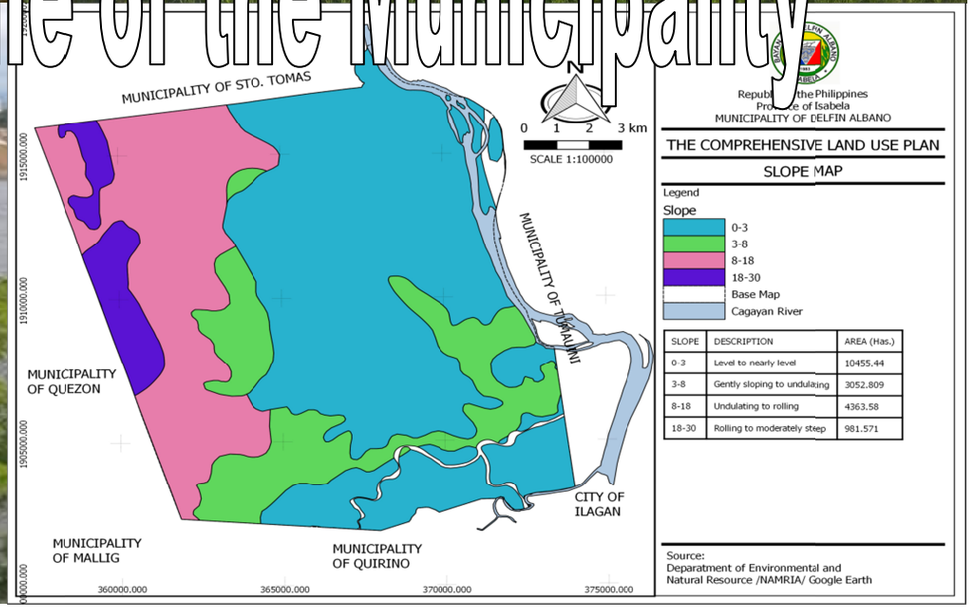
Part I - Brief Profile of the Municipality



SLOPE	DESCRIPTION	AREA (Has.)
0-3	Level to nearly level	10455.44
3-8	Gently sloping to undulating	3052.809
8-18	Undulating to rolling	4363.58
18-30	Rolling to moderately steep	981.571

PART I - BRIEF PROFILE OF DELFIN ALBANO, ISABELA

1.0 Brief History

One of the youngest towns created in the Province of Isabela is the town of Delfin Albano. It was created under Republic Act No. 2009 and had full operation in October 1957. It was then called Magsaysay in honor of the late President Ramon Magsaysay, who met his untimely death in March 17, 1957. The municipality of Magsaysay was established first in San Juan before it was finally established it in its present site in 1957 by the late Mayor Vicente P. Taccad. That same year the municipal boundaries were fixed at Calinaoan Sur in the north and San Macario in the south. In 1957 the town already included fifteen barangays, which were located mostly along the western part of the Cagayan River. Today, the number has increased to twenty-nine (29) barangays.

This new town was formerly a part of the town of Tumauini and its first inhabitants were believed to be descendants of Indonesians as seen from the physical characteristics of these people. Later in the early part of 1780 intermarriages between the Indonesians with the Malays took place and their offspring evolved the Kalinga speaking group and the Ibanag group. From 1780 to the later part of 1880 a strong rivalry between the Kalingas and the Ibanags took place. The Ibanags prevailed and this development forced the Kalingas to settle in the hills and the thick forest in the western side of this town. In the middle of 1880 the famous Ilocano pioneers from the Ilocos Region have set foot on the rich and fertile soil of this town. They began establishing their houses and several years later majority of them have already occupied the largest area of this town.

In 1982, Assemblyman Prospero Bello filed a bill changing the name of the municipality from Magsaysay to Delfin Albano. This is in honor of the late Delfin Albano, the lone Congressman for the lone District of Isabela in 1957 who authored Republic Act No.

2009 creating the municipality of Magsaysay. In November 14, 1982, Batasang Pambansa Blg. 291 was approved and in October 1, 1983 the municipality formally celebrated the installation of her new name the municipality of Delfin Albano.

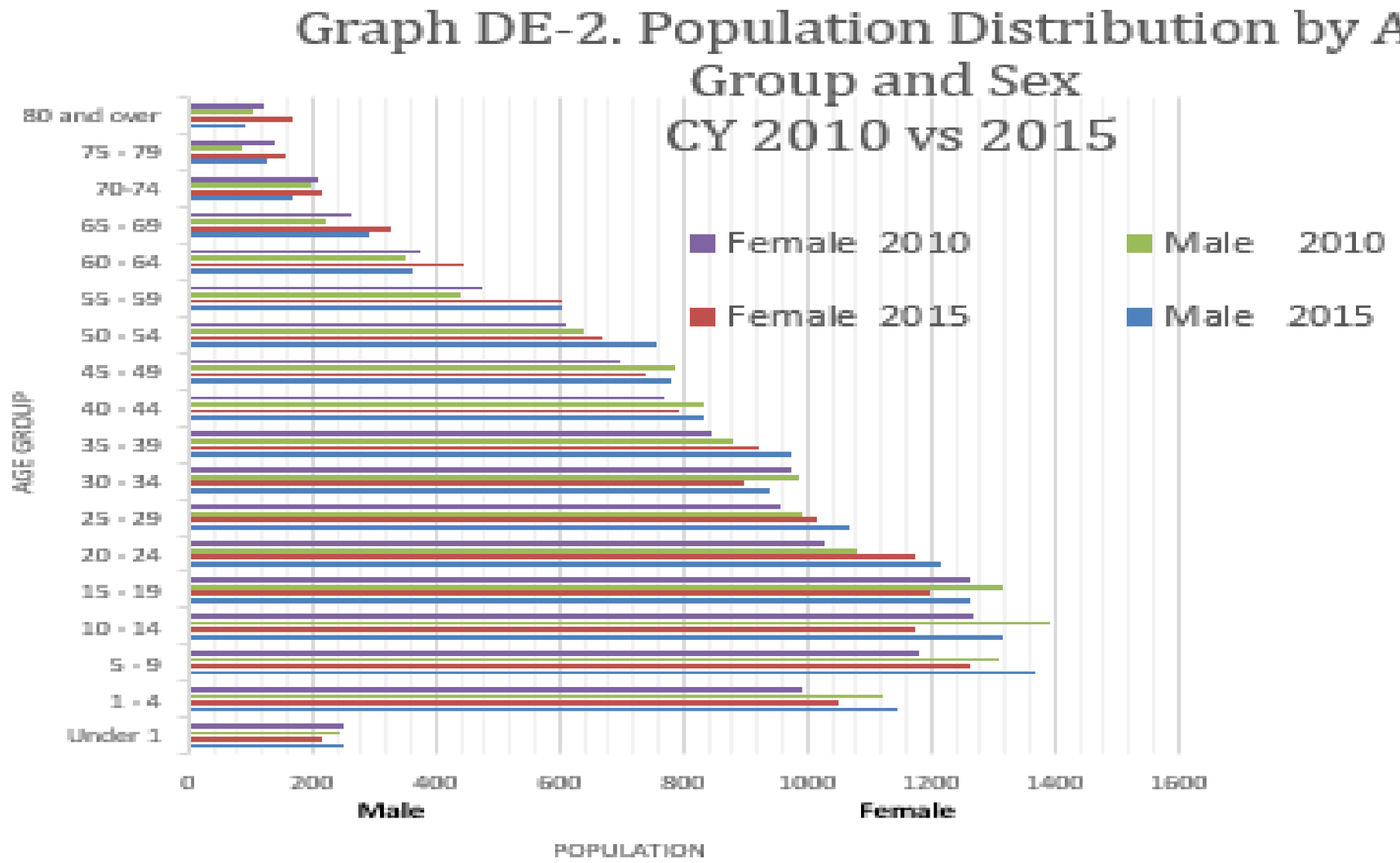
2. Human Resources

2.1 Population Distribution by Age-Group and Sex

A comparative analysis of population distribution by age-group and sex for two census

year 2010 and 2015 shows that there were population increases in both males and females in all age grouping with ages 1-24 having the highest share at about 47% and 46%, respectively. This is indicative of a young population for the whole municipality with ages 5-19 having the biggest population among ages 1-24.

Further revealed in Table DE-2 is that among the total females in the municipality, the population of child-bearing women (ages 15-49) was a an average of 52% of the total female population for both years indicating that with their number, population may increase massively if these reproductive females would not practice family planning methods. However when considering the municipal average growth rate (AGR) of 0.92% (year 2010-2015), population to balloon at tremendous speed may be not a concern if this AGR is maintained.


Graph DE-2. Population Distribution by Age Group and Sex
CY 2010 vs 2015
Female 2010
Male 2010
Female 2015
Male 2015
80 and over
75 - 79
70-74
65 - 69
60 - 64
55 - 59
50 - 54
45 - 49
40 - 44
35 - 39
30 - 34
25 - 29
20 - 24
15 - 19
10 - 14
5 - 9
1 - 4
Under 1
AGE GROUP
0
200
400
600
800
1000
1200
1400
1600
Male
Female
POPULATION

Graph DE-2 shows the age-sex structure of the population of Delfin Albano for two census year 2010 and 2015. For both years, the population of Delfin Albano is represented by an expansive pyramid because of the broad base, which means that a very large population belongs to the younger age belonging to 1-24 year old. . Expansive pyramid is brought upon by a high fertility rate since new births are being added to the population thus producing a broad-based age and sex distribution.

Table DE- 3. Household Population by Urban and Rural Barangay and Average Household Size, Year 2015

Barangay	Population	Number of Household	Average Household Size
Urban			
Ragan Sur	1,809	347	5
San Antonio	2,977	726	4
San Juan	1,790	491	4
Sub-Total	**6,576**	**1,614**	**4**
Rural			
Aga	897	219	4
Andarayan	1,310	328	4
Anep	1,555	398	4
Bayabo	987	256	4
Calaocan	687	147	5
Calinagan Sur	445	139	3
Capitol	797	192	4
Carmencita	1,355	366	4
Concepcion	408	141	3
Maui	794	233	3
Quibal	427	120	4
Ragan Almacen	314	84	4
Ragan Norte	599	147	4
Rizal	1,379	339	4
San Andres	505	168	3
San Isidro	533	144	4
San Jose	1,050	272	4
San Macario	552	136	4
San Nicolas	803	163	5
San Patricio	535	152	4
San Roque	324	84	4
Sto. Rosario	837	183	5
Santor	742	192	4
Villalux	966	247	4
Villa Pereda	759	182	4
Tiritecima	478	134	4
Sub-Total	**20,038**	**5,166**	**4**
Total	**26,614**	**6,780**	**4**

Source: PSA

2.2 Household Population by Urban and Rural Barangays, and Number of Household

Table DE-3 shows the household population in terms of urban and rural barangays. The municipality of Delfin Albano has three (3) urban barangays which are Ragan Sur, San Antonio, and San Juan with San Antonio being the most populated urban barangay. The remaining 26 barangays are all considered rural with Aneg as the most populated rural barangay and Ragan Almacen as the least populated. Urban dwellers compose 24.71% of the total population while 75.29% are rural dwellers

The total number of household for year 2015 is 6,780 of which 1,614 or 23.80% are urban households and 5,166 or 76.20% are rural households. The average household size ranges from 3-5 members averaging at 4 members per household at the municipal level.

Population density is the measurement of the number of inhabitants that make up a population in a defined area, in this case, the barangays of Delfin Albano. The population density of Delfin Albano can be seen in Table DE-5. In order to obtain the population density, the number of inhabitants should be divided by the gross area of the place. It can be seen in the table that the densest barangay in the municipality is San Andres at 1,559 inhabitants per square kilometer. All barangays that have reached the thousand mark in terms of population density are three (3) of the rural barangays. The population with the least density is barangay San Macario at 37 inhabitants per square kilometer. The population density of the province of Isabela for the same year is 130 inhabitants per square kilometer.

It is significant to identify the population density of an area to know if the resources within a specific area is enough to sustain the inhabitants living proximal to the area. Also, it can be used to plan for programs and projects which can aid in the conservation of resources to avoid going beyond the carrying capacity of the land.

