



FOREST LAND USE PLAN OF DAVAO DEL NORTE

2018-2023

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INTRODUCTION

Context and Rationale

The Davao del Norte Forest Land Use Plan is a framework plan formulated to guide the development and management of the forest and forestland of the province. This five-year plan outlines the overall direction and broad management options and strategies the province will take to drive sustainable growth. As a rational spatial plan it aspires to inform both public and private investment decisions and priorities. As a planning tool, it aims to coordinate and guide the preparation of future; more detailed local forestland use plans.

The aspiration of the Province pertaining to the environment is encapsulated in its Vision:

A premier province producing export quality agricultural products that are globally competitive with climate-change adaptive and risk resilient communities, social equity, improved quality of life under a transparent and responsive governance.

The goal of improving the quality of life of Dabawnons puts the environment and natural resource management on top of the development agenda, especially with the growing clamour to respond to climate change as well as disaster risk impacts. This Provincial FLUP is also a product of the prime thrust in the BEST PEOPLE Development Agenda - Balanced Ecology. It supports the goal of the provincial government to build a better future for the next generations by sustaining significant interventions and engaging the community in managing our forest, watershed areas, coastal marine ecosystems, as well as, the urban landscape.

Scope, Limitations and Assumptions

The preparation of this FLUP is primarily focused on the forests and forestlands in the locality. Specifically, the plan:

1. **Covers a planning period of five-years.** Plan will be reviewed every two-years to ensure responsiveness.
2. **Used watershed as the primary planning unit.** It covers all ecosystem assets within the horizontal and vertical influence of the watershed landscape within the province's political boundary.
3. **Used secondary data from the LGUs, national and local agencies released not more than 5-6 years.** Except for analysis of trends along a longer period of time, all secondary data used in this FLUP are the most recent and updated as a guarantee that the basis for analysis is

relevant and still applicable. The SEEP 2016 is one of the primary sources of data. Specific data on FFL are consolidation from municipal FLUP gathered through **community profiling and mapping**. Most primary data were gathered and validated through a series of stakeholders consultation activities. Meanwhile, the maps were generated by GIS specialists in the municipality using the Manifold System assisted by the Provincial-TWG member. For LGUs still in the process of FLUP formulation, data were provided by the local TWG through the multi-sectoral consultation workshop.

4. **Is an elaboration of the Forestry/Protected Areas Sector of the Provincial Development and Physical Framework Plan.** The plan provides a framework for the proper allocations of forestlands and the proposed actions necessary to efficiently and effectively manage allocated forest and increase forest cover in the Province of Davao del Norte. It also includes the recommendations and strategies in addressing current problems and issues in forestlands.
5. **Complements with the ADSDPP and other spatial and sectoral plans of the cities, municipalities, province and region.** During the planning process, existing plans such as the Regional Development Plan, Tagum-Libuganaon Riverbasin Master Plan and Provincial Development and Physical Framework Plan were always referred to and consulted to ensure that this FLUP is consistent with these plans.
6. **Does not cover portions of the watersheds which extends beyond the province's political boundary.** These are watersheds shared by adjoining provinces who also need to produce their own municipal/provincial level FLUPs

Methodology

The formulation of the Provincial Forest Land Use Plan is anchored in the principle of transparent, accountable and participatory environmental governance. The formulation is a five-step process with stakeholder's participation at its core. The major processes and its corresponding output is summarized in Figure 1.

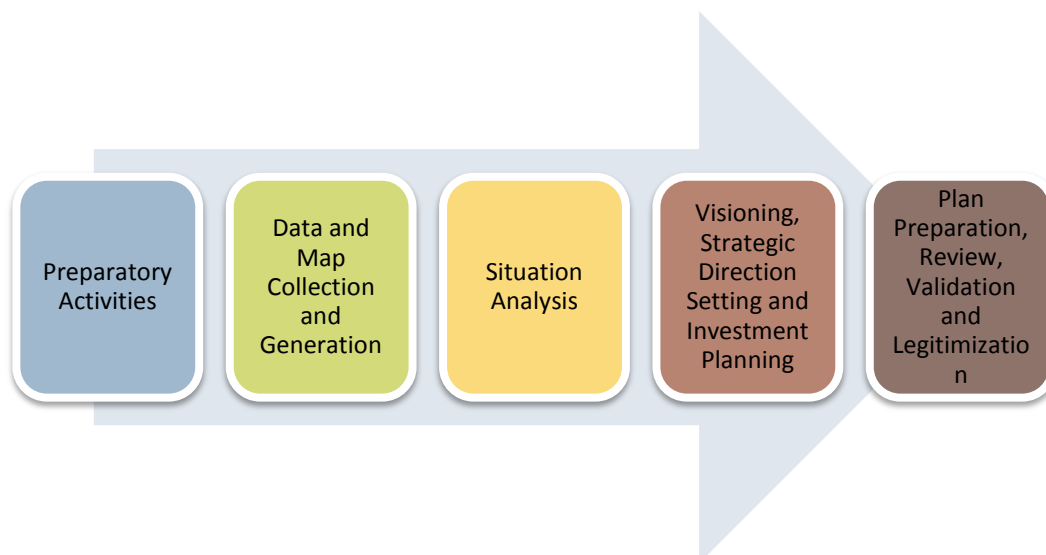


Figure 1. FLUP Methodology

The formulation of the FLUP took off with the creation of a multi-stakeholder technical working group (FLUP-TWG). The FLUP-TWG is composed of technical personnel from varying offices with specialized skills relevant to forest management (Annex 1).

The FLUP-TWG has adopted a landscape and integrated approach in planning. Considering the highly spatial nature of FLUP, GIS mapping is the foundation of its information gathering activity. Preparation, validation and revision of thematic and composite maps and map overlays analysis were conducted in consultation with various stakeholders. Prior to this, the GIS-Team of the Province has conducted a series of GIS trainings to equip the local government units with the skills in data collection and mapping.

Upon completion of all data, the FLUP-TWG facilitated a multi-stakeholders consultation workshop to validate data gathered from the communities and local government units and gather recommendations for the allocation and management of the FFL. Once finalized, a draft FLUP was submitted for legitimization.

Provincial Forest and Forestland Profile

Location and accessibility

Davao del Norte is strategically located at the southeastern part of Region XI, bounded by Agusan del Sur on the North, Bukidnon on the Northwest, Davao City on the West, Davao Gulf on the South and the Province of Compostela Valley on the East.

The external linkages of the province are mainly land-based. The major external linkages consist of national roads connecting Davao del Norte to adjacent provinces of Compostela Valley, Bukidnon, Agusan del Sur, Davao Oriental and to the City of Davao.

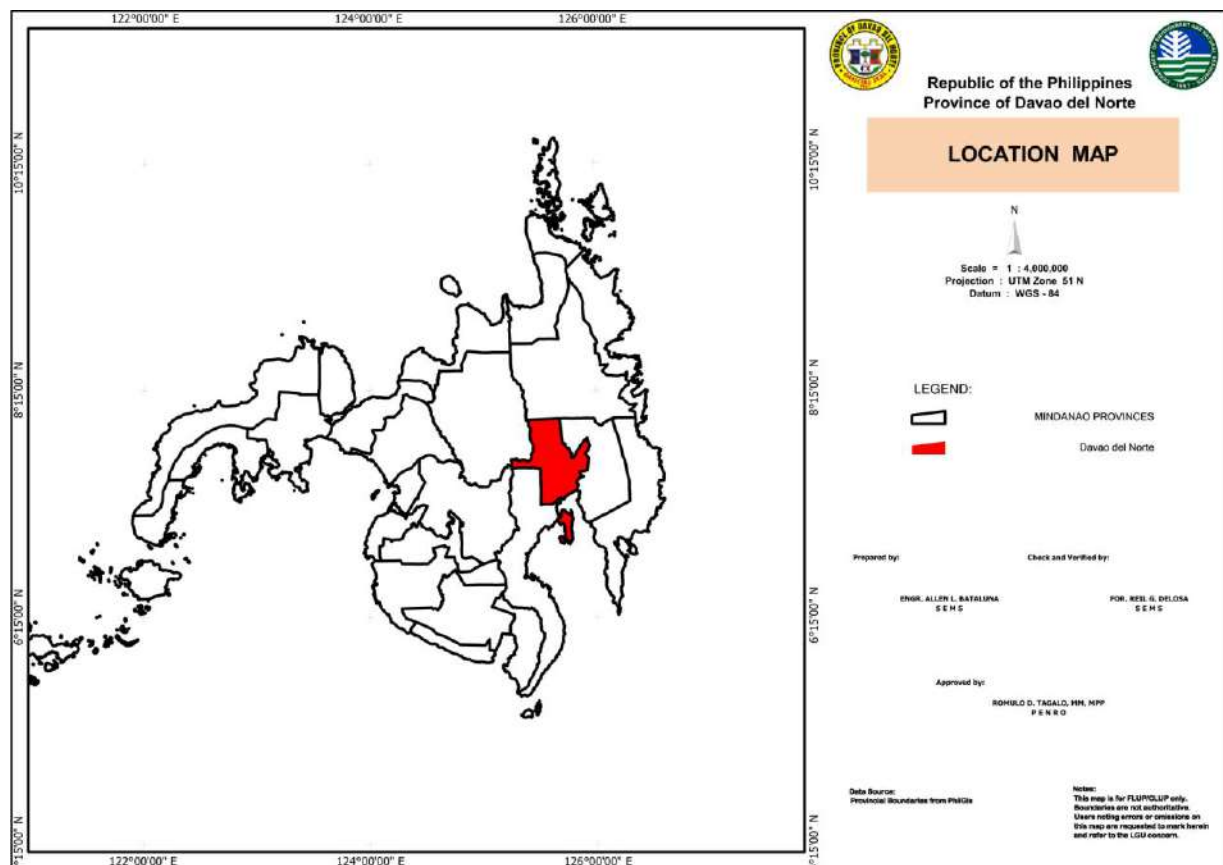


Figure 2. Location Map of Davao del Norte

In relation to the larger watershed, Davao del Norte is right at the heart of the Tagum-Libuganon River Basin. It covers the vast area of TLRB with about 240,029.49 ha representing 76% of the total area of the river basin. The management of the province's FFL greatly affects the general health of the river basin. The province has 7 major watersheds, with river systems draining to Davao Gulf.

Figure 3. Watershed Map

Land Area

Davao del Norte has a total land area of 360,851.61 distributed among its 8 municipalities and 3 cities. There are 222 barangays, 63 of which have areas classified as forestland.

Table 1. Land Area and Number of Barangays,

by City/Municipality Davao del Norte, 2015

City/Municipality	Land Area (Sq. Km.)	No. of Barangays	No. of Forestland Brgy.
District I			
Asuncion	293.47	20	4
Kapalong	945.86	14	5
New Corella	321.48	20	7
San Isidro	152.49	13	9
Tagum City	182.54	23	0
Talaingod	454.96	3	3
District II			
Braulio E. Dujali	91.00	5	0
Carmen	166.25	20	4
Island Garden City of Samal	280.71	46	17
Panabo City	253.63	39	8
Sto. Tomas	320.41	19	6
DAVAO DEL NORTE	3,462.80	222	63

Note: GIS computation based on the Land Classification Map from DENR-XI,

Data is not authoritative and generated for planning purposes only

Land Classification

Of the total area of 360,851.61 ha, about half or 177,328.50 ha are classified as forestlands while the other half or 183,523.11 ha are alienable and disposable (A&D) lands.

Table 2. Land Classification, Davao del Norte

Land Classification	Area (ha)	% Distribution
A&D	183,523.11	50.86
Forestland	177,328.50	49.14
Total	360,851.61	100

Note: GIS computation based on the Land Classification Map from DENR-XI,

Data is not authoritative and generated for planning purposes only

Among the cities/municipalities in the province, the Municipality of the Kapalong has the biggest timberland of 64,554.64 ha followed by Talaingod with 58,696.45. About 29,917.64 of the contested area between Talaingod and Bukidnon is classified as Forestland. See **Figure 4** for the Land Classification Map.

