FM of areas under threat.
- Map showing PPAs.
- Stakeholder and Institutional assessment matrix.
- Conflicting and complementary interests among stakeholders in FFL.
- Institutional gaps in the management of FFL.
- Enhanced POI map.

STEP 3: PARTICIPATORY PRIORITIZATION OF SUB-WATERSHED AND ALLOCATION OF FFL

This step provides the opportunity to identify the sub-watersheds affecting the LGU. The objective of this step is to consolidate information to be used in criteria-based prioritization of sub-watersheds and investment areas. After identifying priority investment areas that produce ES, maps showing the proposed allocation of FFL are prepared and presented including the prescribed uses of FFL. The criteria and indicators identified should be reflected in the LGU's vision, mission, goals and objectives in the management of FFL.

Figure 2: Workflow of Prioritization of Sub-watersheds and Allocation of Forest and Forest Lands



3.1. Initial LGU vision and mission statement

An initial statement on the vision and mission of the LGUs in the management of FFL is presented. This should be anchored on the LGU's Vision and Mission statement (see module 6 of FLUP Training Guide).

3.2. Finalization of sub-watersheds that affect the LGU

This allows the LGU to appreciate the sub-watershed boundary vis-à-vis the barangay boundary using the POI map (may result in the aggregation/disaggregation of sub-watersheds). For modeling purposes, it may be better to merge smaller-sized (less than 5,000 ha) sub-watersheds draining to a common major river.

3.3. Comparative analysis and prioritization of sub-watersheds for investments

The information to be used in criteria-based prioritization of sub-watersheds and

investment areas are consolidated in this step. This step should also help to justify why there is need to prioritize watersheds.

Criteria define the essential elements against which sustainability is assessed, with due consideration paid to the productive, protective and social roles of forests and forest ecosystems. Each criterion relates to a key element of sustainability, and may be described by one or more indicators (see Box 3).

Indicators are parameters which can be measured and correspond to a particular criterion. They measure and help monitor the status and changes of forests in quantitative, qualitative and descriptive terms that reflect forest values as seen by those who defined each criterion. Table 4 provides sample criteria and indicators for prioritizing sub-watersheds, while Table 5 provides a sample decision matrix with the computed point scores for various criteria.

3.4. Zoning of FFL and Allocation of FFL using Decision Matrix

The zoning of FFL is discussed in Section 2.2.7 of this document. Management interventions or strategies (reference Section 2.5) include zoning the FFL to identify production and protection zones, allocation of areas without management agreement and sub-watershed prioritization. Allocation of FFL is expected to produce initial allocation plan for FFL based on the agreed sets of criteria. The zoning map derived from Step 2 will be used as one of the basis in allocating FFL.

An example of a POI matrix is shown in Table 6. This matrix was derived from the POI Map where the issues and points of interest are tabulated by barangay and sub-watershed. Thus, decisions on the allocation of FFL is facilitated considering the presence of important features or the significance of the problems occurring in the area.

Box 3. Sample Criteria for Prioritization of Sub-watersheds

- Biodiversity value of a sub-watershed, may consist of the extent of natural forest cover by sub-watershed and the presence of rare/threatened species.
- Hydrological value can be measured by the irrigation service areas per sub-watershed (within and outside the municipality), number and density of irrigation and domestic water infrastructures by sub-watershed, number of families benefited by irrigation and domestic water facilities per watershed, potential for irrigation/power generation, annual water volume, groundwater yield, and monetary value of water provisioning service.
- Economic Production value can refer to the extent of agricultural areas per sub-watershed, area of A&D by sub-watershed, extent of residual forests in production areas, and existing and potential production areas per sub-watershed.
- Protection potential to infrastructure, lives and properties refers to the number and density of each infrastructure per watershed, and to the population and density by sub-watershed and settlement density per watershed. It can also be measured by stream and hillslope erosion, and monetary value of erosion control service.
- Nature-based Tourism/Aesthetic value accounts for the number of existing and potential sites for tourism and nature-based attraction by sub-watershed.
- Historical and Cultural Value can refer to the presence of Indigenous Cultural Communities, cultural heritage sites, and Indigenous Knowledge Systems and Practices.

Table 4: Sample Criteria and Indicators for Prioritizing Sub-watersheds

CRITERIA/INDICATORS	Unit	SUB-WATERSHED (SW)					
		%	SW1	SW2	SW3	SW4	SW5
		Weight of Criterion	Ranking of SW per Criterion	Ranking of SW per Criterion	Ranking of SW per Criterion	Ranking of SW per Criterion	Ranking of SW per Criterion
A. BIODIVERSITY VALUE							
1. Total natural forests within protection zone	hectares						
Closed Canopy	hectares						
Open Canopy	hectares						
Mangrove	hectares						
(Sub-Marginal)	hectares						
2. Presence of endangered species (Flora and Fauna)	number						
3. Presence of endemic species (Flora and Fauna)	number						
TOTAL							
B. HYDROLOGICAL VALUE							
1. Irrigation service areas	hectares						
2. Number of water irrigation & domestic water infrastructure	number						
3. Areas planned to be developed for irrigation, power and domestic water supply	number						
4. Number of HH benefited	number						
By irrigation facilities	number						
By domestic water infrastructures	number						
By deep well, spring	number						
By water pump	number						
5. Annual Water Volume	cu m/yr						
6. Monetary value of water provision service	Php/hh/yr						