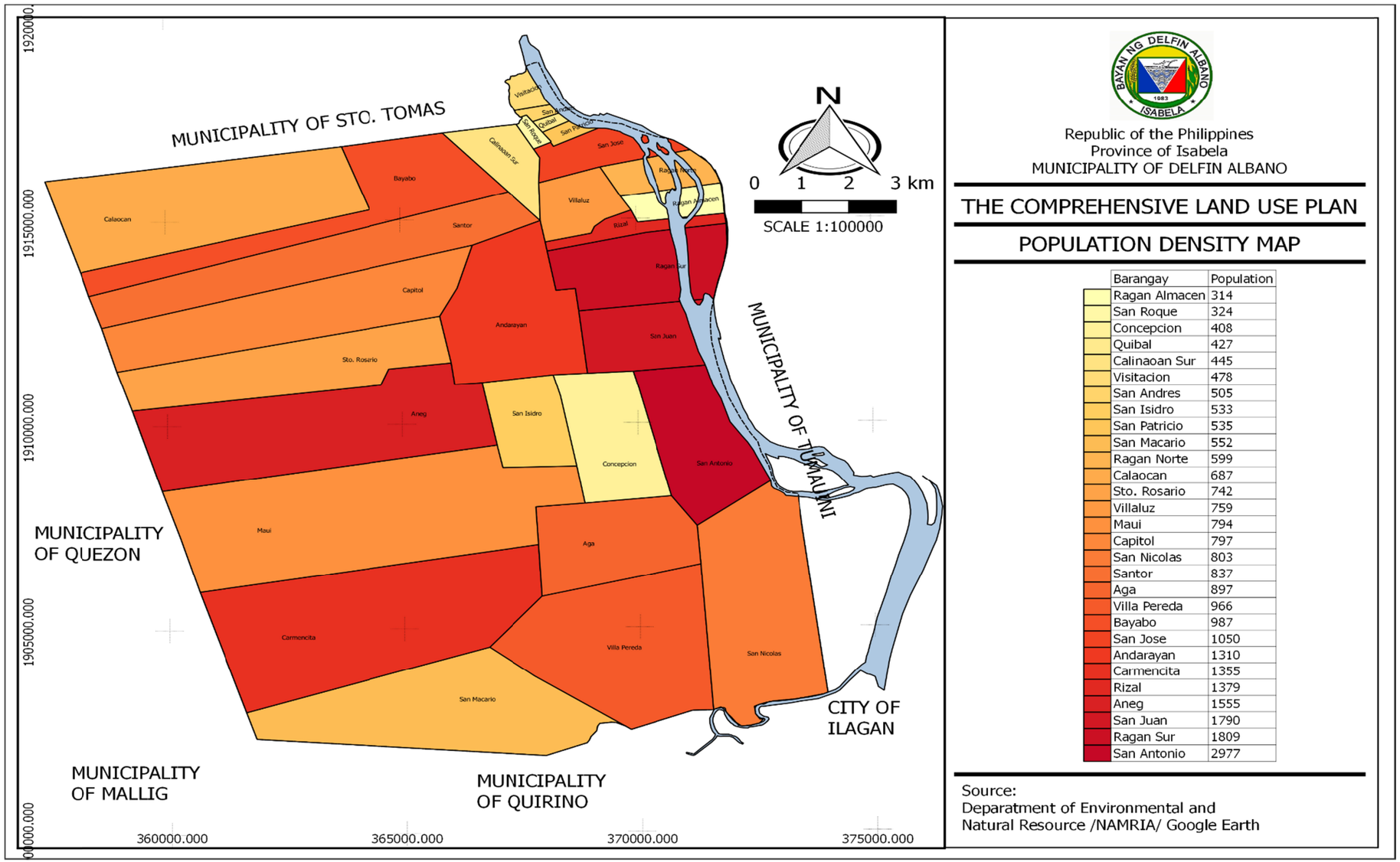
Table DE-5. Population Density by Barangay, Year 2015

Barangay	Population	Gross Area (sq. km)	Population Density (persons/sq km)	Population Density (Province)
Urban				
Ragan Sur	1,809	4.7655	380	
San Antonio	2,977	11.5464	258	
San Juan	1,790	4.1006	437	
Sub-Total	6,576	20.4125	322	
Rural				
Aga	897	6.9871	128	
Andarayan	1,310	3.7066	353	
Aneg	1,555	17.2863	90	
Bayabo	987	7.8669	125	
Caloocan	687	7.6605	90	
Calinaoan Sur	445	4.7051	95	
Capitol	797	15.3711	52	
Carmencita	1,355	24.5507	55	
Concepcion	408	3.755	109	
Maui	794	15.3033	52	
Quibal	427	0.3516	1214	
Ragan Almacen	314	0.5904	532	
Ragan Norte	599	1.367	438	

130 persons/square kilometer

Rizal	1,379	2.6696	517	
San Andres	505	0.3239	1559	
San Isidro	533	6.0588	88	
San Jose	1,050	2.0653	508	
San Macario	552	14.9134	37	
San Nicolas	803	4.7428	169	
San Patricio	535	0.401	1334	
San Roque	324	0.452	717	
Sto. Rosario	837	9.0023	93	
Santor	742	8.6575	86	
Villaluz	966	2.0066	481	
Villa Pereda	759	8.0024	95	
Visitacion	478	0.7431	643	
TOTAL	**26,614**	**189.9155**	**140**	

Source: PSA/MPDC



Map 1-1 Population Density Map

Map I-1 gives the visual representation of the population density of Delfin Albano as elaborated in Table DE-5.. It can be seen in the map that the urban barangays of the municipality have gross density ranging from 250-450 persons per square kilometer or an average of 322 persons per square kilometer or roughly 3-4 persons per hectare. This translate to the barangays having large spaces potential for settlements and other urban activities.

2.3 Historical Growth of Population As of 2015, Delfin Albano has a population of 26,614 which is at its highest since its inception. Table DE-6 further discusses the increase in the population of Delfin Albano from 1960 until 2015 vis a vis provincial, regional and national populations. It can be said that the municipality of Delfin Albano did not experience any decrease in the population. As to the provincial, regional and national data, it can be deduced that their respective population count experienced no decreases as reflected in the positive AAGRs.

The highest population growth rate was felt most by the municipality between years 1960 to 1980 at a 2.61% AAGR.
Between 1970 and 1975 has a population increase of 1,680 with an annual growth rate of about 2.31%. The 1975 and 1980census

Table DE-6. Historical Growth of Population

Year	Population	Increase/Decrease	Annual Growth Rate (%)			
	Total	Total	Municipal[3]	Provincial[1]	Regional[1]	National[1]
1960	10,742					
1970	13,905	3,163	2.61	3.91	3.7	2.87
1975	15,585	1,680	2.31	2.42	2.62	2.75
1980	17,725	2,140	2.61	3.57	2.75	2.66
1990	20,410	2,685	1.42	2.18	2.01	2.33
1995	21,811	1,401	1.34	1.46	1.51	2.32
2000	23,619	1,808	1.61	2.10	2.25	2.36
2007	24,899	1,280	0.76	1.22	1.16	2.21
2010	25,422	523	0.70	2.05	1.92	1.11
2015	26,614	1,192	0.92	1.36		

Source: NSO/PSA

year revealed a net population increase of 2,140 with growth rate of 2.61%.

Between years 1980 and 2000, the municipality continued to grow although with an AAGR lower than the previous census years and averaging between 1.34-1.61%. The turn of the twentieth century showed lowered AAGRs for the municipality manifesting low population growth at a range of 0.76-0.92%.

The table below shows the different Average Annual Growth Rate (AAGRs) in the population of Delfin Albano at specific census years. The AAGR of Delfin Albano from 2010 - 2015 is at 0.92%. With this growth rate, the municipality is expected to double its population in seventy-five (75) years.

Graph DE-6 shows the apparent increasing trend in the population of Delfin Albano since the 1960s. It further illustrates the different AAGRs at the municipal, provincial, regional and national levels.

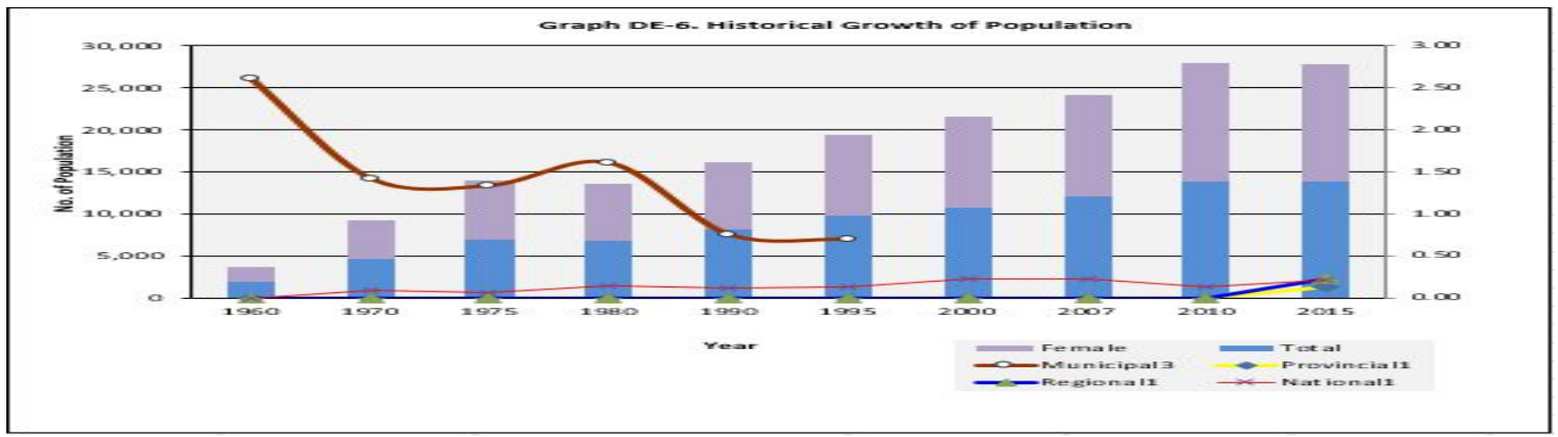


Table DE-12 reflects the labor force and employment of the municipality and the province.

The municipality's labor force or those belonging to ages 15 and above totaled to 18,818 of which 10,828 (57.5%) are gainfully employed. From the gainfully employed, 85.6% are males and 29% are females. Unemployed labor force totaled to 42.5%. There are more non-economically active females than the male labor force. In fact, only 14.4% of the total males 15 years old are unemployed as against 71% of the total female population 15 years old and over. This numbers show that the females in the municipality focus on managing their household rather than earning money. This dynamic is common among Filipino households as the father, who is the head of the family, is the breadwinner while the mother takes care of all household related activities.

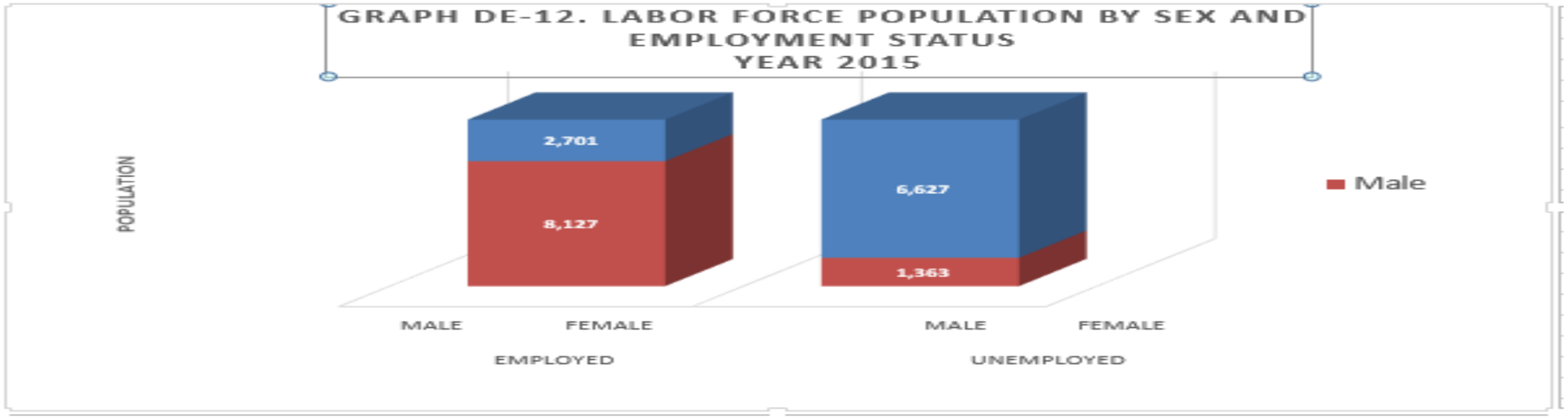
At the provincial level, employment rate is slightly above the municipal level by 3.2% hence a reduced unemployment rate by 3.2%. Generally those unemployed or the non-economically active population of the labor force consist of full-time housewives,

Table DE-12. Labor Force Population by Sex and Employment Status, Year 2015

Sex	Municipal					Provincial				
	Population 15 Yrs and Over	Employed	%	Unemployed	%	Population 15 Yrs and Over	Employed	%	Unemployed	%
Male	9,490	8,127	85.6	1,363	14.4	562,119	469,698	83.6	92,421	16.4
Female	9,328	2,701	29.0	6,627	71.0	546,168	203,368	37.2	342,800	62.8
Both Sexes	18,818	10,828	57.5	7,990	42.5	1,108,287	673,066	60.7	435,221	39.3

Source: PSA

students, retirees and other similarly-situated people.



2.4 Projected Population and Households

Following the arithmetic geometric progression tool, the projection of the population for the next ten (10) years is based on the 2010-2015 Average Annual Growth Rate (AAGR) of 0.92%. From 26,614, it is expected to increase to 29,706 in year 2027.

The municipal population is expected to doubling in 75 years from 2015 or in year 2090.

For the total projected household at the targeted average household size of four (4) members per household, it is expected to grow by 646 households or a total of 7,426 households in year 2027.