Table 3. Area and Location of A&D lands and Forestlands

Municipality	A & D Land	Forestland	Grand Total
ASUNCION	21,846.64	6,887.72	28,734.36
B. E. DUJALI	8,560.89	-	8,560.89
CARMEN	15,336.52	100.02	15,436.54
IGACOS	25,726.72	2,398.44	28,125.16
KAPALONG	19,254.32	64,554.64	83,808.97
NEW CORELLA	19,071.23	5,909.94	24,981.17
PANABO CITY	24,252.79	596.91	24,849.71
SAN ISIDRO	10,291.37	5,775.13	16,066.50
STO. TOMAS	16,453.77	2,491.61	18,945.39
TAGUM CITY	18,668.11	-	18,668.11
TALAINGOD	3,344.17	58,696.45	62,040.62
TALAINGOD (STO NIÑO VS	716.57	29,917.64	30,634.21

Municipality	A & D Land	Forestland	Grand Total
BUKIDNON)			
Grand Total	183,523.11	177,328.50	360,851.61

Source: DENR XI

Note: GIS computation based on the Land Classification Map from DENR-XI,

Data is not authoritative and generated for planning purposes only

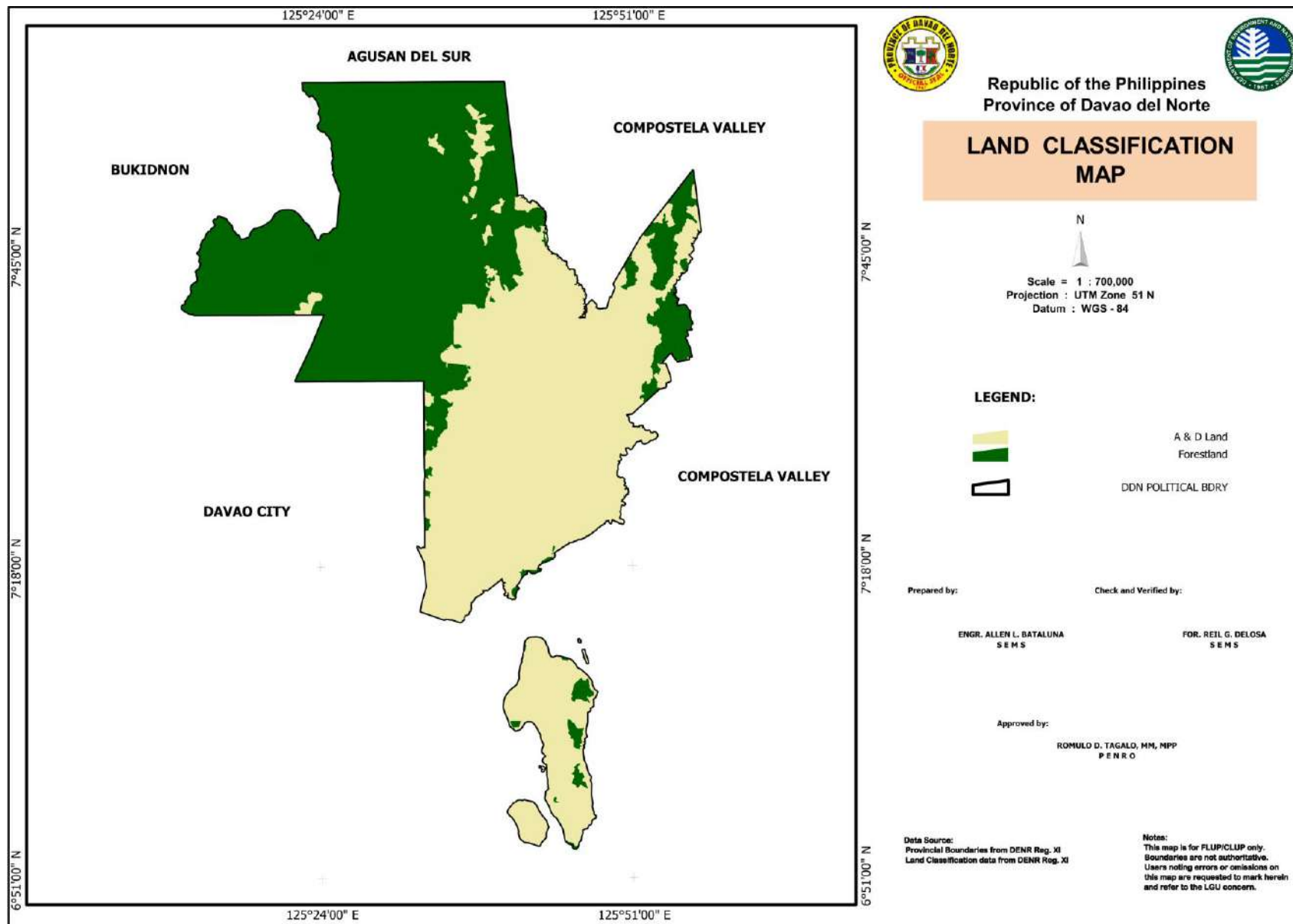


Figure 4. Land Classification Map

Elevation

Rugged, mountainous and moderately to steeply sloping areas on the western part and a wide alluvial plain on the central lowland area generally characterize the topography of the province. Comprising the major portion of the alluvial plain is a flat tract of land. However, some places are gently undulating and exhibit a rolling topography. Davao del Norte has generally a lowland terrain comprising 37 percent of the total land area with less than 100 meters elevation.

Highest elevations in the Davao del Norte FFL are found in the upland areas of Kapalong and Talaingod, with a combined total area of 17,900 ha. The said areas are located at 1,000 meters above sea level (masl). Not surprisingly, majority of the FFL areas are within the range of elevation from 501 to 1000 to masl with a total area of 57,000 ha followed by areas between 101-300 masl about 55,000 ha. Please see **Table 4**. Also refer to **Figure 5**.

Table No.4: **Elevation Characteristics, Davao del Norte FFL**

Municipality	Height (masl)					
	<100	101-300	301-500	501-1000	1001-1500	>1500
ASUNCION	385.38	3,448.53	2,948.00	105.72	-	-
CARMEN	100.02	-	-	-	-	-
IGACOS	378.61	1,409.18	609.13	1.51	-	-
KAPALONG	3,560.40	28,445.31	19,198.67	12,065.79	1,284.42	-
NEW CORELLA	223.42	4,916.25	770.24	-	-	-
PANABO CITY	540.87	56.04	-	-	-	-
SAN ISIDRO	130.42	4,557.13	1,087.56	-	-	-
STO. TOMAS	487.51	2,004.10	-	-	-	-
TALAINGOD	459.41	10,602.87	14,275.32	27,186.56	6,151.24	20.98
TALAINGOD (STO NIÑO VS BUKIDNON)		-		17,646.98	10,231.22	197.55
Davao del Norte FFL	6,266.05	55,439.42	38,888.92	57,006.55	17,666.88	218.53

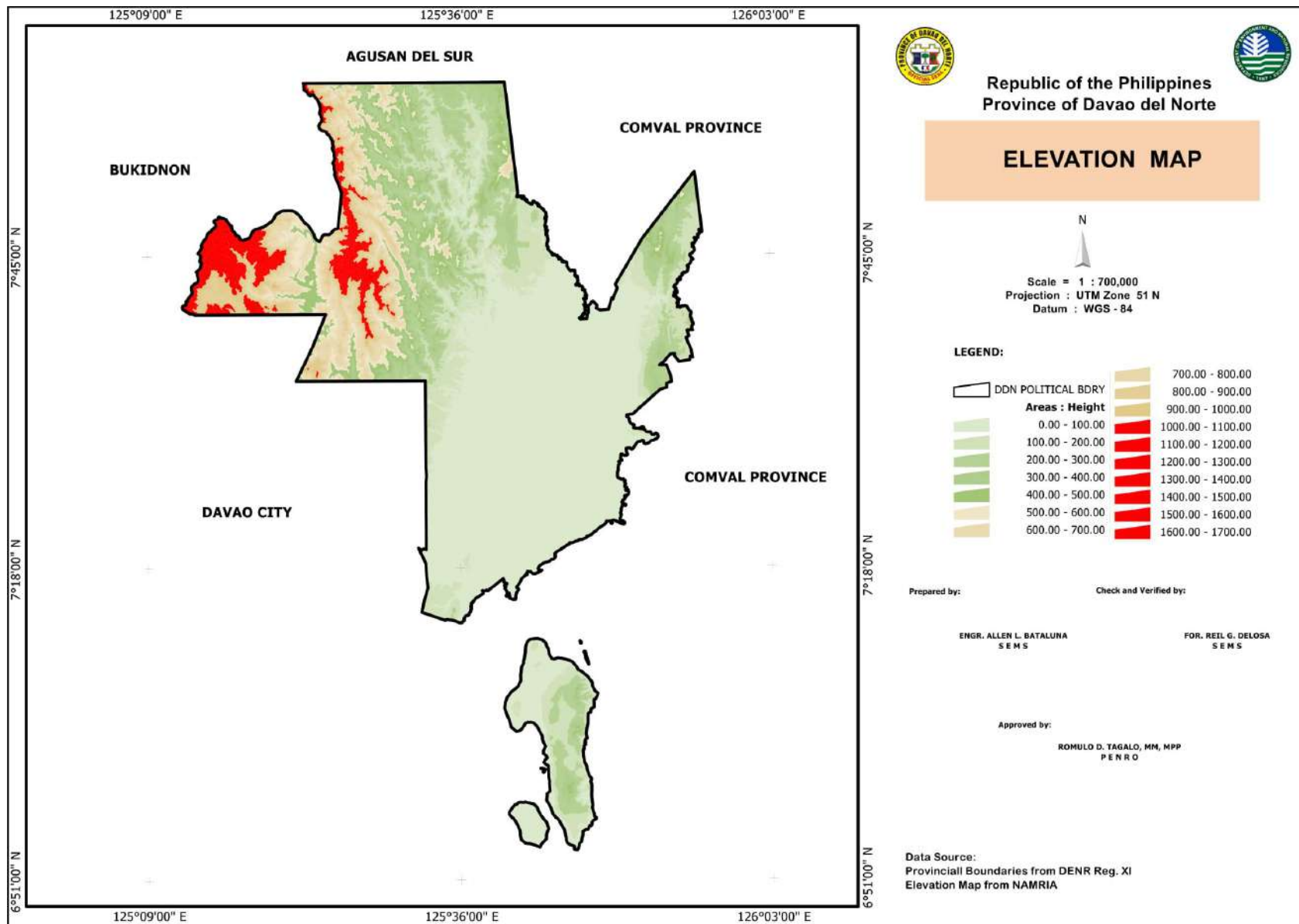


Figure 5. Elevation Map

Slope

51,000 ha of the FFL area has mountainous slope followed by rolling to hilly and hilly to mountainous consisting of 50,500.00 ha and 42,000 ha, respectively. The largest area that is highly vulnerable to landslide occurs in the higher slopes comprising the Municipalities of Kapalong, Talaingod, San Isidro and Asuncion. Slope is one factor that contributes to soil erosion. The steeper the slope, the higher the soil erosion is. It is also a key variable affecting the selection and positioning of crops and likewise, influences the type of management infrastructure that must be adopted to sustain land productivity.

Table No. 5 : Slope Classification, Davao del Norte FFL

Municipality	0-8% Slope, Level to Undulating	18-30% Slope, Rolling to Hilly	30-50% Slope, Hilly to Mountainous	8-18% Slope, Undulating to Rolling	Above 50% Slope, Mountainous
ASUNCION	923.44	2,420.27	659.09	2,266.57	618.32
CARMEN	100.02				
IGACOS	390.31	718.22	576.83	197.07	516.00
KAPALONG	3,564.94	15,822.25	13,520.52	9,023.97	22,622.89
NEW CORELLA	861.28	2,550.90	458.75	1,282.97	756.01
PANABO CITY	234.60	207.70	29.25	125.36	
SAN ISIDRO	441.56	1,798.59	1,288.80	2,019.71	226.45
STO. TOMAS	123.86	790.98	814.02	174.40	588.35
TALAINGOD	479.68	17,396.90	15,365.75	4,240.35	21,213.76
TALAINGOD (STO NIÑO VS BUKIDNON)	1,642.87	8,876.91	9,474.88	5,167.98	4,754.96
Davao del Norte FFL	8,762.57	50,582.72	42,187.89	24,498.39	51,296.74

Source: BSWM XI, GIS computations based on the maps by the DENR, BSWM

Note: Land area is not authoritative for any other purposes.