7. Ground water yield	cu m/yr						
TOTAL							
C. ECONOMIC VALUE							
1. Production areas within forestland	hectares						
2. Alienable and Disposable Lands	hectares						
3. Plantations in production zones	hectares						
4. Forests in A&D lands and production zones	hectares						
5. Plantations in A&D lands and production zones	hectares						
6. Cultivated areas within FL	hectares						
TOTAL							
D. ECOTOURISM/ AESTHETIC VALUE							
1. Number of nature-based tourism sites							
Existing	number						
Emerging/Potential	number						
2. Tourist arrival	number						
3. Gross Revenue	amount						
TOTAL							
E. PROTECTION POTENTIAL TO INFRASTRUCTURE, LIVES AND PROPERTIES							
1. Frequently flooded areas	hectares						
a. Estimated population affected by flooding	number						
b. Bridges which may be damaged by flooding	number						
2. Landslide prone areas	hectares						
a. Estimated population affected by landslide	number						

b. Average Hillslope Erosion service	tons/yr						
c. Monetary value of hillslope erosion service	Php/yr						
d. Bridges which may be damaged by landslide	number						
3. Settlement density	no/ha						
4. Stream Erosion	tons/yr						
a. Monetary value of stream erosion service	Php/yr						
5. Road density	kms/ha						
TOTAL							
F. HISTORICAL AND CULTURAL VALUES							
1. ICCs							
a. Diversity of ICCs	number						
b. Ancestral domain	hectares						
2. Cultural heritage sites							
a. Pilgrim Areas (Century Old Churches/religious sites/museums)	number						
3. Sources of Indigenous Knowledge Systems and Practices							
a. Indigenous culture bearers	number						
b. Indigenous Knowledge Systems and Practices (IKSP) documented	number						
TOTAL							

Table 5: Sample Decision Matrix with Computed Point Scores

CRITERIA/INDICATORS	SUB-WATERSHED					
	%	SW1	SW2	SW3	SW4	SW5
A. BIODIVERSITY VALUE	22	17.60	13.20	4.40	22.00	8.80
		4	3	2	5	1

B. HYDROLOGICAL VALUE	22	13.20	4.40	22.00	22.00	17.60
		3	1	5	2	4
C. ECONOMIC VALUE	18	3.60	18.00	7.20	14.40	10.80
		1	5	2	4	3
D. ECOTOURISM/AESTHETIC VALUE	8	8.00	3.20	6.40	4.80	1.60
		5	2	4	3	1
E. PROTECTION OF INFRASTRUCTURE, LIVES AND PROPERTIES	17	6.80	13.60	10.20	3.40	17.00
		2	4	3	1	5
F. HISTORICAL AND CULTURAL VALUES	13	10.40	7.80	2.60	13.00	5.20
		4	3	1	5	2
TOTAL	100	59.60	60.20	52.80	79.60	61.00
Sub-watershed Ranking		4th	3rd	5th	1st	2nd

Table 6: Sample POI matrix

Sub-watershed	Barangays (nearby or within)	Point of Issue	Point of Interest
SW1	Barangay 1, 2 ...n	Illegal Cutting of Trees; Regulating (Soil Erosion); Landslide	Cultural (Ecotourism); Flying Foxes, Butterfly Garden, Campsite; Provision (Timber&NTPF); Tiger Grass Source; Production Field; Pili Plantation, Fish Pens
SW2	Barangay 1, 2 ...n	Regulating/Soil Erosion; Landslide; Sanitary Land Fill (existing and proposed) Closed Dump Site	Cultural (Ecotourism); Suhi Spring; Provision (NTPF); Production of Coconut
SW3	Barangay 1, 2 ...n	Regulating (Sediment); Siltation; encroachment Area; Illegal Quarrying; Degradation of Marine habitat; Regulating (Stream Flow); Conflicting Water Use Provisioning; Illegal Fishing	Provision (Timber&NTPF) ; Abaca, Pili Plantation, Century Old Tree, Pump Prime Water SW; Regulating (Streamflow); Sunwest Hydro Plant, kawayan tinik plantation (for River Stabilization and Livelihood); Community Fish Processing Center; Cultural (Ecotourism); Bucalbucalan Cold Spring

3.5 Finalization of LGU vision, mission, goals and objectives

The vision, mission, goals and objectives are finalized considering information from the previous sub-activities in Step 3. Goals should reflect the set of criteria; Objectives of each goal, and succeeding activities should reflect the indicators per criterion. The Investment Plan that will be prepared under Step 4, should be based on the LGU's Goals and Objectives

Box 4. Expected Outputs for Step 3

- Final list of sub-watersheds that affect LGU
- Prioritized sub-watersheds and investment areas
- Map showing the proposed allocation of FFL (areas without management agreements and tenured areas that are improperly managed and abandoned)
- Prescribed uses for FFL
- LGU vision, mission, goals and objectives in the management of FFL

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