Table DE- 15. Projected Population and Households

Annual Population Growth Rate: **0.92 %**

Average HH size: **4.00**

Year	Population	Household
2015	26,614	6,780
2016	26,859	6,715
2017	27,106	6,776
2018	27,355	6,839
2019	27,607	6,902
2020	27,861	6,965
2021	28,117	7,029
2022	28,376	7,094
2027	29,706	7,426

Source: NSO/PSA

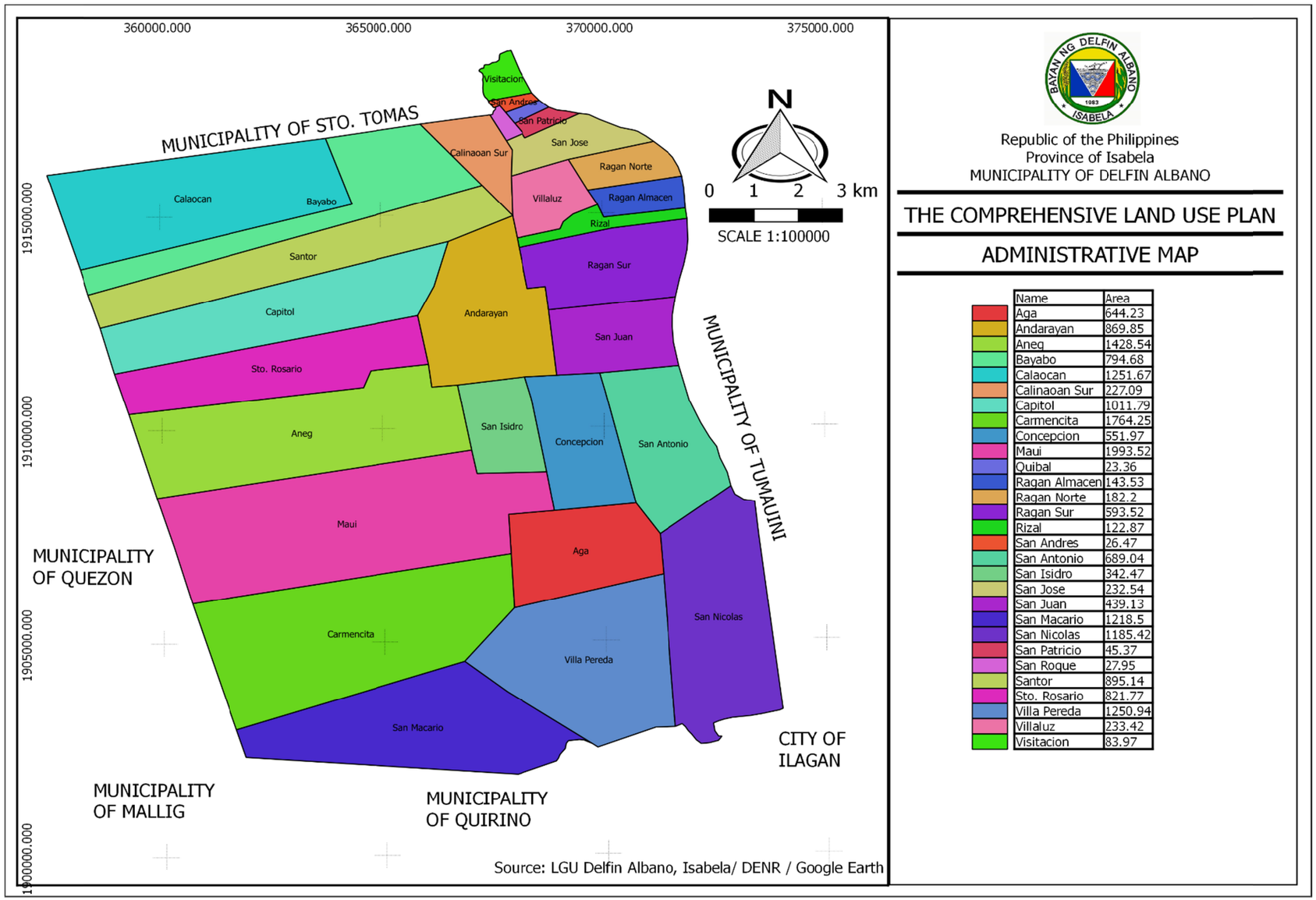
3. Physical Features

3.1 Geographical Location

The municipality is composed of twenty-nine (29) barangays and seven sitios. Map 1 shows the boundaries of barangay in Delfin Albano. Barangay Ragan Sur is the seat of Government that is centrally located along the Provincial / National Road from Ilagan and Mallig to Delfin Albano to Santo Tomas and Santa Maria this province.

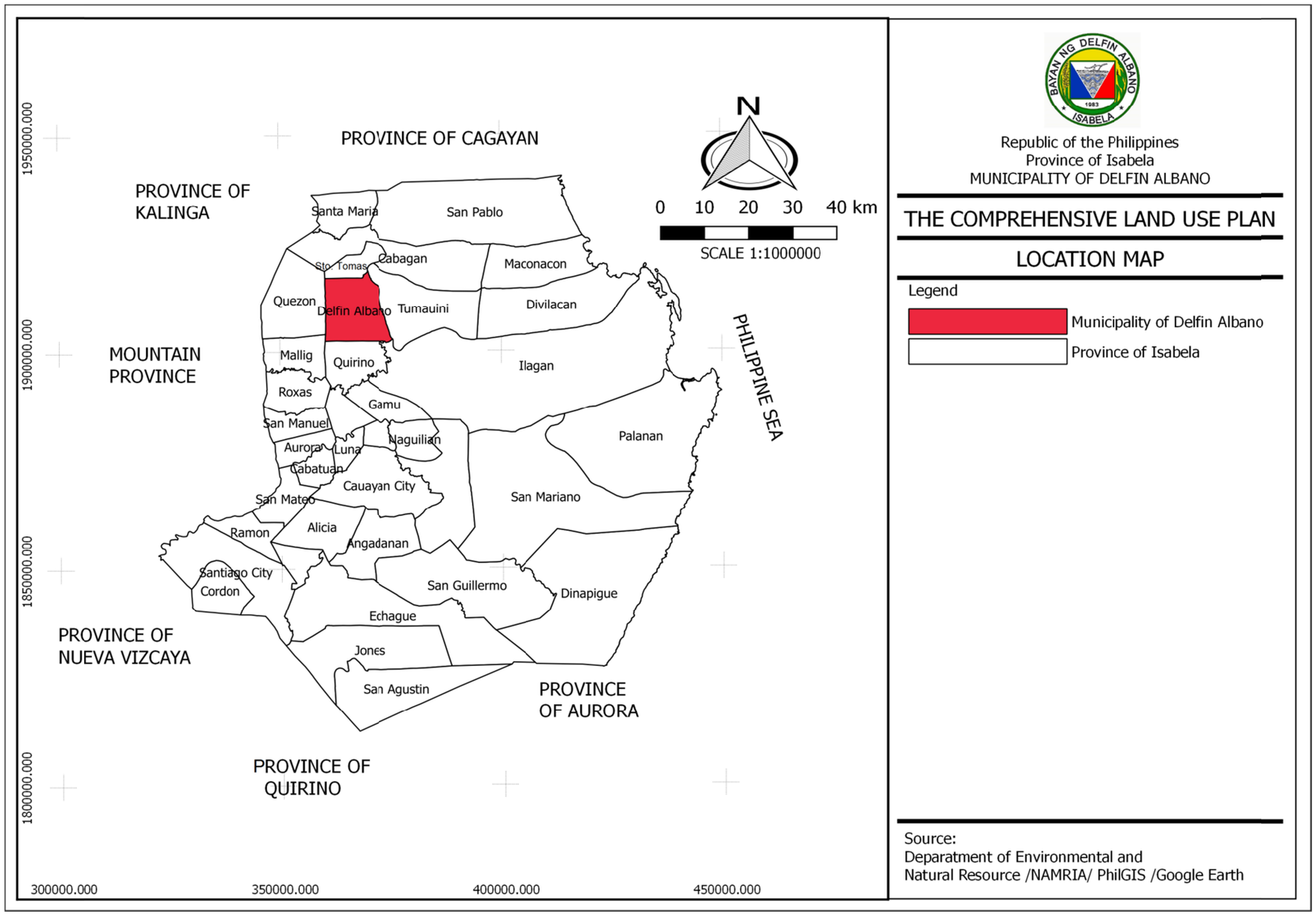
Delfin Albano is located some 35 kilometers, northwest of Ilagan, the capital town of the Province. It is bounded on the north by the municipality of Sto. Tomas, on the east by the municipality of Tumauini, the Cagayan River as the natural boundary, on the west by the municipalities of Quezon and Mallig and on the south by the municipalities of Quirino and Ilagan with Mallig River as natural boundary. The boundaries of Delfin Albano against its neighboring municipalities can be seen in Map 2.

Delfin Albano is subdivided into two (02) physiological areas namely the Eastern Area long the Cagayan River which is good for intensive agriculture and high density urban development as the western area along the mountain range which is good for intensive agriculture, pasture and forest purposes.

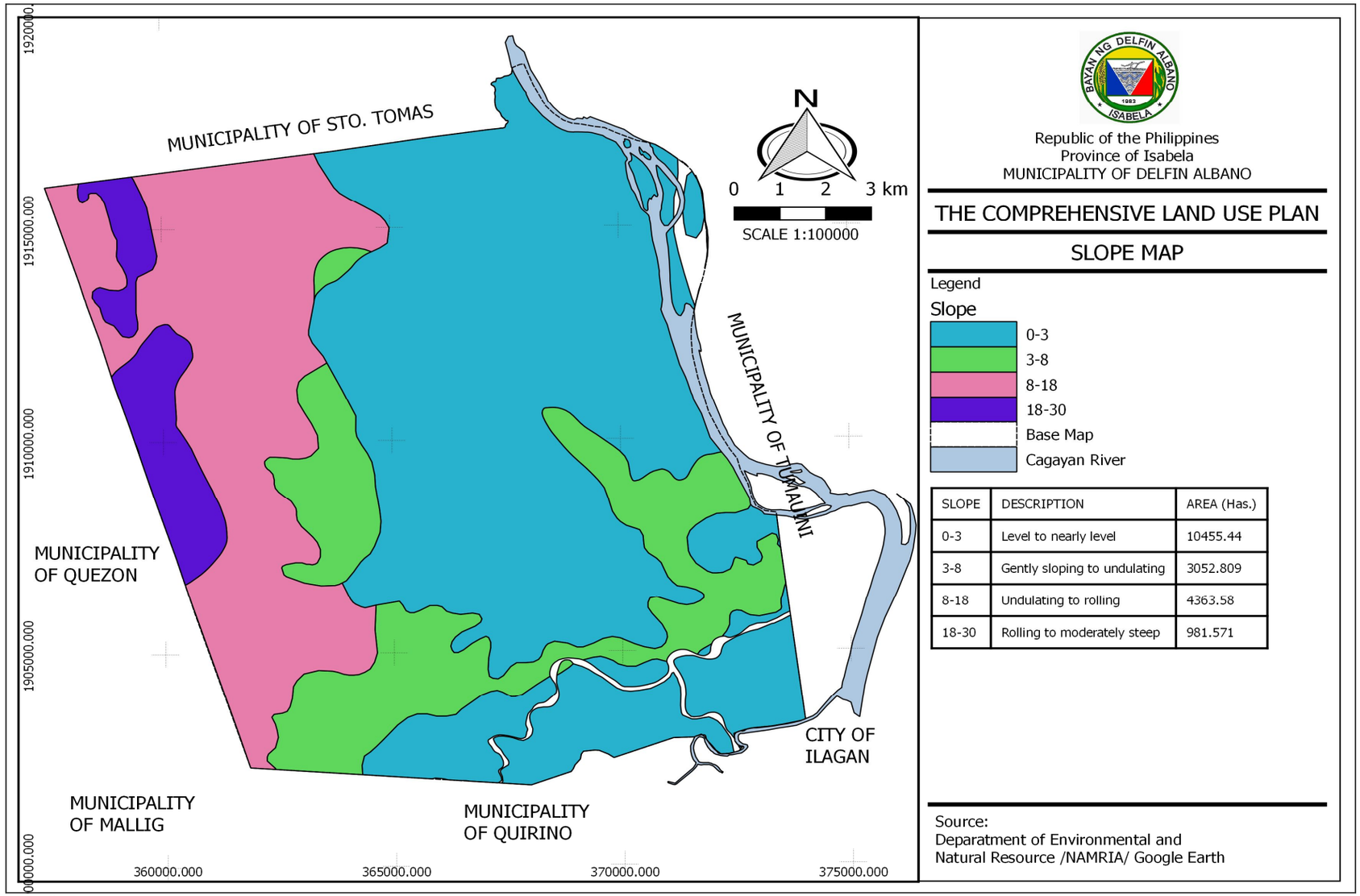


Name	Area
Aga	644.23
Andarayan	869.85
Aneg	1428.54
Bayabo	794.68
Calaocan	1251.67
Calinaoan Sur	227.09
Capitol	1011.79
Carmencita	1764.25
Concepcion	551.97
Maui	1993.52
Quibal	23.36
Ragan Almacen	143.53
Ragan Norte	182.2
Ragan Sur	593.52
Rizal	122.87
San Andres	26.47
San Antonio	689.04
San Isidro	342.47
San Jose	232.54
San Juan	439.13
San Macario	1218.5
San Nicolas	1185.42
San Patricio	45.37
San Roque	27.95
Santor	895.14
Sto. Rosario	821.77
Villa Pereda	1250.94
Villaluz	233.42
Visitacion	83.97

Map 1. Administrative Map



Map 2 . Location Map



SLOPE	DESCRIPTION	AREA (Has.)
0-3	Level to nearly level	10455.44
3-8	Gently sloping to undulating	3052.809
8-18	Undulating to rolling	4363.58
18-30	Rolling to moderately steep	981.571

Map 3. Slope Map

3.2 Slope

The town center of Delfin Albano is generally flat, as seen in Map 3. Rolling terrains with low-lying elongated ridges defined the eastern portion of the town. The Cagayan River serves as the main tributary with other minor tributaries draining towards it, resembling a dendritic pattern typifying the drainage system in this part of the Cagayan Valley Basin.

The town has also three (03) slopes classifications prevailed, which is displayed in Map 3. The 0-3% slope found on the level land ranging from the north to the southern part of the town. The 3-8% slope found adjacent the level land ranging from the north to the southwestern part of the town and the 8-15% slope found at the forest area ranging from north to south at the northwestern part of the town. The foregoing data revealed that the municipality has vast potentials for agricultural lands.