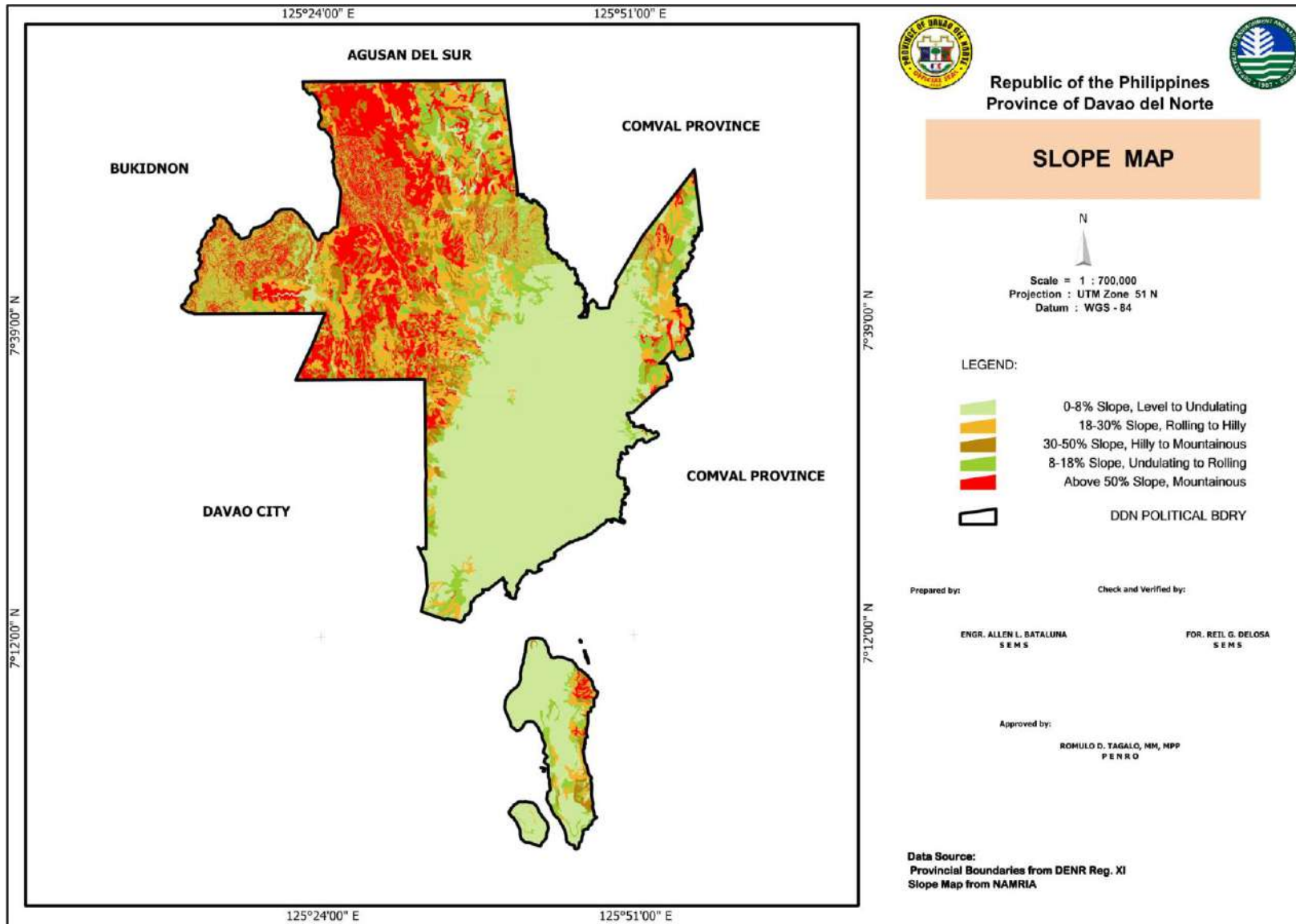


Figure 6. Slope Map

Climate

The province has Type IV climate under the coronas classification. Rainfall is more or less evenly distributed throughout the year with no pronounced rainy season and dry season. Davao del Norte lies within the typhoon belt. According to the Manila Observatory Report (Arguilles 2013), six typhoons made landfall in Mindanao in the last 15 years before Typhoon Sendong. It also pointed out that typhoons do pass through Mindanao in December and that “roughly one typhoon per 10 years crosses Mindanao in December”.

The fairly pronounced rainy months in the province are from November through February. The province’s average annual rainfall for the past five years, which was based on climatological data from PAG-ASA Agromet Station in Tagum City, ranges from 179.50 mm. to 244.25 mm.

Table No. 6 : **Monthly and Annual Rainfall** (In Millimeter)

From 2011 to 2016

Province of Davao del Norte

Month	Total Monthly Rainfall (in mm.)					
	2011	2012	2013	2014	2015	2016
Jan.	194.8	190.0	603.6	323.9	248.2	22.0
Feb.	347.7	260.2	175.2	55.2	78.1	51.8
March	210.8	308.2	161.2	170.4	28.5	32.4
April	110.4	191.9	215.3	310.0	206.6	160.7
May	388.7	143.8	266.1	222.4	346.4	210.9
June	173.0	94.2	159.3	427.6	195.5	292.1
July	315.2	153.9	453.3	64.6	137.3	354.1
Aug.	326.7	181.6	133.2	200.8	343.2	
Sept.	194.8	190.0	75.8	311.7	139.4	
Oct.	347.7	260.2	167.0	148.6	147.9	
Nov.	210.8	308.2	347.1	347.1	184.2	
Dec.	110.4	191.9	153.7	153.7	98.7	
Average	244.25	206.18	242.57	228.00	179.50	

Source : PAG-ASA Agromet Station in Tagum City

Humidity is a measure of the amount of water vapor in the air. Relative humidity refers to the ratio of the amount of water vapor present in a given volume of air to the amount of vapor required for saturation at the existing air temperature. Table No. 7, provides a five-year information of the average monthly relative humidity of the province of Davao del Norte from 2011 to 2016. Average range of humidity for the past five years is from 72.9% to 93.7%.

Table No. 7: Average Monthly Relative Humidity (%)
From 2011 to 2016

Month	Relative Humidity					
	2011	2012	2013	2014	2015	2016
January	87.7	89.4	100.1	72.4	73.2	70.2
February	88.8	90.4	94.5	76.8	70.8	71.4
March	88.4	85.5	90.5	69.7	76.4	73.3
April	81.4	87.2	90.1	74.3	69.2	69.8
May	88.0	87.0	92.4	71.8	71.4	
June	89.0	87.0	94.9	77.2	77.3	
July	88.6	88.0	86.3	70.5	72.4	
August	85.0	87.0	93.6	73.2	69.0	
September	89.4	87.0	99.6	74.9	75.7	
October	88.0	88.0	96.4	69.6	74.0	
November	89.6	90.0	94.7	75.1	71.2	
December	91.0	88.0	91.0	73.4	74.9	
Average	87.9	87.9	93.7	73.2	72.9	

Recent vegetative cover

Per DENR-XI GIS (2015), the dominant vegetative cover of the provincial FFL are the shrubs covering a total area of 56,930.96 ha followed by an open canopy forest and annual crops about 46,816.17 ha and 44,047.76 ha, respectively. Of the entire area of Provincial FFL, only Kapalong and Talaingod has the remaining closed forest combining an area of about 20,000 ha. See **Figure 7** for the Vegetative Cover Map and **Tables 8 and 9** for the Area distribution of the Vegetative Cover of Davao del Norte FFL.

These vegetative covers on those timberland areas are very vital in sustaining the biodiversity of the FFL. The management and protection of these remaining forest cover is being done through collaborative efforts of the stakeholders, LGUs within the provincial boundaries, DENR and other National Government Agencies including the Philippine National Police and the Armed Forces of the Philippines (AFP).

Table 8. Land Cover, Davao del Norte 2015

Type of Cover	Area (ha)
Annual Crop	3780.23
Closed Forest	20,957.03
Open Forest	48,214.97
Open Barren	64.45
Wooded Grassland	12,321.83
Grassland	10,913.72
Shrub	56,930.96
Perennial Crop	22,120.35
Fishpond	166.12
Inland Water	1,540.99
Mangrove	107.56
Shoreline	14.05
Built-up	196.25

Table 9. Vegetative Cover in FFL per LGU

Land Cover	ASUNCION	CARMEN	IGACOS	KAPALONG	NEW CORELLA	PANABO	SAN ISIDRO	STO. TOMAS	TALAINGOD	TALAINGOD (STO NIÑO VS BUKIDNON)
Annual Crop	5.13		2.88	80.34	3.00		2.21	2.70	76.19	3,607.77
Built-up	20.05		33.53	13.96	19.08	22.64	27.89		33.64	25.46
Closed Forest				2,336.28					10,550.53	8,070.22
Fishpond		49.81	2.89			113.42				
Grassland	8.44		5.11	574.96	14.84	12.85		315.65	9,581.44	400.43
Inland Water	22.16	7.44		800.17	27.34	5.90	0.17	17.40	619.08	41.32
Mangrove		20.65	0.30			86.60				
Open Forest			348.76	29,360.85					13,205.61	5,299.75
Open/Barren			2.98	41.87	0.80				18.82	
Perennial Crop	6,416.80	14.49	1,722.61	2,677.55	5,635.29	104.63	5,115.43	66.69	365.46	1.40
Shoreline		7.63	6.29			0.13				
Shrubs	415.14		273.08	28,564.80	209.59	250.73	629.47	2,089.18	23,854.07	644.91
Wooded grassland	0.00			103.83		0.00	0.00	0.00	391.62	11,826.38
Davao del Norte FFL	6,887.72	100.02	2,398.44	64,554.61	5,909.94	596.91	5,775.16	2,491.62	58,696.44	29,917.64

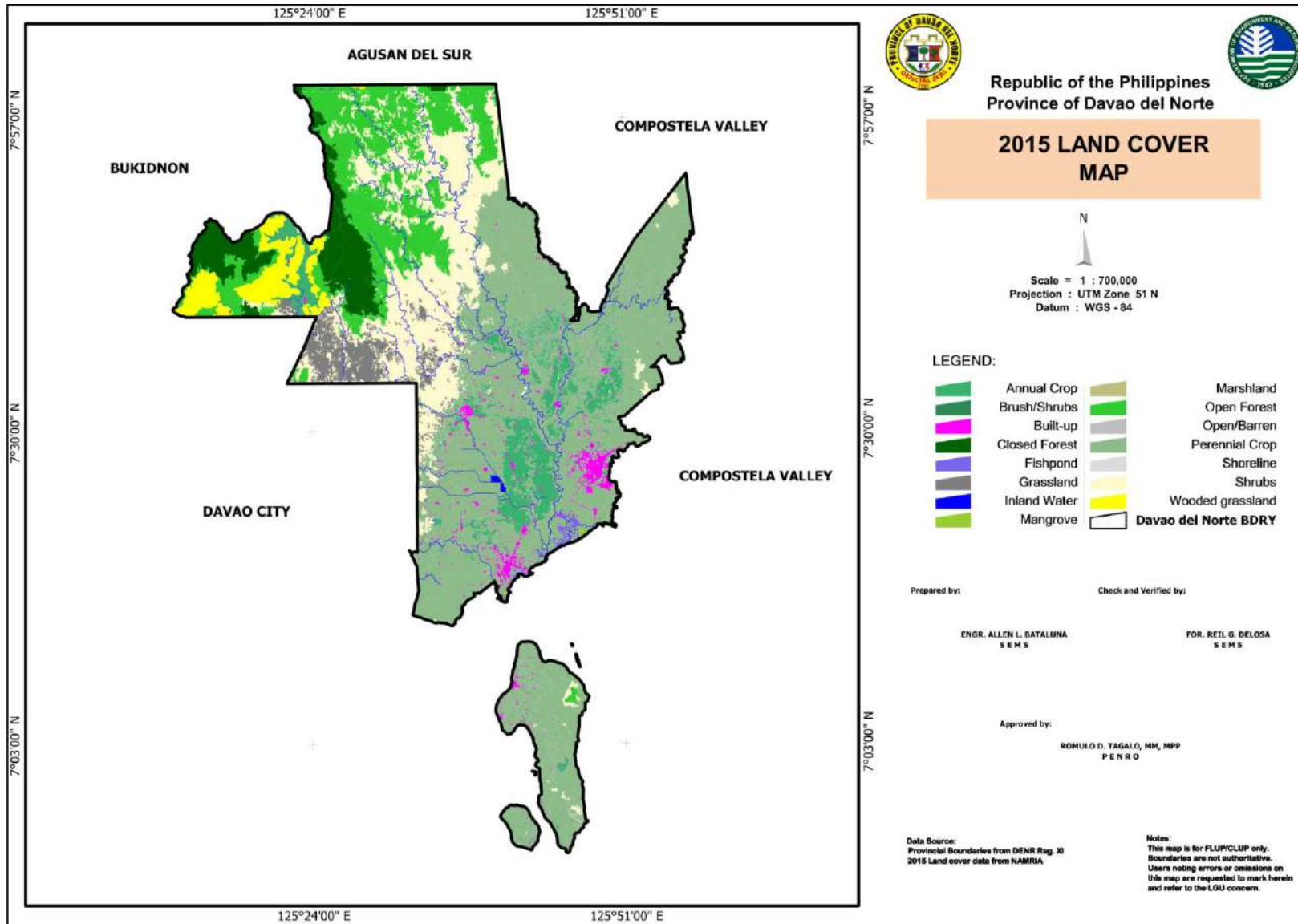


Figure 7. Land Cover Map

Sub-watersheds and drainage

There are two major watersheds in Davao del Norte. These are the Saug-Libuganon watershed covering 247,500 hectares and the Tuganay watershed with 69,375 hectares covers the municipalities of Sto. Tomas, B. E Dujali, Carmen and part of Talaingod. These watersheds should be able to sustain life and provide economic benefits. Rehabilitation and protection of the province watershed through reforestation program is of prime consideration of the provincial government. Saug-Libuganon watershed covers the municipalities of Asuncion, New Corella, San Isidro, Kapalong, Talaingod and the City of Tagum.