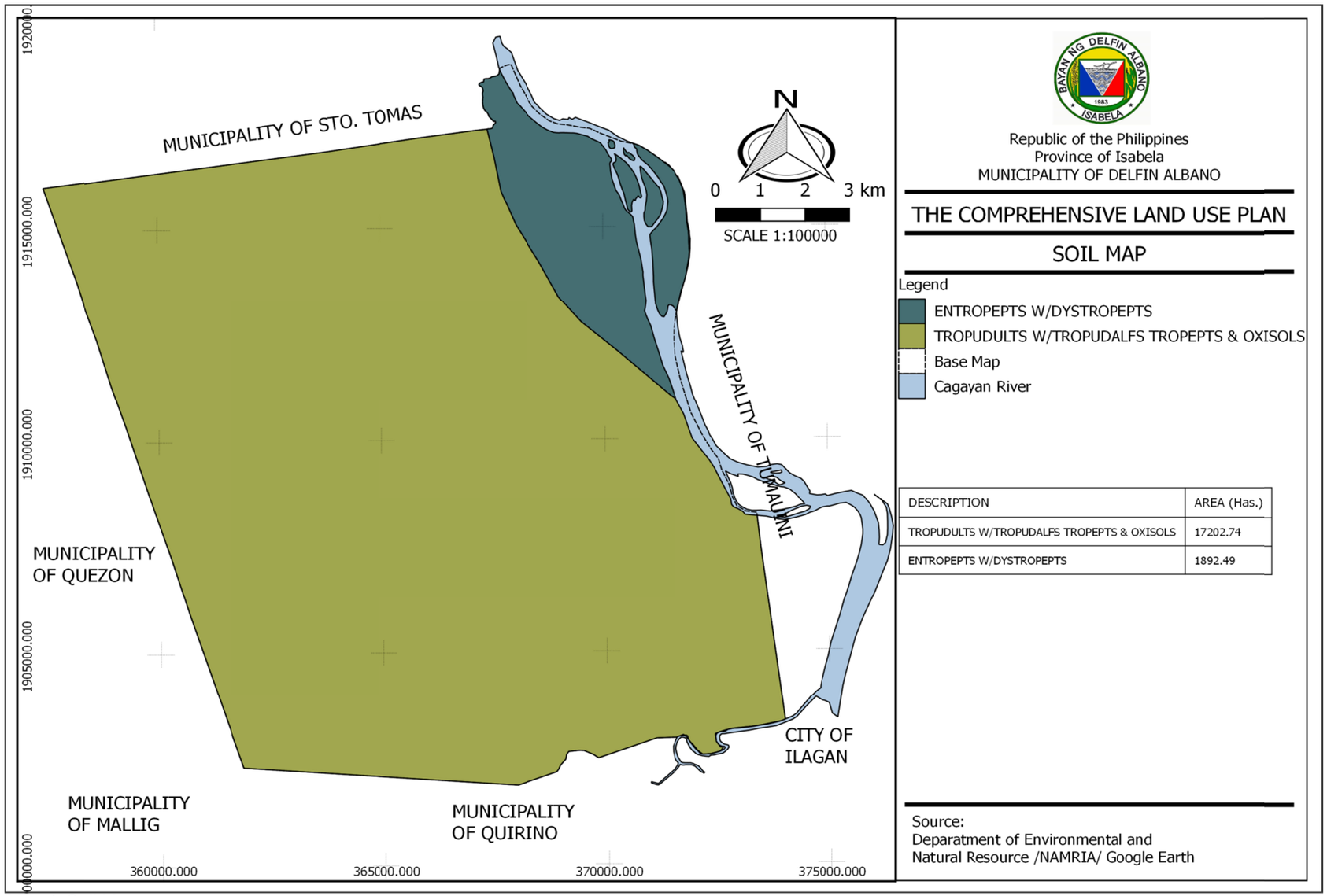
3.3 Geology

It was revealed that Delfin Albano has only one geological classification which is classified as Marly Limestone's and poorly consolidated sediments. The central and northern part of Cagayan Valley including Delfin Albano is generally underlain by thick sequence of fine to coarse-grained sedimentary units belonging to the Ilagan Formation.

It grew along the banks of mighty Cagayan River and swift of Mallig and Siffu River. The town has no indication of any existing or probable fault line and has artesian aquifer at 12-39 meters that are recharged continuously.

3.4 Climate

Delfin Albano is nestled in the verdant Cagayan Valley. It is protected by the Sierra Madre in the east, the Cordilleras in the west and by the far-off Caraballo Mountain in the south. The town is located in the typhoon belt of the Philippines and generally has the third type of climate which is characterized by no pronounced maximum rain period with a short day season lasting from one to three months. In this type, rainfall starts in July and continues through January with either October to November as the peak of the rainy season. The locality of this type is partly sheltered form the northwest monsoon and trade winds and open to the southeast monsoon or at least to frequent cyclonic storms.



Map 4. Soil Map

3.5 Soil Types

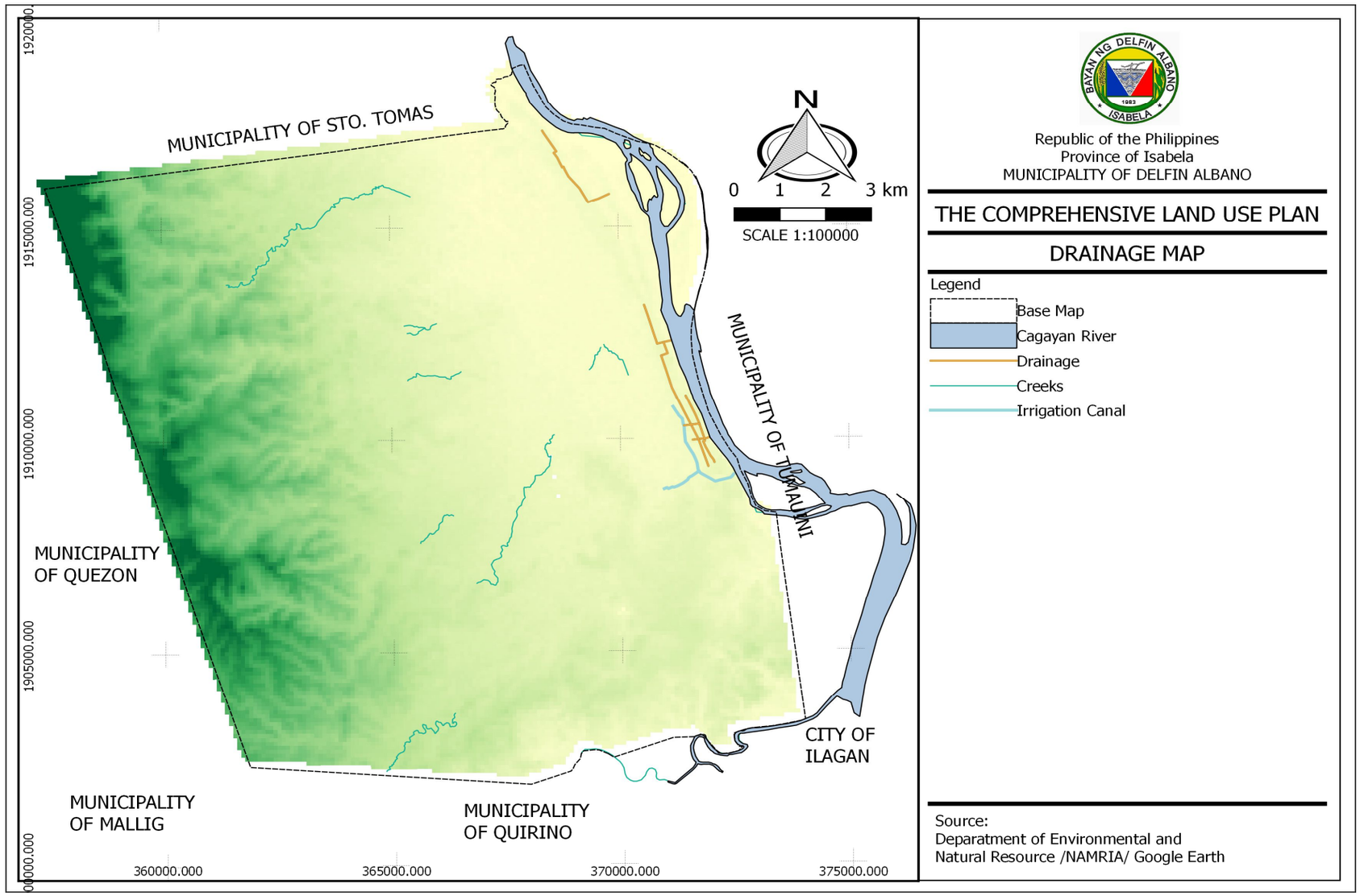
The municipality has three (3) soil types according to the Department of Agriculture-Soil Management Bureau. The San Manuel Sandy Loam which are found on the eastern part, the Quingua Silty Clay which is found on the south eastern part and the San Juan Clay which is found on the western part of the town. Map 4 shows the different soil types found in the municipality of Delfin Albano.

Delfin Albano is subdivided into two (02) physiological areas namely the Eastern Area long the Cagayan River which is good for intensive agriculture and high density urban development as the western area along the mountain range which is good for intensive agriculture, pasture and forest purposes.

3.6 Drainage

Drainage wise, the presence of the Cagayan River which serves as an emptying portion of the municipality is of great help especially during floods and rainy season. These are several creeks which aid in the drainage of various agricultural areas in the municipality. The drainage system of Delfin Albano can be observed in Map 5. It can be observed in the map that most drainage canals are located in the western part of the municipality.

The municipality of Delfin Albano has the third type of climate which is characterized by no pronounced maximum rain period with a short dry season lasting from one to three months. In this type, rainfall starts in July and continuous through January with either October to November as the peak of the rainy season. The locality of this type is partly sheltered from the northwest monsoon and trade winds and open to the southeast monsoon or at least to frequent cyclonic storms. The annual average rainfall recorded for the past five (5) years was 2,376.18 mm from 2006 to 2010 and a maximum rainfall of 198.014mm.



Map 5. Drainage Map

3.7 Temperature

Temperature is hot and humidity is high the year round within Delfin Albano. Observation shows an annual mean temperature of 21.34 degrees Centigrade, a mean maximum of 30.07 degrees Centigrade within the municipality, based on a five (5) years period from 2006-2010. Evaporation is high the year round within Delfin Albano except for the month of November, December and January. Observation shows an annual average of 126.54 mm from the period 2006-2010. Wind velocity is relative normal the year round except when tropical storm hit the area. Observations show an annual average wind velocity of 33.7534 kph from the period 2006-2010.

4. Disaster Report Assessment

4. Disaster Risk Assessment and Disaster Management

The office of the Municipal Mayor directed the office of the Municipal Planning and Development Coordinator, together with the members of the Municipal Disaster Risk Reduction Management Committee to conduct a Planning Workshop to generate Disaster Risk Assessment Report (DRA) in Land Use Planning and produce important data and informations which shall form an integral part of this Plan.

Whatever data produced on the said workshop shall serve as basis for understanding implications of current and future land management and development which shall guide planners and policy makers in determining responsive and appropriate actions and interventions in reducing risks to properties and life.

To be more precise as to the output this assessment includes a four-step process namely hazard characterization, consequence analysis, risk estimation and risk evaluation and Disaster Risk Management Matrix which will be discussed one after the other in this portion of this plan.

4.1 Hazard Characterization

This step involves the assessment of past disaster events and current observations affecting the planning area to determine the pattern of occurrence over time such as: the preparation of an inventory of hazards affecting the municipality by collecting geo-hazard maps and climate related maps and the identification of all natural hazards that this LGU is prone to such as those presented in Table A.

Table No A : Checklist of Hazards

BARANGAY	HYDRO-METEOROLOGICAL			CLIMATE			
	FLOOD	LANDSLIDE	TYPHOON	SOIL EROSION	EARTHQUAKE	LIQUEFACTION	Drought
Aga			/				/
Andarayan			/				/
Aneg		/	/				/
Bayabo		/	/				/
Calaocan		/	/				/
Calinaoan Sur	/		/	/			/
Capitol		/	/				/
Carmencita		/	/				/
Concepcion			/				/
Maui		/	/				/
Quibal	/		/	/			/
Ragan Almacen	/		/	/			/
Ragan Norte	/		/	/			/
Ragan Sur			/	/			/
Rizal			/				/
San Andres	/		/	/			/
San Antonio			/	/			/
San Isidro			/				/
San Jose			/	/			/
San Juan			/	/			/
San Macario			/				/
San Nicolas			/	/			/
San Patricio	/		/	/			/
San Roque	/		/	/			/
Santor		/	/				/

Sto. Rosario		/	/				/
Villa Pereda			/				/
Villaluz			/	/			/
Visitacion	/		/	/			/

The Mines and Geo-hazards Bureau has identified eleven (8) barangays are expose to flooding, one (8) barangay within rain-induced landslide areas, twelve (14) barangays are experiencing soil erosion hazard. As emphasized from the table above, the common hazard is flood, the most affected areas are barangays situated along the Cagayan River. The municipality of Delfin Albano is located in the eastern part of the mighty Cagayan river, where eight (8) barangays of the municipality namely San Nicolas , Ragan Sur, (northern and Eastern part), Ragan Norte, Ragan Almacen, San Patricio, San Andres, Quibal, Visitacion, San Roque and Calinaoan Sur are located. These barangays are directly experiencing flood due to the overflowing waters from the Cagayan River most especially during typhoons and heavy downpour of rain. Some part of the Municipality, especially barangay San Isidro, due to its geographical location also experiencing flood.

The eight (8) Barangays experiencing rain induced landslides as these are located on the hilly portion of the western part of this Municipality are Aneg, Bayabo, Calaocan, Capitol, Carmencita, Maui, Santor, Sto. Rosario. The areas affected have higher elevations and with moderately steep slopes. The landslides are rain-induced and it only happens during very strong typhoons and heavy rainfall.

The Municipality of Delfin Albano has fourteen (14) Barangays prone to soil erosion namely; San Nicolas, San Antonio, San Juan, Ragan Sur, Ragan Norte, Ragan Almacen, Villaluz, San Jose, San Patricio, Calinaoan Sur, Quibal, San Andres, Visitacion, San Roque, these barangay are located along the Cagayan River. As we know soil erosion is a major problem for environment. However there are some ways to decrease this rate of erosion, one of the most common soil erosion prevention methods is vegetation. Plants established road system, which in the long run stabilizes the soil thereby preventing erosion.

Typhoons that hit the region are at an average of nine (9) typhoons per year the municipality and at least three (3) having a landfall. The municipality is unfortunately not spared from this yearly occurrence.

Droughts are common every year and the whole municipality experiences the harsh effects of not having adequate water supply especially among the agriculture sector.

Drought is when a region receives below average precipitation, resulting in prolonged shortage in its water supply, whether atmospheric, surface or ground water. A drought can last for a couple months. It can have a great or substantial impact on the ecosystem and agriculture of the affected region. Although droughts can persist for several years, even a short, intense drought can cause significant damage and harm to the local economy. Annual dry season in the tropics significant increase the chances of a drought developing and subsequent forest fires.

CLASSIFICATION OF DROUGHT

Meteorological drought: "A period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area." (Huschke, R.E., ed., 1959, Glossary of meteorology: Boston, American Meteorological Society, 638 p.)

Agricultural Drought: "A climatic excursion involving a shortage of precipitation sufficient to adversely affect crop production or range production." (Rosenberg, N.J., 1979, Drought in the Great Plains- Research in Great Plains Drought Management Strategies, University of Nesbraska, Lincoln, March 26-28: Littleton, Colorado, Water Resources Publications, 225 p.)

Hydrologic Drought:" A period of below average water content in streams, reservoirs, Groundwater aquifers, lakes and soils." (Yevjevich Vujica, Hall, W.A., and Salas, J.D, Eds., 1977, Drought research needs, in proceeding of the Conference on Drought Research Needs, December 12-15, 1977: Colorado State University, Fort Collins, Colorado, 276 p.)

HISTORICAL DATA OF HAZARDS AND DISASTERS

Table B Historical Data of Typhoon, Drought and Flood Events

DATE OF OCCURRENCE/TYPHOON	NO. CASUALTIES	NO. FAMILIES/PERSONS AFFECTED	NO. OF HOUSES DAMAGED	DAMAGE TO PROPERTIES			
				LIVESTOCK AND POULTRY	CROPS	FISHERY	INFRASTRUCTURE
Nov. 2011 Flood	0	1262	0	-	150,121,000.00	-	
July 2012 Drought	0		0	-	23,712,000.00	-	-
Aug. 2012 Flood	0	1262	0	-	9,412,000.00	-	
Oct. 2011 Typhoon Kiel	0	200	0	-	8,019,200.00	-	
Dec. 2012 Flood	0	200	0	-	1,724,000.00	-	-
Dec 2011 Flood	0	200	0	-	5,171,200.00	-	-
March 2012 Drougth	0		0	-	576,000.00	-	-
June 2012 Flood	0	200	0	-	12,694.00	-	-

June 2013 Drought	0		0	-	497,760.00	-	-
Aug. 2013 Typhoon Labuyo	0		0	-	1,789,200.00	-	
June 2014 Drought	0		0	-	35,452,880.00	-	
Sept. 2014 Typhoon Luis	0	200	0	-	11,117,551.43	-	
June 2015 Drought	0		0	-	11,354,120.00	-	-
Dec 2015 Typhoon Nona	0	14041	4006	45,600.00	79,561,880.00	-	
2015 Typhoon Lando	0	259	0	-		-	9,705,000.00
Dec 2015 Flooding	0	496	0	-	15,623,946.00	-	
Oct 2016 Typhoon Lawin	0	9172	2041	136,900.00	124,909,300.00	381,000.00	10,500,000.00
Total	**0**	**27,492**	**6,047**	**182,500.00**	**479,054,731.43**	**381,000.00**	**20,205,000.00**

As apparently shown in the above table, the major damaged incurred by the Municipality in the past six years is in the field of agriculture amounting to Php 479,054,731.43 followed by Infrastructures amounting to Php 20,205,000.00, Fishery amounting to Php 381,000.00 and lastly on Livestocks amounting to Php 182,500.00.

CLIMATE PROJECTION FOR 2020

Based from table below, by 2020, the projected Mean Temperature from September to February will be 0.8 degrees Centigrade, from March to May will be 1.0 degree Centigrade and from June to August will 0.9 degrees Centigrade.

The same table shows the rainfall percentage by 2020. From December to February, projected rainfall measurement will be 6.9%, March to May will be 3.6%, June to August will be 2.9% and September to November will be 16.3%.

The impact of climate change projection/scenario to the locality's existing hazard situation/disaster risk areas are discussed below.

Table C: PAGASA Seasonal temperature

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

PROVINCES	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 2												
CAGAYAN	24.5	28.1	28.9	27.1	0.8	1.0	0.9	0.8	2.0	2.2	2.0	1.8
ISABELA	24.1	27.9	28.7	26.8	0.8	0.9	0.9	0.8	2.0	2.1	2.1	1.9
NUEVA VIZCAYA	22.3	25.1	25.4	24.4	0.9	1.0	0.9	0.9	2.0	2.1	1.9	1.9
BATANES	23.0	26.7	28.8	26.9	0.7	0.6	0.6	0.7	1.8	1.6	1.4	1.5
QUIRINO	23.7	26.8	27.6	26.2	0.9	1.0	1.0	0.9	2.0	2.2	2.0	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

PROVINCES	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 2												
CAGAYAN	284.4	207.7	538.4	832.1	6.9	-3.6	2.9	16.3	14.6	-23.3	0.9	-1.0
ISABELA	412.2	325.0	530.8	867.0	3.9	-8.6	5.1	13.5	25.1	-29.2	8.7	1.7
NUEVA VIZCAYA	180.9	416.8	1149.8	880.5	-3.5	-8.6	20.1	9.8	-7.8	-23.6	36.1	-0.5
BATANES	531.1	354.5	928.7	1057.8	-2.1	-7.8	6.4	-14.4	-4.9	-4.4	10.2	-7.4
QUIRINO	419.0	465.9	776.4	957.9	-5.7	-18.2	9.7	6.1	-0.9	-33.9	12.9	-5.8

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
CAGAYAN	Aparri	273	1276	2403	8156	6498	6770	16	33	24
	Tuguegarao	2769	3930	5119	8573	6513	6580	6	25	22
BATANES	Basco	51	1	24	7038	5112	5315	17	13	20

Note:

- For northern Cagayan, use values of Aparri.
- For southern Cagayan, use values of Tuguegarao.
- For Isabela, use values of Tuguegarao.
- For Nueva Vizcaya, use values of Tuguegarao.
- For Quirino, use values of Baler (page 32).

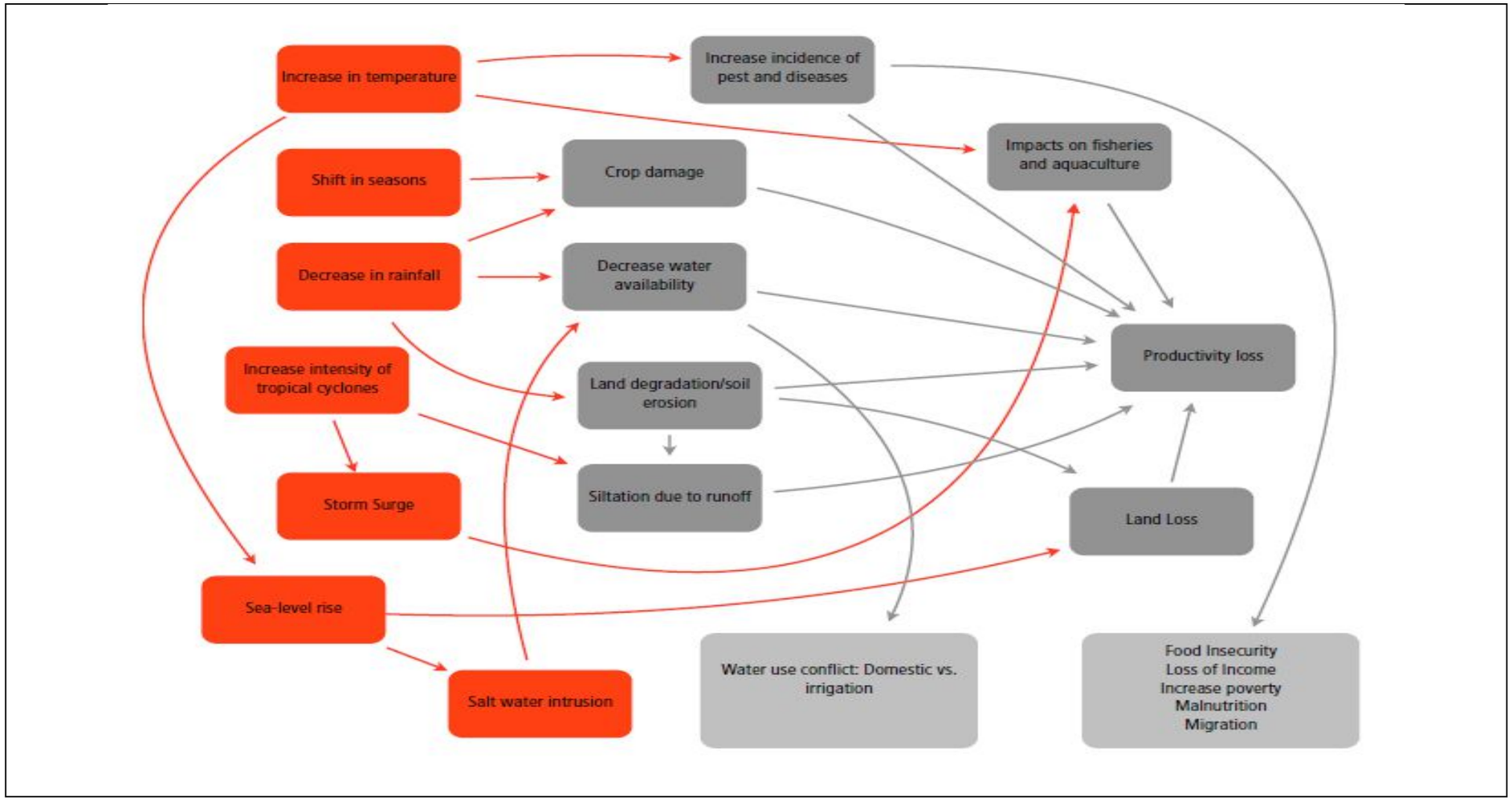
Impact Chain Analysis:

Flood is a consequences of typhoon which causes the flooding of production areas for crops as well as residential areas. This will surely result in loss of food supply as well as the interrupted services due to damaged facilities, thereby resulting to loss of income, increased poverty, morbidity and mortality. Floods further caused damage to trees and other vegetation's resulting thereby in the increase of temperature as a result of which it causes drought and scarcity of water. An additional impact that may arise in increased temperature would result in tropical cyclone and precipitation, leading to landslides which will damage trees and bury lowland/settlement areas, bury production areas and would surely result in increased morbidity and mortality.

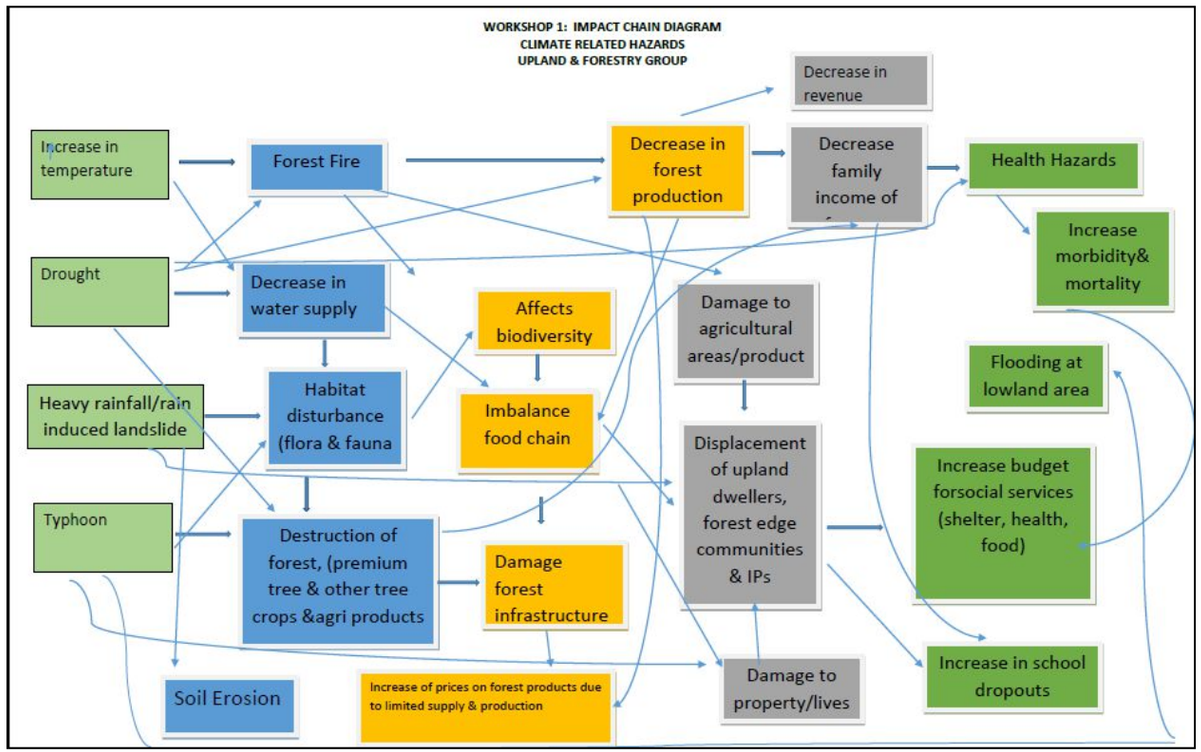
Furthermore, increased temperature would also result in the rise of sea level resulting in water loss and flood. Flood will damage production areas and other facilities resulting in loss of food supply and cut-off services of damaged facilities, respectively. There will be loss of income and increased morbidity and mortality in the locality.

It is of paramount importance to plant trees in the forest area of the municipality preferably those endemic to the locality in order to increase the water holding capacity of the environment to prevent the occurrence of tropical cyclone, precipitation, floods, landslides and drought.