From these watershed flows the major river system of the province which originates in the uplands and drains to the Davao Gulf. See Figure 7 for the Drainage Map.

Table No. 10 : **Drainage Areas and Flow Rates of Major Rivers**

Province of Davao del Norte

Major Rivers	Drainage Area (km ²)	Flow Rate (m ³ /sec)		
		Peak	Maximum	Minimum
Hijo	617	150.9	102.5	8.3
Tagum	2,326	654.7	601.9	24.1
Lasang	808	No gauging station present		

Source: *Philippine Water Resources Summary Data, NWRRC*

Provincial Water Supply, Sewerage and Sanitation Sector Plan, Davao del

Norte

Notes: *Peak – Peak discharge of Daily Maximum Discharge*

Maximum – Maximum Daily Discharge of Weighted Daily Discharge

Minimum – Minimum Daily Discharge of Weighted Daily Discharge

Groundwater availability in the province is classified as deepwell and difficult area. Deep well area covers approximately 80% of the province, widely distributed in the river basins of Tagum and Davao rivers. Groundwater is the main source of drinking water in the urban centers of Tagum, Panabo, Sto. Tomas, Island Garden City of Samal, New Corella and Carmen. About 20% of the provincial area is classified as a difficult area to exploit groundwater. Such areas are characterized by mountains in the northwestern side of the province. Springs are the common source of water in these areas. There are 157 developed springs currently serving the populace mostly in the rural areas of the province.

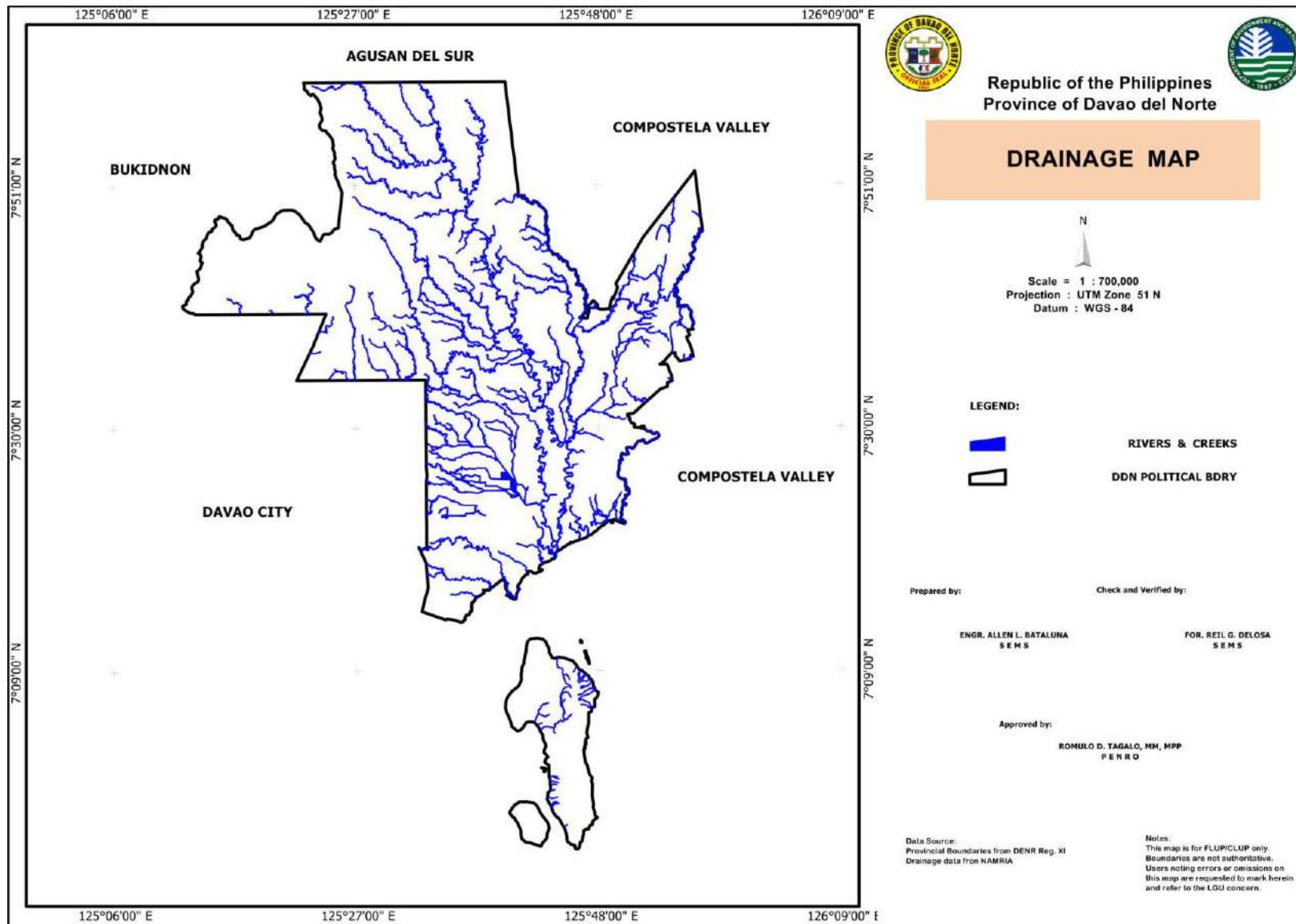


Figure 7. Drainage Map

Landslide Prone Areas

Landslides (or mass movements) are downward and outward movement of materials, including rock and soil due to various causes such as excessive rain, earthquake, volcanic eruption, rapid undercutting by rivers, waves or man's activities.

Areas prone to landslides typically include old landslide deposits along, near or beneath steep slopes and down slope of streams and creeks; thick soil or fractured rocks; those along or on top of cut slopes; and developed steep slopes with no appropriate drainage. Human activities sometimes contribute to the susceptibility of the area to landslides. Building structures around or on top of the slopes, pipe leakages, septic system and irrigation discharges, and vibrations from machinery and from blasting can increase pressure and weaken the soil.

Landslide hazard susceptibility zones were derived through a qualitative map combination using lithogy, geomorphology, slope gradient and fault distance. DENR-MGB has set four possible levels of susceptibility to landslides. Each level was defined based on the characteristics of slope, cracks, and recent landslide activities. Even without the benefit of a map, one can still identify active landslide areas by looking for cracks or scars, surface depressions, disturbance of the drainage patterns; hummocky topography; and ear-lobe like bulges near the base of slopes.

Table 11. **Landslide Susceptibility Levels**

Province of Davao del Norte

Susceptibility Levels	Description
High Susceptibility	Presence or active/recent landslides Large tension cracks that would affect the community Areas with drainages that are prone to landslide damming Steep slopes (21%-55%gradient)
Moderate Susceptibility	Areas with inactive and old landslides Small tension cracks are located away from the community Moderately steep slopes (15%-30%) Small, shallow landslides (<1.0 vertical displacement)
Low Susceptibility	Gently sloping to sloping Absence of tension cracks Flat terrain (5%-15%)
Possible Landslide Debris Accumulation Zone	Areas to be likely affected by transported landslide materials

The area of TLRB is categorized into High, Moderate and Low landslide hazard. Per DENR-XI, 2013, FFL has a high landslide hazard about 105,604.26 ha representing 60% of the entire FFL area of Davao del Norte. This comprises nine (9) Municipalities with a total of 32 barangays basin-wide. These include 4 upland barangays of Asuncion such as Sonlon, Binancian, Buan, and Camansa. Eleven barangays of New Corella are also affected such as Carcor, Suaon, Cabidianan, Del Monte, El

Salvador, New Bohol, New Cortez, Patrocenio, Limbaan, Sta. Fe, and Mambing. Two barangays in San Isidro were affected by landslide namely Monte Dujali and Pinamuno, while one barangay in Kapalong is affected which is barangay Gupitan. All of which are located in Davao del Norte.

This means that residents have to wary on the situation because at any day or anytime, their lives and properties would have to be put into destruction. On the other hand, any proposed infrastructures on these areas have to be carefully studied on before it will be constructed thereon, otherwise, it would mean a waste of money, time and effort and even endangering the lives of the workers.

Table 12. Landslide susceptibility levels in Davao del Norte FFL

Municipality	High	Low	Moderate	Total
ASUNCION	2,016.14	1,707.46	3,164.12	6,887.72
CARMEN		90.14		90.14
IGACOS	1,725.17	126.98	546.28	2,398.43
KAPALONG	38,570.86	6,879.23	19,104.98	64,555.07
NEW CORELLA	1,768.68	642.20	3,499.05	5,909.94
PANABO CITY		505.02	91.89	596.91
SAN ISIDRO	1,293.12	1,344.52	3,137.47	5,775.11
STO. TOMAS	74.24	838.25	1,579.13	2,491.61
TALAINGOD	43,290.98	2,194.73	13,210.18	58,695.89
TALAINGOD (STO NIÑO VS BUKIDNON)	16,865.06	1,612.80	11,433.48	29,911.34
Grand Total	105,604.26	15,941.33	55,766.58	177,312.17

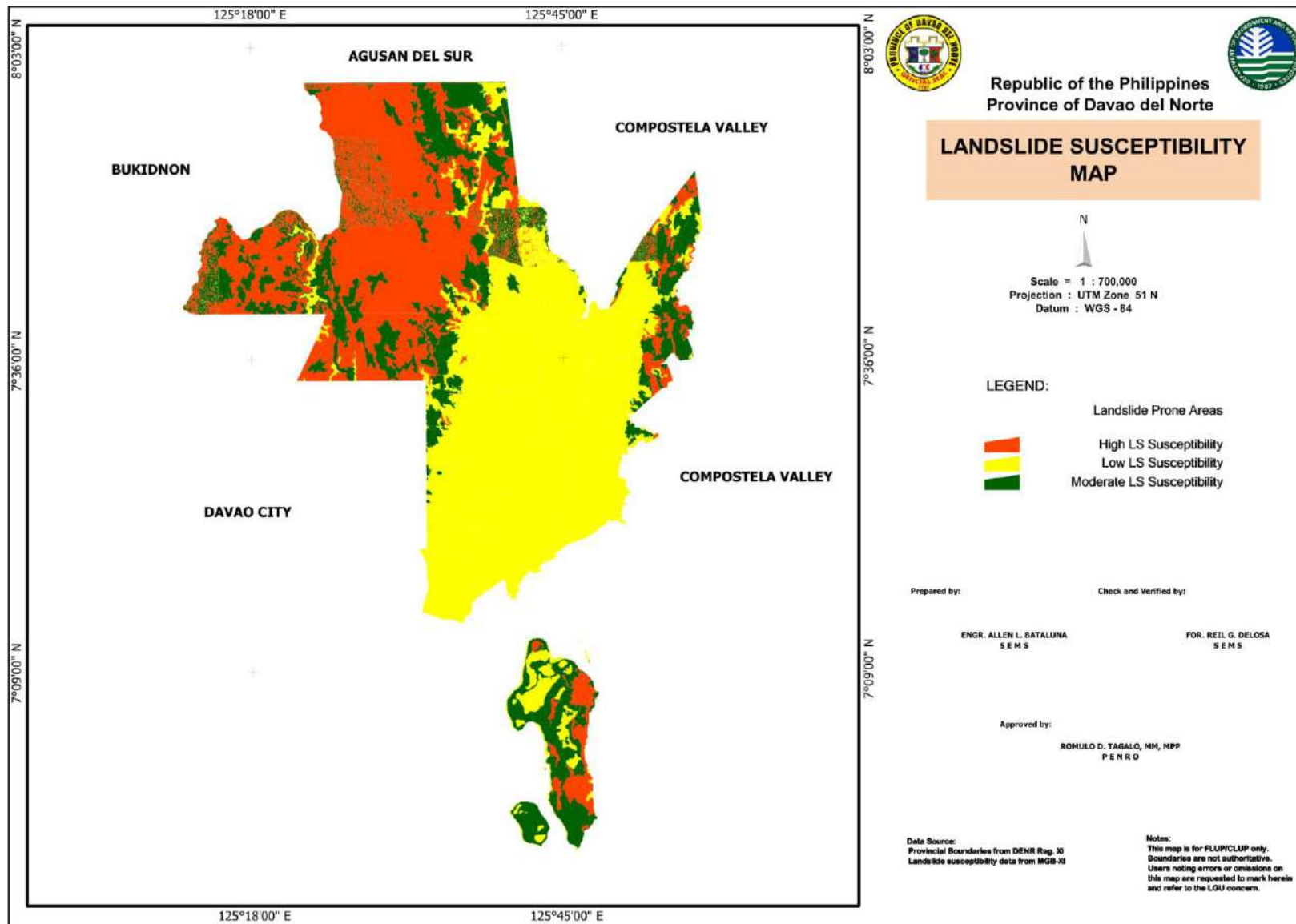


Figure 7. Landslide Susceptibility Map

Flood-prone area

Floods are caused by a variety of factors, both natural and man-made. Obvious causes of floods are heavy rains and frequent storms due to passing typhoons within short time period. Other causes are silted streams resulting to reduce carrying capacity, constricted channels caused by illegal infrastructures and loss or diminish of channel shortage caused by excessive removal of sand and gravel. The combination of these natural and man-made factors results to damage costing millions of pesos and loss of lives.

In Davao del Norte FFL, considering the elevation, 1,256.14 ha are exposed to flooding. These are located in low-lying areas usually near river systems such as the Municipality fo Asuncion, Carmen, Kapalong and Panabo.

Table 13. FFL Areas Susceptible to Flooding, Davao del Norte FFL

Municipality	High	Low	Moderate	Very High
ASUNCION	42.18			12.59
B. E. DUJALI				
CARMEN	31.79	1.63	16.07	
KAPALONG	365.35	43.27	51.72	427.56
NEW CORELLA	0.03			6.36
PANABO CITY	94.53	17.39	0.82	
SAN ISIDRO	10.33		73.71	0.00
STO. TOMAS	0.04		37.59	
TAGUM CITY				
TALAINGOD	23.18			
Davao del Norte FFL	567.43	62.29	179.90	446.52

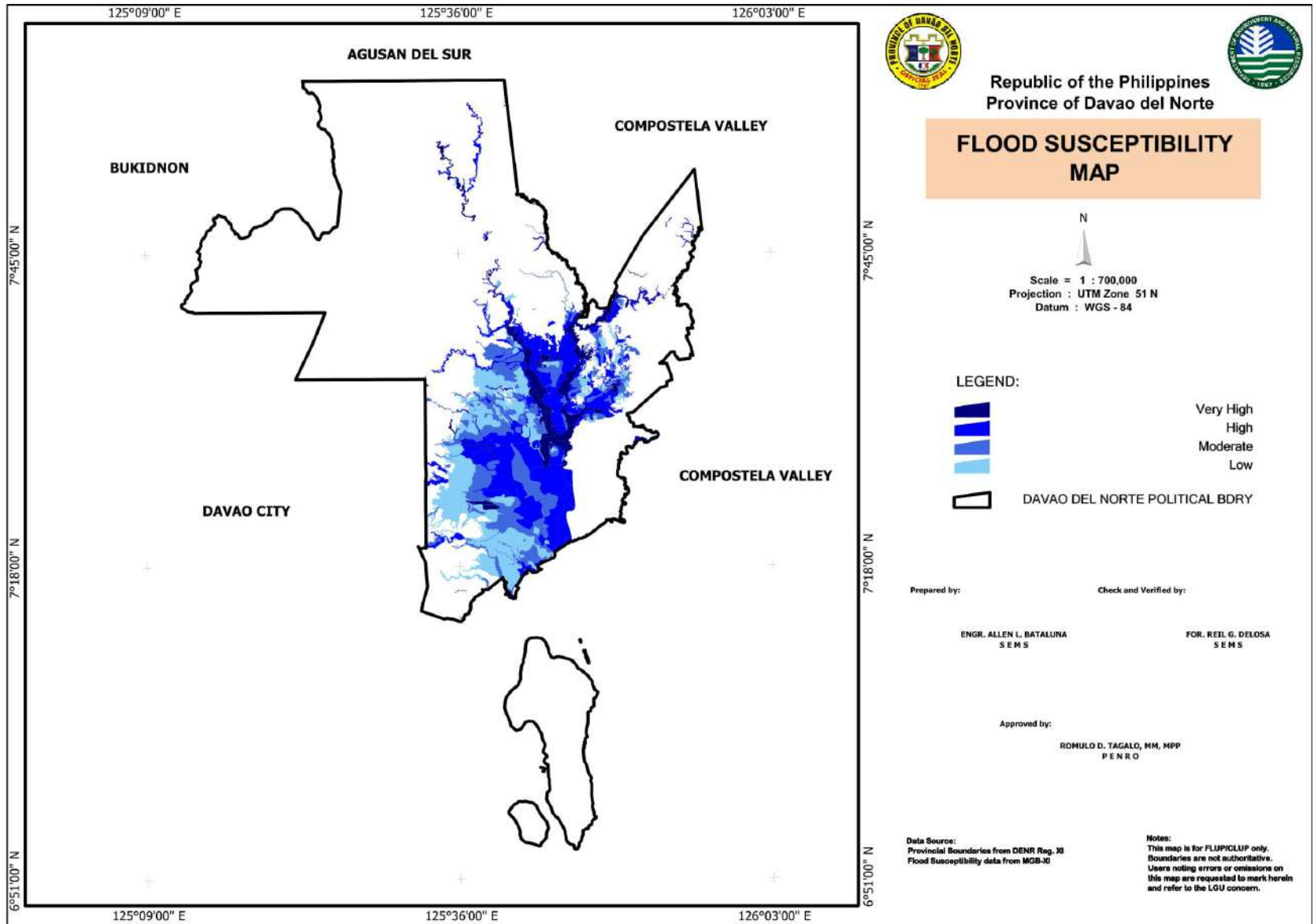


Figure 8. Flood Susceptibility Map

Storm Surge

There are no reported storm surge occurrences in Davao del Norte. However, to determine the effect of the storm surge and the extent of flooding if so ever it occurs in the province, a simulation using the worst case scenario (5 meter surge) is done through GIS. The result of the simulation is presented in Table 14.

Table 14: **Storm Surge Susceptibility Area**

Province of Davao del Norte

Municipality/City	Barangay	2 meters	3 meters	4 meters	5 meters	Grand Total
Carmen	LA PAZ	51.63				51.63
	TABA	29.11				29.11
IGACOS	BALET	8.42	1.02	0.74	0.76	10.94
	CAMUDMUD	2.68	3.95	1.79	1.33	9.75
	LIBUAK	2.40				2.40
Panabo City	CAGANGOHAN	60.17				60.17
	J.P. LAUREL	52.74	2.34	2.50	2.29	59.87
	NEW PANDAN	10.46				10.46
	SAN PEDRO	58.96				58.96
	SAN VICENTE	0.13				0.13
	STO NINO	0.26				0.26
Grand Total		276.98	7.30	5.02	4.38	293.69

Demography

Davao del Norte is the smallest of the region's provinces, covering a land area of 3,463 sq. kilometers or 18.4% of the entire region. Its population is 945,764 based on the 2010 census with an annual average growth rate of 2.23% from CY2000. Its population density was 273 persons/sq. km in 2010 compared to 245 persons/sq. km in 2007

The 2015 Census of Population and Housing shows that the population of Davao del Norte rose to 1,016,318 with an annual growth rate of 1.38%. The increase indicates that over a

period of 5 years there was an increase of 70,554 persons or 14,111 persons every year. (PSA 2016).

Demographic information of the FFL of Davao del Norte is summarized in Table 15.

Table 15. Population in Davao del Norte FFL, 2015

	Province	FFL Barangays
Population	1,016,332	209,322
Households	233,232	41,864.40
HH Size	4.3	5.4
ICC/IP Population	94,023	70,515

Source: PSA, NCIP

Key Institutions

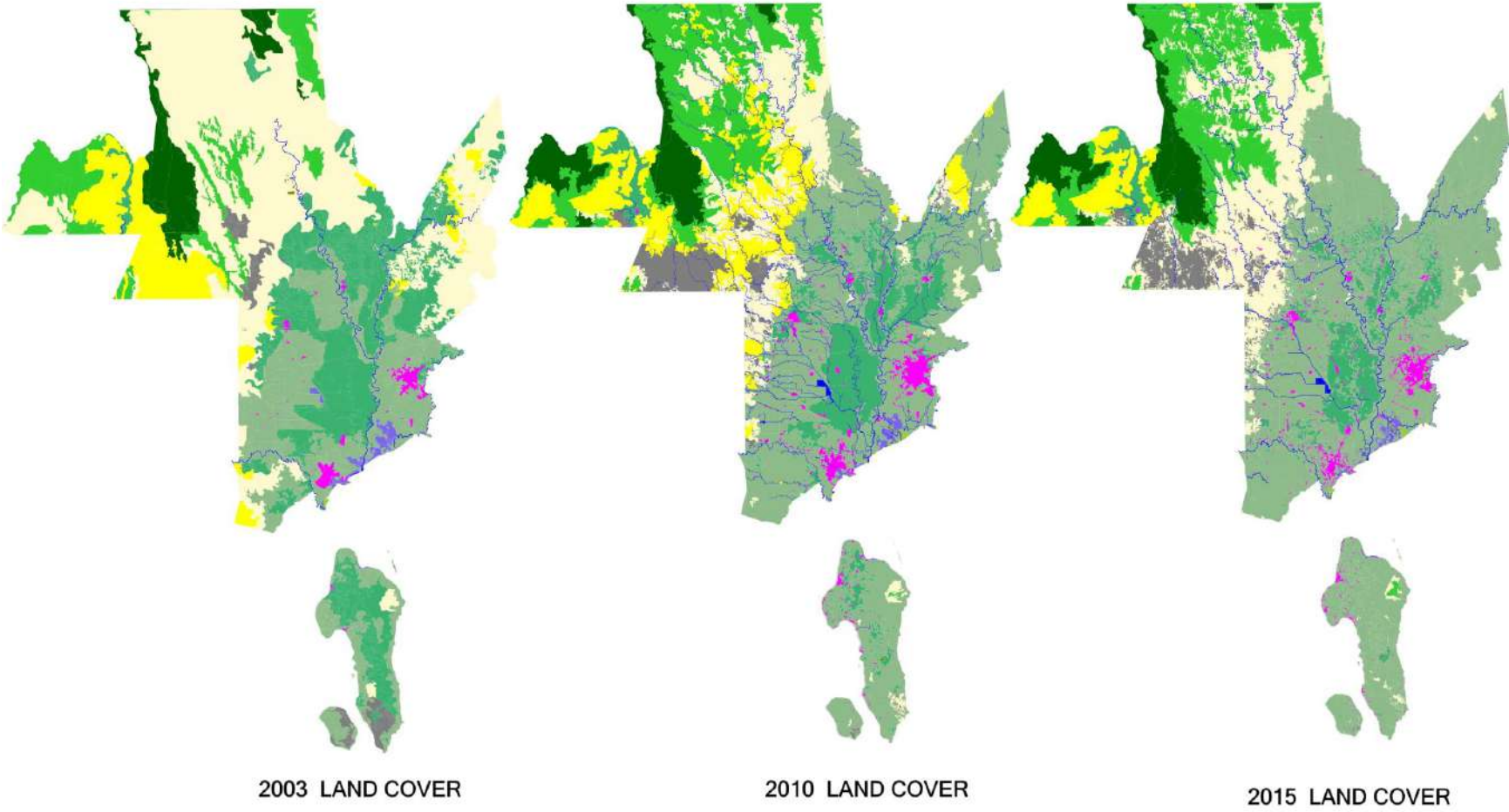
Local Government Units now share with the national government the responsibility of maintaining the ecological balance within their respective jurisdictions. Under the Local Government Code (RA 7160), certain forest management functions were devolved to the LGUs. The Code allows for the DENR and the LGU to enter into a co-management agreement, which empowers the LGU to develop, manage, protect and use in a sustainable manner a specified area of forest/ forestland.