IMPACT CHAIN ANALYSIS (Increase in Temperature)



IMPACT CHAIN ANALYSIS



4.2 LIKELIHOOD AND SEVERITY OF CONSEQUENCE OF A HAZARD PER BARANGAY

Using the Likelihood Score Table and the Consequence Severity Score to arrive at the Risk Score based from the Specific Criteria of Consequences, or in simpler equation, that is, Risk = Likelihood of Hazard x Severity of Consequences, the tables below scored per hazard event express the severity of consequences of the different hazards in each barangay.

Consequence Severity and Risk Score

No (A)	Area of Concern (B)	Likelihood Score (Hazard) (D)	Consequence Severity Score (E)			Risk Score (F)		
Flood	Barangay Name		Human	Property	Operational	Human (D) x (E)	Property (D) x (E)	Operational (D) x (E)
	Aga	1	2	1	1	2	1	1
	Andarayan	1	2	1	1	2	1	1
	Aneg	1	2	1	1	2	1	1
	Bayabo	1	2	1	1	2	1	1
	Calaocan	1	2	1	1	2	1	1
	Calinaoan Sur	6	4	4	4	24	24	24
	Capitol	1	2	1	1	2	1	1
	Carmencita	1	2	1	1	2	1	1
	Concepcion	1	2	1	1	2	1	1
	Maui	1	2	1	1	2	1	1
	Quibal	6	4	4	4	24	24	24
	Ragan Almacen	5	3	3	3	15	15	15

	Ragan Norte	6	4	4	4	24	24	24
	Ragan Sur	1	2	2	2	2	2	2
	Rizal	1	2	1	1	2	1	1
	San Andres	6	4	4	4	24	24	24
	San Antonio	2	2	2	2	4	4	4
	San Isidro	1	2	2	2	2	2	2
	San Jose	1	2	1	1	2	1	1
	San Juan	1	2	1	1	2	1	1
	San Macario	1	2	1	1	2	1	1
	San Nicolas	2	2	1	1	4	2	2
	San Patricio	6	4	4	4	24	24	24
	San Roque	6	4	4	4	24	24	24
	Santor	1	2	1	1	2	1	1
	Sto. Rosario	1	2	1	1	2	1	1
	Villa Pereda	1	2	1	1	2	1	1
	Villaluz	1	2	1	1	2	1	1
	Visitacion	6	4	4	4	24	24	24

The red color with the corresponding score suggests the most severe impact and should be addressed immediately.
Purple color suggests moderate consequences but are severe but unlikely or rare to happen
Yellow color considered as low risk. However, may need emergency management, special land use management options and improving hazards information and communication

Based from the matrix above there are 8 barangays of the municipality that have high susceptibility in flooding. The Barangays having high susceptibility to floods are Calinaoan Sur, Quibal, Ragan Almacen, San Andres, Ragan Norte, San Patricio, San Roque and Visitacion. These vulnerable barangays are along the Cagayan River and its tributaries experiencing frequent flooding during the occurrence of strong typhoons which cause the rivers to overflow. The hazard poses great risk to human lives, properties and operation of all government entities concerned. The rest of the barangays have low susceptibility to flooding events.

Flooding to likely manifest in the locality are frequently or very likely to be every 1-3 years.

4.2.1 As a result of the field geo-hazard survey conducted by the Mines and Geosciences Bureau (MGB-Region II), the Municipality of Delfin Albano is established to be vulnerable to flooding. There are 10 barangays that are considered susceptible to flooding, being described as to the type and the cause of the hazard as shown in the below.

Flood Susceptibility of Barangays in the Municipality

No.	Name of Barangay	Flood Susceptibility	Observations / Remarks
01	AGA	LOW TO MODERATE	The barangay is located in the upstream area, has a low flood susceptibility. The flood prone area of the barangay are the low lying rice paddies bordering the western side of the poblacion. The creek crossed by Aga bridge has been reported by a respondent to flood by as much as a meter above the normal water elevation. The bridge, however, has never been flooded nor overflowed.
02	ANDARAYAN	LOW TO MODERATE	Andarayan is located on the central part of the municipality and consists of seven (7) puroks. Purok 6 is the westernmost settlement of the barangay and has low to moderate

			flood susceptibility, flooding occurs near the edge of the settlement close to Brgy. Sto. Rosario (Andarayan-1; 17.292247N, 121.740871E) Purok 7 is located at the southern portion of the barangay and is separated from the barangay center. Parts of Purok 7 are flooded when the creek overflows. Flood height reached five meters during typhoon Juan. The other puroks of Andarayan have low flood susceptibility.
03	ANEG	LOW	Aneg is one of the barangays bordering the western side of the municipality. The location of the barangay is on higher elevation and characterized by flat to rolling terrain. The barangay has low flood susceptibility.
04	BAYABO	LOW IN MOST PARTS OF THE BARANGAY LOW TO MODERATE	Bayabo is located in the northern part of the municipality. Flooding sometimes occurs in Purok 1 due to overflow from a creek (Bayabo-2; 17.323323N, 121.734042E) and the irrigation canal (Bayabo-1; 17323031N, 121.734198E). Other parts of the barangay have low flood susceptibility.
05	CALAOCAN	LOW	Calaocan occupies the north-western-most portion of the municipality. Rolling terrain and vast plains in elevated areas define the terrain in the barangay.
06	CALINAOAN	HIGH TO VERY	Calinaoan Sur is located in the northern part of the municipality and is the last

	SUR	HIGH	barangay before reaching the municipality of Sto. Tomas. Usual flood height in the barangay ranges from 1 to 1.7 m. The highest flood recorded was 2.5m which happened in 1973.
07	CAPITOL	LOW TO HIGH	Capitol is located in the central part of the municipality and is bordered by Santor to the north and Sto. Rosario to the south. The barangay proper including the residential areas are located on higher elevations, thus have low flood susceptibility. Flooding with moderate to high classification occurs, but is confined to the rice fields located along the periphery of the tributary/ creek.
08	CARMENCITA	HIGH TO LOW	Most of the populated areas of Brgy. Carmencita have not experienced flooding and are classified as low flood-hazard areas. The low lying rice paddies are traversed by the headwater of a tributary of Calinaoan Creek. An overflow bridge, near Purok 5, crossing Calinaoan Creek was overflowed by flood water during typhoon Juan. Flood water was reportedly a meter deep on the bridge.
09	CONCEPCION	LOW TO HIGH	The populated areas of Brgy. Concepcion is located on top of a road low ridge. As such, the settlements are not prone to flooding. The flooded areas in the barangay are confined along the low-lying rice paddies situated in a shallow valley. The valley is traversed by a tributary of Calinaoan Creek and is mainly responsible for flooding.
10	MAUI	LOW TO	Maui is located in the central part of the municipality and is connected by a road system to San Isidro in the north and Carmencita in the south. Flood height in the

		MODERATE	barangay ranges 0.2 to 0.7 meter in the residential and 0.7m to 1m in the rice fields.
11	QUIBAL	HIGH TO VERY HIGH	Quibal is traversed by Cagayan River in the north-eastern section of the municipality. Small residential community is located along the east and west sides of the municipal road. Annual flood height in the residential areas ranges from 1 to 2m. The barangay was severely affected in 1980 flooding the area with 3 meters high.
12	RAGAN ALMACEN	MODERATE TO VERY HIGH	Ragan Almacen is located on the eastern side of the barangay along the eroding banks of Cagayan River. Reported flood height in 1980 ranges from 1 to 1.3m in the residential area. A 3m annual flood height was reported in the floodplains of Cagayan River. Bank erosion in this part of Cagayan River is estimated to have retreated by as much as 10 meters over the last 5 years as deduced from the position of the bank in the Google Earth imagery and the present position of the bank as surveyed during the fieldwork on August 2013.
13	RAGAN NORTE	HIGH TO VERY HIGH	Ragan Norte is located on the eastern side of the municipality along the eroding banks of Cagayan River. It is relatively lower elevation than Ragan Almacen (situated north of the barangay), thus it has higher flood heights. Reported annual flood height in the barangay is 0.5 to 1.2 meter while flood height

			in 1980 was estimated to be 2 to 2.5m. A 2.5 m flood was also noted during the 1973 and 1982 events (17.324535, 121.774544E). As described by a respondent, Ragan Norte is isolated during floods as the north flow channel that separates Ragan Norte from Villaluz fills up. An interviewed barangay official mentioned that they need better evacuation equipment, i.e. rescue boats. Alternatively, early warning and early evacuation are the preferred disaster management actions for this barangay.
14	RAGAN SUR	LOW IN RESIDENTIAL AREAS VERY HIGH IN THE CORNFIELDS	Ragan Sur lies on the eastern side of the municipality and is traversed by the Cagayan River. The municipal town hall is located in this barangay with the residential and commercial areas bounding the provincial road. The barangay proper has low flood susceptibility because of its elevation. Flooding occurs along the cornfields within the flood channel of Cagayan River located east of the barangay. The alluvial channel and the cornfields have very high flood susceptibility.

15	RIZAL	LOW IN RESIDENTIAL AREAS VERY HIGH IN THE CORNFIELDS	Rizal is located on the eastern part of the municipality and is traversed by the Cagayan River. Most of the residential areas are located east of the provincial road. Generally, the residential area has low flood susceptibility. The only Purok with flooding history is Purok 6, a small community located at the east of the flood channel near Ragan Almacen. Purok 6 was affected in 1980 with about 0.5m high flood. Vast cornfields lining the eastern side of the barangay have very high flood susceptibility.
16	SAN ANDRES	MODERATE TO HIGH VERY HIGH IN THE	San Andres is located on the northeastern part of the municipality south of Brgy. Visitacion. It is bounded by Cagayan River to the West. Portion of the western side of the barangay is flooded annually, with reported flood height of 1.3 to 2 meters near the San Andres Elementary School (17.340569, 121.755901E) and adjacent cornfields (17.339927N, 121.755824E). During the 1980 flood event, some places in relatively elevated areas (17.340032N, 121.756873E) of the barangay were flooded with about 0.8m high flood.

		CORNFIELDS	The cornfields in the floodplain of Cagayan River have 4 meters extreme flood height in 1980 (17.341626N, 121.757716E).
17	SAN ANTONIO	LOW TO MODERATE	San Antonio is located on the south-eastern part of the municipality. The eastern side of the barangay is bound by Cagayan River. Residential and institutional areas are located along the provincial road. The barangay is located in relatively elevated area making it susceptible to low to moderate flood. The floodplains including the cornfields to the east are reached by sheet flood from Cagayan River. Residential areas are not prone to flooding.
18	SAN ISIDRO	LOW TO MODERATE	San Isidro is located in the central part of the municipality. It is connected by a road system to Andarayan in the North, Concepcion in the southeast and Maui in the southwest. Annual flood height in the barangay ranges from 0.1 to 0.5 meter while the highest reported flood height is about 0.7 to 1m.
19	SAN JOSE	LOW TO HIGH	San Jose is located in the north-eastern side of the municipality. Its location is along the curve portion of the Cagayan River. Residential areas are commonly found

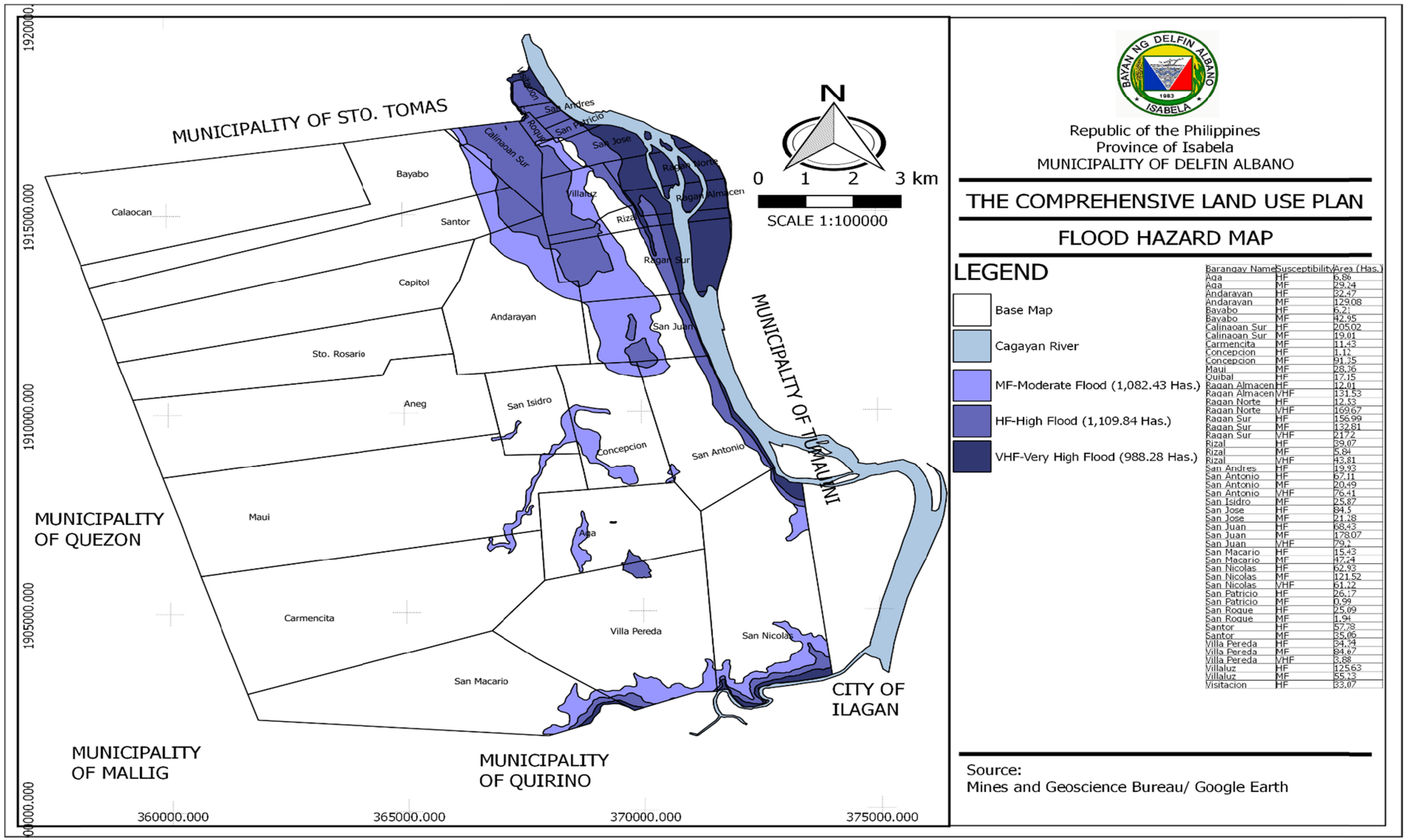
			along the provincial road. Annual flooding of Cagayan River does not affect the barangay proper. The residential areas however were affected during the 1980 and 1970s flood events with flood height ranging from 0.2 to 1m. Typhoon Ondoy and Typhoon Pepeng inundated some areas with 0.5 m high flood (Purok 6). An extreme flood height of about 2 meters, which happened in 1973, was reported by a respondent in Purok 6.
20	SAN JUAN	LOW	San Juan is located on the eastern side of the municipality and is traversed by Cagayan River to the east. Generally, the barangay has low flood susceptibility owing to its relatively elevated location. Flood along the banks of Cagayan River reached as high as 2m making the area susceptible to high flood (17.294548N, 121.786716E).
21	SAN MACARIO	LOW	San Macario is the largest barangay in terms of land area in the municipality. The topography in San Macario is flat to rolling, with settlements located on elevated areas. Areas that are prone to flooding are the low-lying rice paddies along the border of the settlements.
22	SAN NICOLAS	LOW IN	San Nicolas is located on the southeastern side of the municipality and partly