The capacity of the municipal and city government units in managing forest and forestland in three areas were assessed and is summarized in Figure 9. Operation and Implementation refers to how the LGUs manages programs and projects related to coastal management, decision-making process refers to how the LGUs make decisions and formulate policies and information flow refers to how information is exchanged between and among stakeholders.

Conditions of Forest and Forest Land Assets

Over three period, 2003, 2010 and 2015, land cover has changed in Davao del Norte. Land cover change is defined as the loss of natural areas, particularly loss of forests to urban or exurban development, or the loss of agricultural areas to urban or exurban development. Land-cover change has numerous ecological, physical and socioeconomic consequences. On the positive side, agricultural expansion may increase food production for a growing population. On the other hand, as natural vegetation is replaced by agriculture, soil porosity may be reduced by soil compaction, decreasing infiltration capacity and increasing the risks of soil erosion. Changes in land cover in Davao del Norte is presented in Figure 9.

LAND COVER CHANGE



2003 LAND COVER

2010 LAND COVER

2015 LAND COVER

LEGEND:

	Annual Crop		Closed Forest		Grassland		Mangrove		Open Forest		Perennial Crop		Shrubs
	Built-up		Fishpond		Inland Water		Marshland		Open/Barren		Shoreline		Wooded grassland

Figure 9. Land Cover Change

Tenure Management

Land allocation responds to the need to close “open access” forests and forest lands. “Open access” are areas not under any management arrangement and anybody—even those not authorized by the government —can just get in and out and use the resources without having any accountability. “Open access” also refers to areas already allocated or under a certain tenure instrument but abandoned by their assigned managers. These areas have to be allocated (or reallocated, in the case of those tenured but abandoned lands) and place them under the care of responsible resource managers who can preserve, rehabilitate, protect these areas from illegal activities, and use these resources in a sustainable manner.

For the Davao del Norte FFL, there is very minimal open access area as these areas have been occupied by tenure holders. Examples of tenurial instruments are Community-Based-Forest-Management Areas and Certificate of Ancestral Domain Title (CADT). CADT areas have been entrusted to the Indigenous Cultural Communities for management. However, they are to be guided by the state in managing resources in these areas.

Tenure Management in Davao del Norte, FFL

LGU	CADT area (ha)	CBFMA (ha)
Asuncion	13,693.80	3943.06
Kapalong	65,113.34	15,536.58
New Corella	4,976.29	
Panabo City	2.00	
San Isidro	3,000.85	
Sto Tomas	2,881.94	
Tagum City	153.66	
Talaingod	61,047.44	336.34
IGACOS (inland)	774.25	
Davao del Norte	151,643.57	

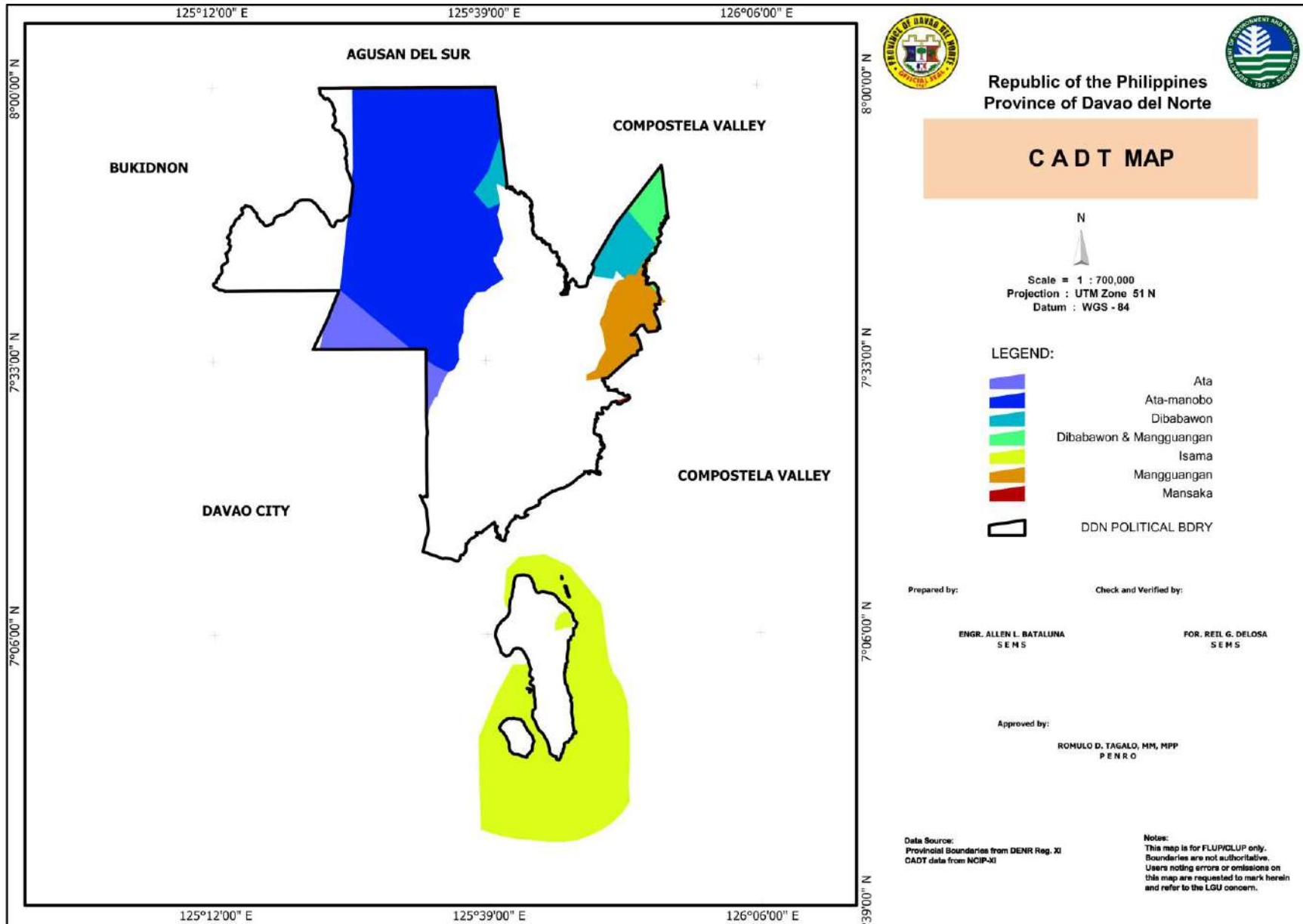


Figure 10. CADT Map

National Greening Programs

The NGP is a massive forest rehabilitation program of the Government established by virtue of Executive Order No. 26 issued on February 24, 2011 by President Benigno S. Aquino III. From the years 2011 to 2014, DENR, Davao del Norte in partnerships with the Peoples Organizations and LGUs and other National Government Agencies, have already covered 5,360.06 ha province. The NGP project is one of the priority programs of the PNOY administration with a timeline from the year 2011 to 2016.

Beyond reforestation, the NGP is designed to reduce poverty, providing alternative livelihood activities for marginalized upland and lowland communities relating to nursery operations, plantation establishment and maintenance.

Table 15. NGP Projects in Davao del Norte

Municipality/City	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total
Asuncion			299.32	182.30	363.32		40.46	70.97	956.37
B.E. Dujali		26.84	12.26						39.10
Carmen		25.48	10.01		4.92				40.41
Island Garden City of Samal		20.59	21.10	145.42	259.36	179.88	78.32	40.45	745.12
Kapalong	117.03	597.56	1135.78	351.79	352.55	212.05	349.82	233.22	3349.81
New Corella	95.94	60.41	118.20	86.30	71.70	308.78	103.32	101.32	945.97
Panabo City		2.52	110.50	107.13	123.02				343.16
San Isidro	96.82	254.09	144.40	150.00	168.82		82.27	100.38	996.79
Sto Tomas		67.94							67.94
Sto. Tomas	298.29		132.06					219.82	650.17
Sto.Tomas	1.70	71.26	439.69	534.67	179.78	299.53	338.56	40.04	1905.23
Tagum City			100.35		6.17				106.52
Talaingod	90.12	167.89	401.23	567.10	706.22	332.28	245.46	202.84	2713.13
Grand Total	699.90	1294.57	2924.88	2124.73	2235.88	1332.52	1238.21	1009.04	12859.71

Source: PENRO-DENR, Davao del Norte

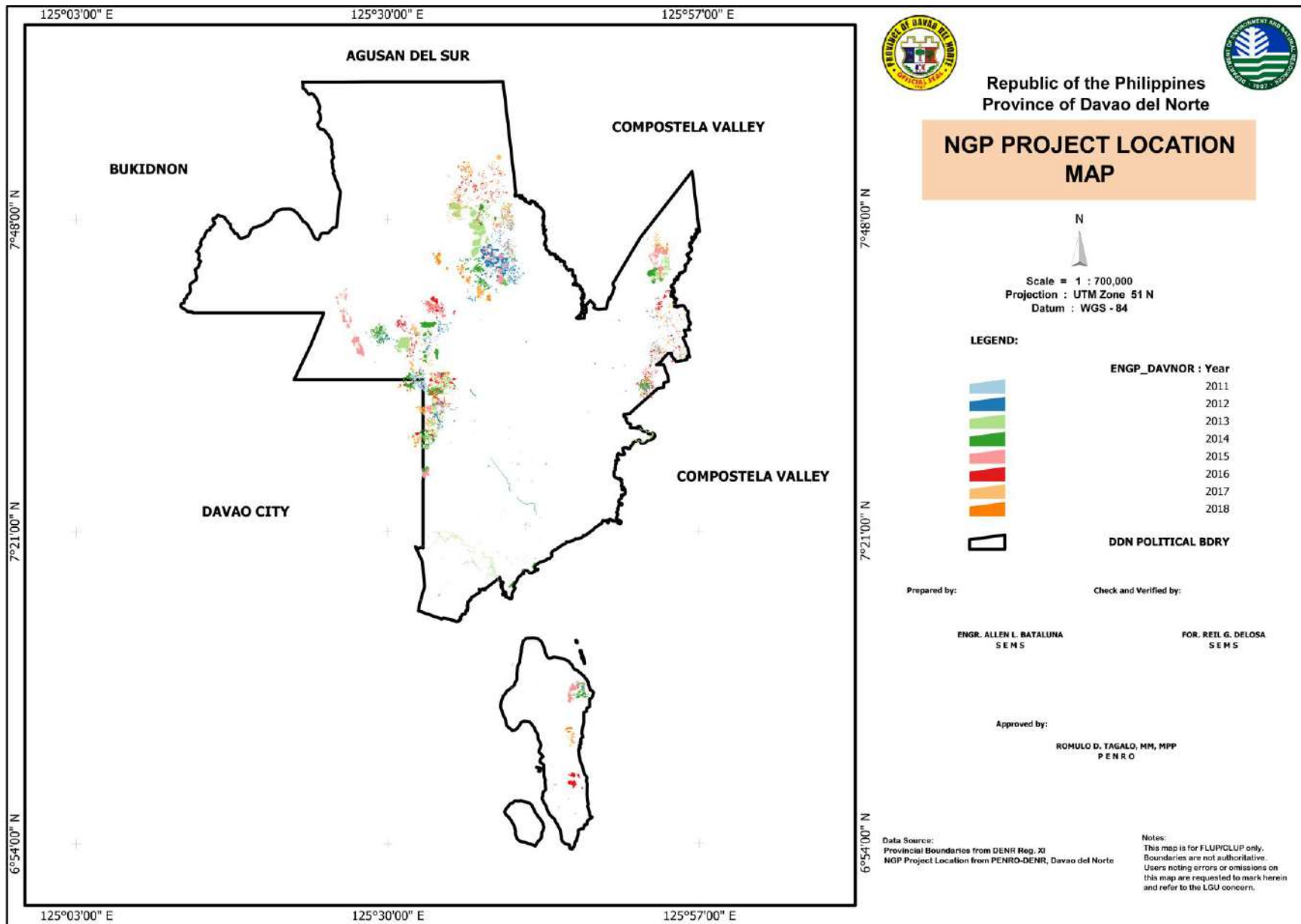


Figure 11. NGP Project

Summary of Key Issues, Conflicts, Problems and Needs

The following are the key issues plaguing the Davao del Norte FFL.