		RESIDENTIAL AREAS HIGH TO VERY HIGH IN THE AGRICULTURAL AREAS ON THE EAST	traversed by Cagayan River. The barangay consists of four puroks. Purok 1 is located along the municipal road connecting the barangay to San Antonio; Puroks 2 and 3 are within the barangay center on the eastern part; and Purok 4 on the southeastern side. The main barangay is located on high elevation thus has low flood susceptibility. Agricultural areas near Cagayan River on the east are affected by annual flood of about 1.5 to 2 meters high.
23	SAN PATRICIO	HIGH TO VERY HIGH	San Patricio is located on the northeastern part of the municipality and is traversed centrally by Cagayan River. The annual flood height in the barangay is about 1.2 meters while reported flood height in 1980 range from 1.5 to 2.5m.
24	SAN ROQUE	MODERATE TO VERY HIGH	San Roque is located on the northeastern part of the municipality southwest of Brgy. Quibal. The depth of annual flood in the barangay ranges from 0.5 to 1m. The highest recorded flood height is 2.5 meters which occurred during a typhoon in 1973.
25	SANTOR	LOW	Santor is located on the north central portion of the municipality. It is connected by a road network to Bayabo in the north and Capitol in the south. The barangay is

			located on high elevation and has low flood susceptibility.
26	STO. ROSARIO	LOW	Sto. Rosario is located on the central part of the municipality and connected by a road network to Capitol in the north and Andarayan on the east. The barangay is located on high elevation and has low flood susceptibility.
27	VILLALUZ	LOW TO HIGH	Villaluz is located on the eastern side of the municipality. The settlement has low to moderate flood susceptibility. The 1980 flood event inundated the Magsaysay Memorial High School with flood height of less than 0.5m (17.318929N, 121.769983E). Sheet flood from Cagayan River, with depth of 1.2m, annually affects the cornfields located in a flood channel.
28	VILLA PEREDA	LOW	Villa Pereda is located on rolling hills and is located within the zone of low flood susceptibility. The flood prone areas of the barangays are low lying rice paddies traversed by a headwater tributary of Calinaoan Creek and along the banks of the water impounding structures.
29	VISITACION	MODERATE TO VERY HIGH	Visitacion is the northeast-most barangay of the municipality and located along the eroding banks of Cagayan River. The cornfields near the river create a 500m wide buffer for the residential areas. Usual flood height in the barangay ranges from 0.5 to 1.3m while flood height in 1980 ranged from 1 to 4 meters.

Overspill of Water from the Cagayan River, the River Magat System, the Pinacanauan River, and poor drainage facilities cause flooding in the barangays identified to be most vulnerable. Of these barangays, Ragan Norte has registered a flood level of 1.5 to 2.5 meters above water level.

Provision of adequate and appropriate drainage facilities, regulated development of upstream/catchment area are highly recommended.



Republic of the Philippines
Province of Isabela
MUNICIPALITY OF DELFIN ALBANO

THE COMPREHENSIVE LAND USE PLAN

FLOOD HAZARD MAP

LEGEND

- Base Map
- Cagayan River
- MF-Moderate Flood (1,082.43 Has.)
- HF-High Flood (1,109.84 Has.)
- VHF-Very High Flood (988.28 Has.)

Barangay Name	Susceptibility	Area (Has.)
Aga	HF	5.86
Aga	MF	29.24
Andaravan	HF	32.47
Andaravan	MF	129.08
Bayabo	HF	6.21
Bayabo	MF	42.95
Calinaoan Sur	HF	205.02
Calinaoan Sur	MF	19.01
Carmencita	MF	11.43
Concepcion	HF	1.12
Concepcion	MF	91.35
Maui	MF	28.36
Quibal	HF	17.15
Ragan Almacen	HF	12.01
Ragan Almacen	VHF	131.53
Ragan Norte	HF	12.53
Ragan Norte	VHF	169.67
Ragan Sur	HF	156.99
Ragan Sur	MF	132.81
Ragan Sur	VHF	21.72
Rizal	HF	39.07
Rizal	MF	5.84
Rizal	VHF	43.81
San Andres	HF	19.93
San Antonio	HF	67.11
San Antonio	MF	20.49
San Antonio	VHF	76.41
San Isidro	MF	25.87
San Jose	HF	84.5
San Jose	MF	21.38
San Juan	HF	68.43
San Juan	MF	178.07
San Juan	VHF	79.2
San Macario	HF	15.43
San Macario	MF	47.24
San Nicolas	HF	62.93
San Nicolas	MF	121.52
San Nicolas	VHF	61.12
San Patricio	HF	26.17
San Patricio	MF	0.99
San Roque	HF	25.09
San Roque	MF	1.94
Santor	HF	57.78
Santor	MF	55.06
Villa Pereda	HF	94.34
Villa Pereda	MF	84.67
Villa Pereda	VHF	3.88
Villaluz	HF	125.63
Villaluz	MF	55.43
Visitacion	HF	83.07

Source:
Mines and Geoscience Bureau/ Google Earth

No (A)	Area of Concern (B)	Likelihood Score (Hazard) (D)	Consequence Severity Score (E)			Risk Score (F)		
Landslide	Barangay Name		Human	Property	Operational	Human (D) x (E)	Property (D) x (E)	Operational (D) x (E)
	Aga	1	1	1	1	1	1	1
	Andarayan	1	1	1	1	1	1	1
	Aneg	3	1	1	1	3	3	3
	Bayabo	3	1	1	1	3	3	3
	Calaocan	3	2	1	1	6	3	3
	Calinaoan Sur	1	1	1	1	1	1	1
	Capitol	3	1	1	1	3	3	3
	Carmencita	3	1	1	1	3	3	3
	Concepcion	1	1	1	1	1	1	1
	Maui	3	1	1	1	3	3	3
	Quibal	1	1	1	1	1	1	1
	Ragan Almacen	1	1	1	1	1	1	1
	Ragan Norte	1	1	1	1	1	1	1
	Ragan Sur	1	1	1	1	1	1	1
	Rizal	1	1	1	1	1	1	1
	San Andres	1	1	1	1	1	1	1
	San Antonio	1	1	1	1	1	1	1

	San Isidro	1	1	1	1	1	1	1
	San Jose	1	1	1	1	1	1	1
	San Juan	1	1	1	1	1	1	1
	San Macario	1	1	1	1	1	1	1
	San Nicolas	1	1	1	1	1	1	1
	San Patricio	1	1	1	1	1	1	1
	San Roque	1	1	1	1	1	1	1
	Santor	3	1	1	1	3	3	3
	Sto. Rosario	3	1	1	1	3	3	3
	Villa Pereda	1	1	1	1	1	1	1
	Villaluz	1	1	1	1	1	1	1
	Visitacion	1	1	1	1	1	1	1

The red color with the corresponding score suggests the most severe impact and should be addressed immediately.

Purple color suggests moderate consequences but are severe but unlikely or rare to happen

Yellow color considered as low risk. However, may need emergency management, special land use management options and improving hazards information and communication

The barangays identified with rain-induced landslide are those found at relatively mountainous areas with moderately sloping topography. The event likely happens every 30-100 Years and the barangays most affected are Aneg, Bayabo, Calaocan, Capitol, Carmencita, Maui, Santor, and Sto. Rosario having a moderate risk to human, property and operational consequences.

All barangays are low-risk on human, property and operational consequences on rain-induced landslides however, these may need emergency management, especially on improving hazards information and communication.

4.2.2 The Mines and Geosciences Bureau (MGB-Region II) had conducted a rapid field geo-hazard assessment in the fifteen (15) municipalities in the Province of Isabela. In the Municipality of Delfin Albano, eight (8) barangays are identified to be probable areas of landslide occurrence.

Rapid Assessment of the LGU on Landslide

No.	Name of Barangay	Landslide Susceptibility	Observations / Remarks
01	AGA	Low	Brgy. Aga is located in southeast part of the municipality. It has elevated and relatively flat terrain thus has low susceptibility to landslide.
02	ANDARAYAN	LOW	Andarayan is located in east central portion of the municipality. The terrain is generally flat with undulating areas towards west. The barangay has low landslide susceptibility.
03	ANEG	LOW TO MODERATE	Generally, the topography in Brgy. Aneg is rolling to flat making it low

			susceptible to landslide.
04	BAYABO	LOW TO MODERATE	Bayabo partly occupies the north and west borders of the municipality. The terrain in the area is mostly undulating with patches of plains and scattered low hills. Generally, the landslide susceptibility in the barangay is low except in the western boundary which has moderate susceptibility for the hills and slopes of the ridge.
05	CALAOCAN	LOW TO MODERATE	Calaocan borders the northwestern part of the municipality. Mostly, it is defined by flat to undulating terrain, but becomes more rolling on the western boundary. The residential area is located in flat areas making it low susceptible to landslides. Moderate susceptibility is assigned along the rolling hills farther west.

06	CALINAOAN SUR	LOW	Calinaoan Sur partly occupies the alluvial terraces of Cagayan River. Landslide susceptibility in the barangay is low.
07	CAPITOL	LOW TO MODERATE	Capitol partly covers the flat to rolling terrain in the north central section of the municipality.
08	CARMENCITA	LOW TO MODERATE	The land boundary of Carmencita spans the flat to rolling areas in the southern portion of the municipality. Generally, the barangay has low landslide susceptibility. Moderate susceptibility is assigned along the steep-sloped hill west of the barangay.
09	CONCEPCION	LOW	Concepcion is characterized by flat topography with small knolls sprawling the area.
10	MAUI	LOW TO	Maui is one of the barangays that

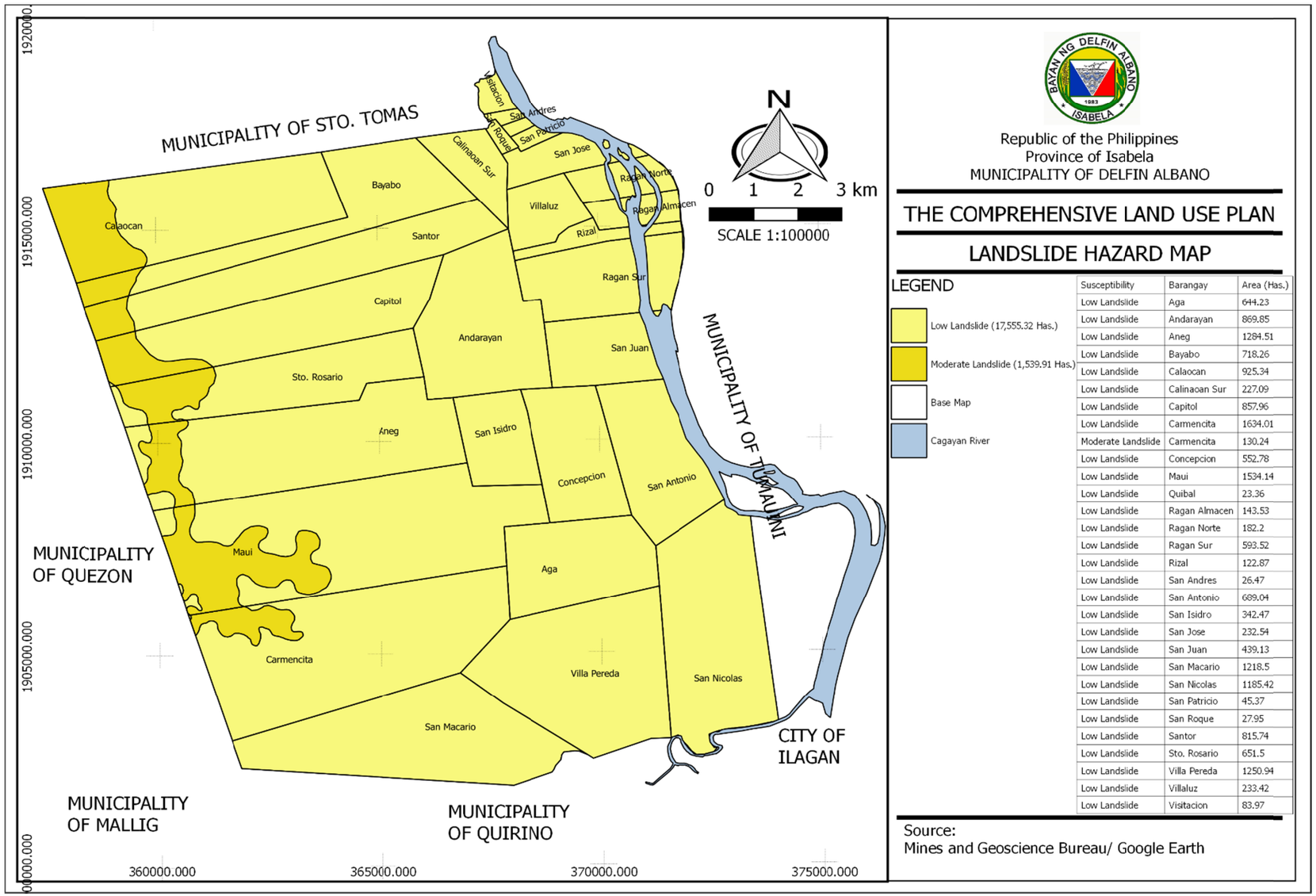
		MODERATE	partly borders the western section of the municipality. Large portion of the barangays have flat to rolling terrain, thus within the low landslide susceptibility zone. The western edge, however, have patches of moderate susceptibility in hills with steep slopes.
11	QUIBAL	LOW	Quibal partly occupies the floodplain and lower alluvial terraces of Cagayan River. The landslide susceptibility is low.
12	RAGAN ALMACEN	LOW	Ragan Almacen lies along the floodplain and lower alluvial terraces of Cagayan River. The landslide susceptibility is low.
13	RAGAN NORTE	LOW	Ragan Norte partly occupies the floodplains and alluvial terraces of Cagayan River. The Landslide susceptibility is low.