Ecological Issues:

1. River Siltation
2. Forest denudation
3. Prevailing open access areas
4. Illegal hunting and collection of fauna

Socio-economic

1. Resource users conflict
2. Informal settlements in FFL
3. Limited accessibility hampers delivery of social services
4. Insurgency
5. No access to adequate sanitation and waste facilities

Institutional

1. Absence of clear-cut management plans
2. Unresolved boundary Conflict
3. Absence of MENROs in some LGUs
4. Lack of capacity to curb illegal activities

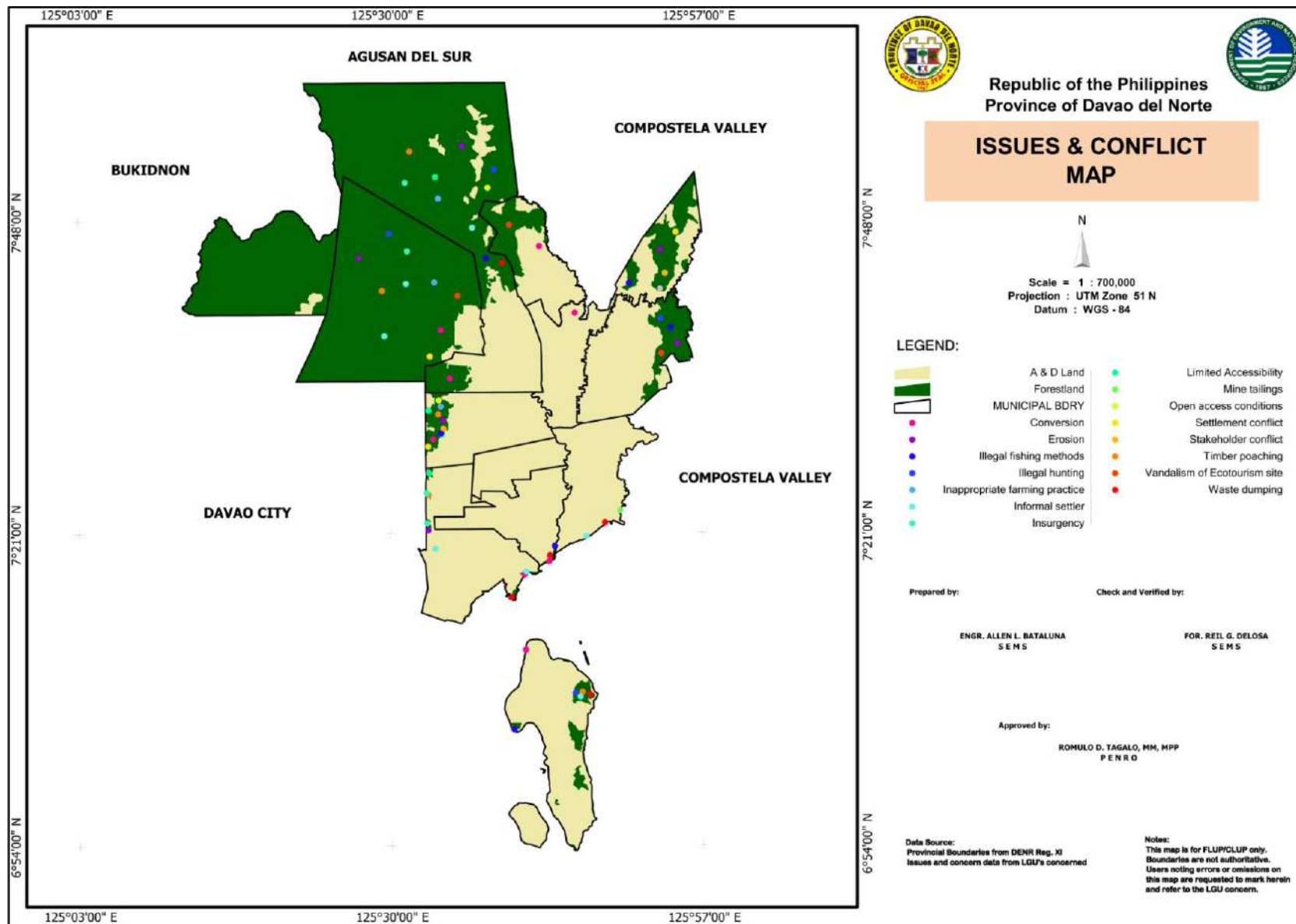


Figure 9. Issues and Conflict Map

Forest and Forestland Sector Goals, Objectives, Strategies and Targets

GOAL

Reduction of open/degraded forestland from 60.36% to 59.04% in 2023

OBJECTIVES

Objective 1: To establish forest production zones providing quality agricultural and forest products.

Strategies:

1. Assessment & Delineation
2. Policy-support and Convergence Initiatives
3. Establishment of Agro-forestry, Wood Production Areas and High-value crops enterprise
4. Funding Mechanisms
5. Monitoring and Evaluation

Objective 2: To increase forest cover in protected areas, stabilize riverbanks, geo-hazard and flood-prone areas.

Strategies:

1. Assessment & Delineation of identified Protected, key biodiversity and eco-tourism areas
2. Policy-support and Convergence Initiatives
3. Rehabilitation of Riverbanks, Mangroves and geo-hazard and flood-prone areas
4. Management and Development of Community Watershed
5. Strengthen community-based forest protection
6. Funding Mechanisms
7. Monitoring and Evaluation

Objective 3: To Strengthen Provision of Basic Services to Upland/Coastal Settlers, Including Provision of Other Livelihood Opportunities.

Strategies:

1. Partnerships with POs in nursery establishment and seedling production as an enterprise
2. Establishment of farm to market road
3. Network and linkage with other agencies and investors

4. Objective 4: To strengthen Local Institutional Capacity for Sustainable Forest Management.
5. Strategies:
6. Establish/strengthen C/MENR Office
7. Organization/Strengthening of POs
8. Organization/Strengthening of Barangay Bantay Kalikasan
9. Linkages with NGAs, NGOs and Academe
10. Policy Support and Funding Mechanism

Zoning of FFL

The Forest and Forestland of Davao del Norte shall be delineated into management zones where activities shall be identified, regulated and managed. Zoning will address the sometimes conflicting and multiple use demands in forest resources. With a zone system in place, responsible resource managers can be assigned to these areas to avoid environmental destruction and minimize conflicts between and among community members who directly or indirectly benefit from these resources.

The recommended management zones are as follows:

Table 16. Proposed Management Zone

MANAGEMENT ZONE	DESCRIPTION	ACTIVITIES	AREA
Strict protection zone	<p>Areas with high biodiversity value</p> <p>All natural forests both closed and open canopy</p> <p>Above 1000masl</p> <p>Above 50% slope</p> <p>Areas prone to landslide and other geohazards (HIGH susceptibility)</p>	<p>No economic activities shall be allowed in this zone.</p> <p>Public access is not allowed</p> <p>Reserved for research and other activities that support forest enhancement.</p>	68,049.66
Regulated protection	<p>All barren areas, wooded grassland, shrubs, grasslands</p> <p>Above 1000masl</p> <p>Above 50% slope</p>	<p>Rehabilitation activities</p> <p>Development limited to ecotourism and other special land use</p>	20,939.46

MANAGEMENT ZONE	DESCRIPTION	ACTIVITIES	AREA
	Areas prone to landslide and other geohazards (medium-high susceptibility)	Caves, waterfalls and other natural tourism areas	
Production Zone	Agroforestry Multiple use		56,505.62
Coastal and riparian greenbelts	Beach forest, Mangrove and riverbank rehabilitation	20m buffer for a&d and 40M for ffl (rivers and riverbank) 100m mangrove belt along shorelines for storm-surge areas 50M along riverbanks along typhoon-prone areas Buffer zone of 50m fronting seas and oceans	10,536.80
Settlement	Built-up areas	Existing settlements	178.06

These zones are spread over the forest and forestland of various Local Government Units. See Table 17.

Table 17. Proposed Zones, Area per LGU

Municipality	Coastal buffers	Production Forest	Regulated Protection	Riparian buffer	Settlements	Strict Protection
ASUNCION		290.98	132.57	835.63	20.05	

Municipality	Coastal buffers	Production Forest	Regulated Protection	Riparian buffer	Settlements	Strict Protection
B. E. DUJALI				255.37		
CARMEN	12.05			328.51		17.07
IGACOS	575.88	120.14	141.27	326.64	27.54	307.69
KAPALONG		20,850.76	7,254.69	2,971.53	12.72	30,937.69
NEW CORELLA		154.19	70.06	742.22	19.06	
PANABO CITY	45.18	263.57		522.08	12.05	63.82
SAN ISIDRO		566.11	44.62	442.35	27.89	
STO. TOMAS		1,738.78	548.12	715.41		
TAGUM CITY	74.06			434.79		
TALAINGOD		22,855.54	9,572.33	2,127.40	33.30	23,386.01
TALAINGOD (STO NIÑO VS BUKIDNON)		9,665.54	3,175.79	127.71	25.46	13,337.38
Grand Total	707.16	56,505.62	20,939.46	9,829.64	178.06	68,049.66

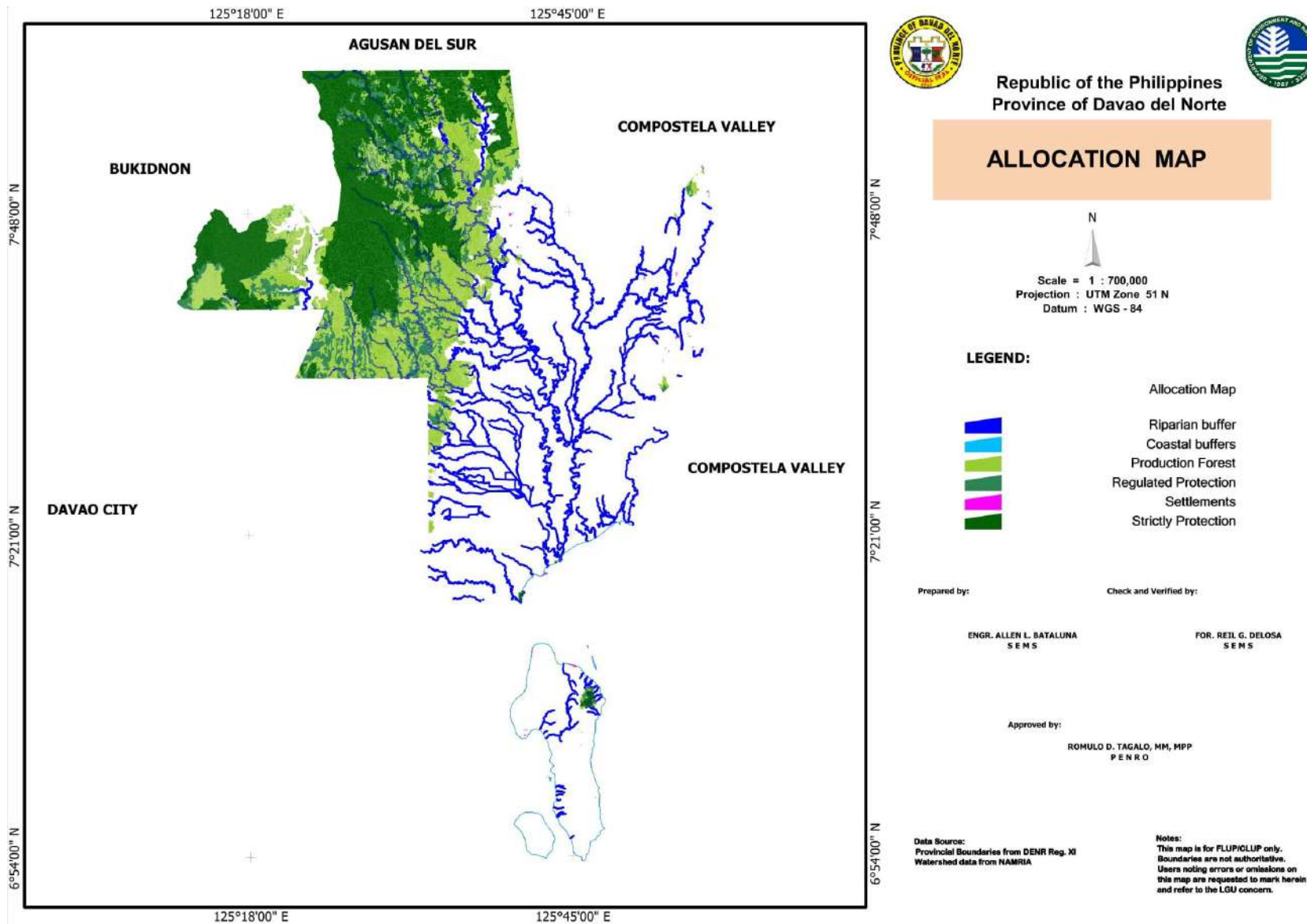


Figure 10. Allocation Map

Organizational Structure and Operations in Support of FLUP Implementation

The PENRO Forest Management Division shall be in the frontline of effective and efficient management of forest and forestlands of Davao del Norte. Together with the Provincial Agriculturist's Office, Provincial Planning and Development Office, Provincial Social Welfare and Development Office and the Provincial Governor's Office, PENRO shall dispense the overall technical and administrative functions in implementing FLUP programs and projects. It will be an informative body of the LCE and the Provincial Development Council in implementing FLUP programs and projects and other activities related to watershed development. Changes and development of the plan shall be updated to the above mentioned body which require major decisions and actions.

Below are the PENRO-FMD's summary of responsibility in relation to FLUP implementation particularly in spearheading the protection, rehabilitation, development and management of forest and forestlands:

1. Develop and implement management plans for zone;
2. Set up an internal monitoring and evaluation system to ensure and effective and efficient system of FLUP implementation and report progress to the Provincial Development Council;
3. Facilitate trainings and capability- building to land tenure holders to capacitate them on FFL Management;
4. Facilitate in the crafting of supporting ordinances in the implantation of FLUP;
5. Conduct IEC and advocacy for the enforcement of forestry rules and regulations, effective management of allocated forestlands, rehabilitation of denuded forestlands, resource mobilization, and other activities and functions;
6. Establish linkages and collaborate with concerned agencies, resource institutions and various stakeholders (private sector) for investment support and services to tenure holders and other upland communities including the provisions of alternative livelihood support;
7. Strengthen the Bantay- Gubat Task force for their effective regular assessment, monitoring, and evaluation activities in FFL, and Tenured areas;

Monitoring and Evaluation of FLUP Implementation

The province shall adopt a Results-Based Monitoring and Evaluation (RBME) system to ensure that program success is determined through a measurable criterion by which results/impacts/outputs of various development activities are monitored and evaluated. Regular evaluation and reports on the progress of the project implementation so that issues and problems that cropped-up are resolved timely and appropriately. The project reports and updates shall be submitted monthly or as the need arise. The project report shall cover activities as specified in the implementation schedule. The report will be submitted to the LCE and other stakeholders.

Estimated 5-Year Investment Plan

Table 18. FLUP Investment Targets

Implementation Activities	Unit of Measure	Total target	Targets				
			Year 1	Year 2	Year 3	Year 4	Year 5
<i>Strategic Objective 1: Strategic Objective 1. To establish forest production zones providing quality agricultural and forest product</i>							
1. Agroforestry Management Project							
- IEC/meetings/conferences	Meeting	20	4	4	4	4	4
- Training and planning	Session	5	1	1	1	1	1
- Site identification and delineation of agroforestry area	Survey	5	1	1	1	1	1
- Purchase of agricultural supplies/seedlings	Pc.	12,500	2,500	2,500	2,500	2,500	2,500

Implementation Activities	Unit of Measure	Total target	Targets				
			Year 1	Year 2	Year 3	Year 4	Year 5
- Purchase of supplies and materials	Lumpsum						
- Development and maintenance of agroforest farms with food for work	Hectare	50	10	10	10	10	10
2.Tree Plantation Management Project							
- IEC/meetings/conferences	Meeting	20	4	4	4	4	4
- Training and planning	Session	5	1	1	1	1	1
- Site identification and delineation of tree plantation area	Survey	5	1	1	1	1	1
- Purchase of agricultural supplies/seedlings	Pc.	300,000	60,000	60,000	60,000	60,000	60,000
- Purchase of supplies and materials	Lumpsum						
- Development and maintenance of tree plantation area with food for work	Hectare	250	50	50.00	50.00	50.00	50.00
- Hiring of casual personnel	Person	1	1	1	1	1	1
3. Rangeland Management Project							

Implementation Activities	Unit of Measure	Total target	Targets				
			Year 1	Year 2	Year 3	Year 4	Year 5
- IEC/meetings/conferences	Meeting	20	4	4	4	4	4
- Training and planning	Session	2	1	1	1	1	1
- Site identification and delineation of rangeland	Survey	5	1	1	1	1	1
- Purchase of forage/fodder species	Pc	100,000	20,000	20,000	20,000	20,000	20,000
- Purchase of supplies and materials	Lumpsum						
- Procurement of cattle stock	Head	100	0	0	25	35	40
- Development and maintenance of rangeland with food for work	Hectare	100	20	20	20	20	20
<i>Strategic Objective 2.To increase forest cover in protected areas and stabilize riverbanks, geo-hazard and flood-prone areas.</i>							
1. Protected Area Management Project for Pantaron Mountain							
- IEC/meetings/conferences	No.	20	4	4	4	4	4
- Training and planning	Session	2	1	1	1	1	1

Implementation Activities	Unit of Measure	Total target	Targets				
			Year 1	Year 2	Year 3	Year 4	Year 5
- Procurement of supplies and materials	Lumpsum						
- Delineation of Pantaron	Contract			0	0	0	0
- Biophysical survey /assessment	Contract			0	0	0	0
SUBTOTAL							
2. Community Tree Parks Management Project							
- IEC/meetings/conferences	Meeting	20	4	4	4	4	4
- Training and planning	Session	2	1	1	1	1	1
- Purchase of supplies and materials	Lumpsum						
- Delineation of tree park area	Survey	100	20	20	20	20	20
- Development and maintenance of tree park with food for work	Hectare	50	10	10	10	10	10
3. Riverbank Rehabilitation Project							
- IEC/meetings/conferences	Meeting	20	4	4	4	4	4
- Training and planning	Session	2	1	1	1	1	1
- Purchase of supplies and materials	Lumpsum						

Implementation Activities	Unit of Measure	Total target	Targets				
			Year 1	Year 2	Year 3	Year 4	Year 5
- Survey of degraded riverbanks and inventory of landowners	Survey	5	1	1	1	1	1
- Development and maintenance of riverbanks with food for work	Hectare	25	5	5	5	5	5
4. Mangrove Rehabilitation Project							
- IEC/meetings/conferences	Meeting	20	4	4	4	4	4
- Training and planning	Session	2	1	1	1	1	1
- Procurement of supplies and materials	Lumpsum						
- Inventory & assessment	Survey	4	1	1	1	1	0
- Purchase of agricultural supplies/seedlings	Pc.	6,000	1,200	1,200	1,200	1,200	1,200
- Development and maintenance of mangrove area with food for work	Hectare	10	2	2	2	2	2
- Hiring of casual personnel	Person	1	1	1	1	1	1
5. Disaster Prone Areas Management Project							
- IEC/meetings/conferences	Meeting	20	4	4	4	4	4

Implementation Activities	Unit of Measure	Total target	Targets				
			Year 1	Year 2	Year 3	Year 4	Year 5
- Training and planning	Session	2	1	1	1	1	1
- Purchase of agricultural supplies/seedlings	Pc.	30,000	6,000	6,000	6,000	6,000	6,000
- Purchase of supplies and materials	Lumpsum						
- Identification and delineation of hazard areas	Survey	30	6	6	6	6	6
- Development and maintenance of diaster prone area with food for work	Hectare	50	10	10	10	10	10
6. Cave Management Project							
- IEC/meetings/conferences	Meeting	20	4	4	4	4	4
- Training and planning	Session	2	1	1	1	1	1
- Purchase of agricultural supplies/seedlings	Pc.	3,000	600	600	600	600	600
- Purchase of supplies and materials	Lumpsum	0					
- Inventory and assessment	Survey	5	5	0	0	0	0
- Development and maintenance of cave sites with food for work	Hectare	15	3	3	3	3	3

Implementation Activities	Unit of Measure	Total target	Targets				
			Year 1	Year 2	Year 3	Year 4	Year 5
- Hiring of casual personnel	Person	1	1	1	1	1	1
<i>Strategic Objective 3: To Strengthen Provision of Basic Services to Upland/Coastal Settlers, Including Provision of Other Livelihood Opportunities.</i>							
1. Forest Nursery Management Project							
- Nursery construction/establishment	Building	2	1	1	0	0	0
- Training/Capacitation	Session	2	1	1	0	0	0
2. Apiary Management Project							
Training on Beekeeping	Session	2	1	1	0	0	0
Provision of Bee colony	Colony	4	2	2	0	0	0
3. Farm to Market Road Construction and Maintenance							
3.1 Maintenance of FMR in FFL	km	269.48	269.48	269.48	269.48	269.48	269.48
3.2 Rehabilitation/Upgrading of FMR in FFL	km	50	10	10	10	10	10

Implementation Activities	Unit of Measure	Total target	Targets					
			Year 1	Year 2	Year 3	Year 4	Year 5	
<i>Strategic Objective 4: To strengthen Local Institutional Capacity for Sustainable Forest Management.</i>								
1. Community Empowerment Management Project								
Training on forest protection/GAD, ERPAT, climate change, solid waste and other environmental related policies	Session	10	2	2	2	2	2	2
Procurement of supplies and materials	Lumpsum							
Production of IEC materials	Lumpsum							
2. Community-Based Bantay Gubat Management Project								
Training on forest protection and enforcement	Session	10	2	2	2	2	2	2
Procurement of supplies and materials	Lumpsum							
Production of IEC materials	Lumpsum							
3. Policy Advocacy Management Project								

Implementation Activities	Unit of Measure	Total target	Targets				
			Year 1	Year 2	Year 3	Year 4	Year 5
IEC/meeting/conferences	Meeting	20	4	4	4	4	4
Production of IEC materials	Lumpsum						
Procurement of supplies and materials	Lumpsum						
4. Land Survey and Mapping Management Project							
- Land Delineation/Boundary surveys	No. of LGUs	12	12	12	12	12	12
- Preparation of maps	No.	12	12	12	12	12	12
- Trainings/capacitation	No.	12	12	12	12	12	12
5. Monitoring and Evaluation Project							
Training	Session	2	2	2	2	2	2
Development of Mobile Application for M&E	Apps	1	1	0	0	0	0
Conduct of M&E	M & E	10	2	2	2	2	2

Table 19. FLUP Investment Cost

Implementation Activities	Total target	INVESTMENT COST				
		Year 1	Year 2	Year 3	Year 4	Year 5
<i>Strategic Objective 1: To establish forest production zones providing quality agricultural and forest product</i>						
1. Agroforestry Management Project	50 ha	675,000	675,000	675,000	675,000	675,000
2. Tree Plantation Management Project	250 ha	3,100,000	3,100,000	3,100,000	3,100,000	3,100,000
3. Rangeland Management Project	100 ha	850,000	850,000	1,225,000	1,375,000	1,450,000
<i>Strategic Objective 2. To increase forest cover in protected areas and stabilize riverbanks, geo-hazard and flood-prone areas.</i>						
1. Protected Area Management Project for Pantaron Mountain	1 ordinance	1,200,000	1,200,000	200,000	200,000	200,000
2. Community Tree Parks Management Project	50 ha	400,000	400,000	400,000	400,000	400,000
3. Riverbank Rehabilitation Project	25 ha	425,000	425,000	425,000	425,000	425,000
4. Mangrove Rehabilitation Project	10 ha	822,000	822,000	822,000	822,000	812,000

Implementation Activities	Total target	INVESTMENT COST				
		Year 1	Year 2	Year 3	Year 4	Year 5
5. Disaster Prone Areas Management Project	50 ha	880,000	880,000	880,000	880,000	880,000
6. Cave Management Project	15 ha	800,000	750,000	750,000	750,000	750,000
<i>Strategic Objective 3: To Strengthen Provision of Basic Services to Upland/Coastal Settlers, Including Provision of Other Livelihood Opportunities.</i>						
1. Forest Nursery Management Project			550,000	550,000		
2. Apiary Management Project	4 colonies	80,000	80,000			
3. Farm to Market Road Construction and Maintenance						
3.1 Maintenance of FMR in FFL	269.48	26.95	26.95	26.95	26.95	26.95
3.2 Rehabilitation/Upgrading of FMR in FFL	50	250	250	250	250	250
<i>Strategic Objective 4: To strengthen Local Institutional Capacity for Sustainable Forest</i>						

Implementation Activities	Total target	INVESTMENT COST				
		Year 1	Year 2	Year 3	Year 4	Year 5
Management.						
1. Community Empowerment Management Project	10 communities	200,000	200,000	200,000	200,000	200,000
2. Community-Based Bantay Gubat Management Project	10 trainings	200,000	200,000	200,000	200,000	200,000
3. Policy Advocacy Management Project	20 IECs	150,000	150,000	150,000	150,000	150,000
4. Land Survey and Mapping Management Project for FFL	12 LGUs	250,000	250,000	300,000	300,000	350,000
5. Monitoring and Evaluation Project for FFL	100% projects	250,000.00	150,000.00	150,000.00	150,000.00	150,000.00