14	RAGAN SUR	LOW	The barangay is located within the floodplains and alluvial terraces of Cagayan River. Low landslide susceptibility is assigned in the area.
15	RIZAL	LOW	The barangay is located within the floodplains and alluvial terraces of Cagayan River. Low landslide susceptibility is assigned in the area.
16	SAN ANDRES	LOW	San Andres occupies the floodplains and alluvial terraces, thus has low landslide susceptibility.
17	SAN ANTONIO	LOW	Residential areas are located in the higher and flat terraces of Cagayan River along the banks of Cagayan River near the Tumauini-Delfin Albano Bridge were observed.
18	SAN ISIDRO	LOW	San Isidro which lies at the central portion of the municipality has flat to rolling terrain. It has low susceptibility

			to landslides.
19	SAN JOSE	LOW	San Jose is located within the floodplains and alluvial terraces of Cagayan River. The barangay has low landslide susceptibility
20	SAN JUAN	LOW	The barangay partly occupies the floodplains of Cagayan River and the alluvial terraces.
21	SAN MACARIO	LOW	San Macario is the southernmost barangay in the municipality. Its terrain varies from undulating to the west and flat towards the east near the floodplains of Cagayan River. Communities are located in low landslide susceptibility areas. Soil erosion is observed along the hillsides and in the sugar cane fields far from settlements (17.205930N, 121.75972E; 17.208849, 121.752602).

22	SAN NICOLAS	LOW	The barangay lies east of Cagayan River within the higher alluvial terraces. It has low landslide susceptibility.
23	SAN PATRICIO	LOW	The barangay is located within the floodplains and alluvial terraces of Cagayan River, thus has low landslide susceptibility.
24	SAN ROQUE	LOW	San Roque is situated in the higher alluvial terrace and portion of the floodplains of Cagayan River. Float terrain defines the area thus the barangay has low landslide susceptibility.
25	SANTOR	LOW TO MODERATE	The landslide susceptibility in Santor is generally low with the exception of moderate susceptible slopes along the ridge in the western side of the barangay.
26	STO. ROSARIO	LOW TO	Santo Rosario is one of the barangays

		MODERATE	that border the western portion of the municipality. The topography in the area is generally flat to rolling with isolated hills. The landslide susceptibility in the barangay is low to moderate.
27	VILLALUZ	LOW	The barangay has low landslide susceptibility. Flat alluvial terraces of Cagayan River underlie the area.
28	VILLA PEREDA	LOW	Villa Pereda is within the higher alluvial terraces, thus has low landslide susceptibility.
29	VISITACION	LOW	The northeastern-most barangay located on the eastern banks of Cagayan River. Settlements occupy the floodplain and higher terraces of Cagayan River.



Susceptibility	Barangay	Area (Has.)
Low Landslide	Aga	644.23
Low Landslide	Andarayan	869.85
Low Landslide	Aneg	1284.51
Low Landslide	Bayabo	718.26
Low Landslide	Calaocan	925.34
Low Landslide	Calinaoan Sur	227.09
Low Landslide	Capitol	857.96
Low Landslide	Carmencita	1634.01
Moderate Landslide	Carmencita	130.24
Low Landslide	Concepcion	552.78
Low Landslide	Maui	1534.14
Low Landslide	Quibal	23.36
Low Landslide	Ragan Almacen	143.53
Low Landslide	Ragan Norte	182.2
Low Landslide	Ragan Sur	593.52
Low Landslide	Rizal	122.87
Low Landslide	San Andres	26.47
Low Landslide	San Antonio	689.04
Low Landslide	San Isidro	342.47
Low Landslide	San Jose	232.54
Low Landslide	San Juan	439.13
Low Landslide	San Macario	1218.5
Low Landslide	San Nicolas	1185.42
Low Landslide	San Patricio	45.37
Low Landslide	San Roque	27.95
Low Landslide	Santor	815.74
Low Landslide	Sto. Rosario	651.5
Low Landslide	Villa Pereda	1250.94
Low Landslide	Villaluz	233.42
Low Landslide	Visitacion	83.97

Landslide Hazard Map

No (A)	Area of Concern (B)	Likelihood Score (Hazard) (D)	Consequence Severity Score (E)			Risk Score (F)		
Typhoon	Barangay Name		Human	Property	Operational	Human (D) x (E)	Property (D) x (E)	Operational (D) x (E)
	Aga	6	4	3	3	24	18	18
	Andarayan	6	4	3	3	24	18	18
	Aneg	6	4	3	3	24	18	18
	Bayabo	6	4	3	3	24	18	18
	Calaocan	6	4	3	3	24	18	18
	Calinaoan Sur	6	4	3	3	24	18	18
	Capitol	6	4	3	3	24	18	18
	Carmencita	6	4	3	3	24	18	18
	Concepcion	6	4	3	3	24	18	18
	Maui	6	4	3	3	24	18	18
	Quibal	6	4	3	3	24	18	18
	Ragan Almacen	6	4	3	3	24	18	18
	Ragan Norte	6	4	3	3	24	18	18
	Ragan Sur	6	4	3	3	24	18	18
	Rizal	6	4	3	3	24	18	18

	San Andres	6	4	3	3	24	18	18
	San Antonio	6	4	3	3	24	18	18
	San Isidro	6	4	3	3	24	18	18
	San Jose	6	4	3	3	24	18	18
	San Juan	6	4	3	3	24	18	18
	San Macario	6	4	3	3	24	18	18
	San Nicolas	6	4	3	3	24	18	18
	San Patricio	6	4	3	3	24	18	18
	San Roque	6	4	3	3	24	18	18
	Santor	6	4	3	3	24	18	18
	Sto. Rosario	6	4	3	3	24	18	18
	Villa Pereda	6	4	3	3	24	18	18
	Villaluz	6	4	3	3	24	18	18
	Visitacion	6	4	3	3	24	18	18

The red color with the corresponding score suggests the most severe impact and should be addressed immediately.

Purple color suggests moderate consequences but are severe but unlikely or rare to happen

Yellow color considered as low risk. However, may need emergency management, special land use management options and improving hazards information and communication

Typhoons accompanied by strong winds and heavy downpour of rains greatly affects those barangays found along the Cagayan River and its tributaries where its water courses through and open field areas that cannot be shielded by natural barriers like hills and mountains. Typhoons frequently affects eastern barangays with high risk to human, property and Operations. Typhoons often strikes on properties and agricultural crops and operations that for the municipality it has been assessed to have very high to severe impact on property and operational aspect. This should be addressed immediately with the appropriate mitigation measures to lessen its impact on the community affected.

The Municipality of Delfin Albano has fourteen (14) Barangays prone to soil erosion namely; San Nicolas, San Antonio, San Juan, Ragan Sur, Ragan Norte, Ragan Almacen, Viilaluz, San Jose, San Patricio, Calinaoan Sur, Quibal, San Andres, Visitacion, San Roque, these barangay are located along the Cagayan River. As we know soil erosion is a major problem for environment. However there are some ways to decrease this rate of erosion, one of the most common soil erosion prevention methods is vegetation. Plants established road system, which in the long run stabilizes the soil thereby preventing erosion.

No (A)	Area of Concern (B)	Likelihood Score (Hazard) (D)	Consequence Severity Score (E)			Risk Score (F)		
Drought	Barangay Name		Human	Property	Operationa	Human (D) x (E)	Property (D) x (E)	Operational (D) x (E)
	Aga	5	3	1	3	15	5	15
	Andarayan	5	3	1	3	15	5	15
	Aneg	5	3	1	3	15	5	15
	Bayabo	5	3	1	3	15	5	15
	Calaocan	5	3	1	3	15	5	15
	Calinaoan Sur	5	3	1	3	15	5	15
	Capitol	5	3	1	3	15	5	15
	Carmencita	5	3	1	3	15	5	15
	Concepcion	5	3	1	3	15	5	15
	Maui	5	3	1	3	15	5	15
	Quibal	5	3	1	3	15	5	15
	Ragan Almace	5	3	1	3	15	5	15
	Ragan Norte	5	3	1	3	15	5	15
	Ragan Sur	5	3	1	3	15	5	15
	Rizal	5	3	1	3	15	5	15
	San Andres	5	3	1	3	15	5	15
	San Antonio	5	3	1	3	15	5	15
	San Isidro	5	3	1	3	15	5	15
	San Jose	5	3	1	3	15	5	15
	San Juan	5	3	1	3	15	5	15
	San Macario	5	3	1	3	15	5	15
	San Nicolas	5	3	1	3	15	5	15
	San Patricio	5	3	1	3	15	5	15
	San Roque	5	3	1	3	15	5	15
	Santor	5	3	1	3	15	5	15
	Sto. Rosario	5	3	1	3	15	5	15
	Villa Pereda	5	3	1	3	15	5	15
	Villaluz	5	3	1	3	15	5	15
	Visitacion	5	3	1	3	15	5	15

The red color with the corresponding score suggests the most severe impact and should be addressed immediately.

Purple color suggests moderate consequences but are severe but unlikely or rare to happen

Yellow color considered as low risk. However, may need emergency management, special land use management options and improving hazards information and communication

The Drought phenomenon has high consequences on human aspect and has low to severe impact on property consequences in all barangays. Operational consequences usually have high score for the consequence aspect in all barangays that have critical infrastructures like source of water supply for domestic and agricultural purposes. This hazard should be addressed immediately to prevent further property consequences particularly for the agriculture sector considering that municipality of Delfin Albano is predominantly an agricultural area.

4.3 VULNERABILITY ASSESSMENT MATRIX

All barangays are vulnerable to floods but the impact is very high on the rural barangays situated along the Cagayan River. Damages ranges from destruction of dwelling units, business establishments, fishponds to even hundreds of hectares of rice lands and corn lands every occurrence of this hazard.

There are eight (8) barangays at high rish to rain-induced landslides particularly Calaocan, Bayabo, Santor, Santo Rosario, Maui, Capitol, Aneg and Carmencita with mountainous portions although its consequence severity damages on critical facilities, lifelines, property and environment are insignificant or very low.

Typhoons which visit the municipality very often affect all barangays and repeatedly have heavy consequences especially on damages in properties such as houses which are either partially blown down or totally damaged, several hundreds of rice lands, corn lands, fishponds, farm to market roads and infrastructures.

Soil erosion experience by barangay located along the stretch of Cagayan River but it only happens when strong typhoons accompanied by heavy downpour of rain which causes the said river to overflow much more than its usual and allowable volume of water.

Delfin Albano is vulnerable to drought especially during summer months and its impact is mostly seen in the lowering of productivity of several hundredths of hectares of ricelands, cornlands lands and areas planted with other commercial crops within the municipality. It has a high consequence on environment and economic and social development to include the living conditions of its inhabitants.

4.4 DISASTER RISK MANAGEMENT MATRIX

Technical Findings/Issues /Concerns	Implications if not solved	POLICY OPTIONS			
		Adaptation Measures		Mitigating Measures	
		Structural	Non-Structural	Structural	Non-Structural
FLOODING	1,061 households affected 4469 individuals affected (2243 males and 2226 females) 888.725 has.	Construction of river control project along Cagayan River Construction of evacuation center	Adopt laws and regulations/ prohibiting construction of residential houses (no built zone) Identification of relocation	Construction of Drainage system and river protection dikes	Planting of trees along Cagayan River Aggressive Reforestation in sub-water shed areas Capacitating /

	Affected (residential, commercial and agricultural area)	Construction of livestock/ relief park or evacuation center	sites. Access funds of National Housing Authority		strengthening of BDRRMC (training and provision of disaster gadgets/ paraphernalia) from NGO Access of livelihood programs and projects coming from national agencies (DOLE, DSWD, DTI, DAR, DA)
RAIN-INDUCED LANDSLIDE	Barangays Aneg, Bayabo, Calaocan, Capitol, Carmencita, Maui, Santor, Sto. Rosario having a population of 8,687 individuals (4,400 males and 4,144 females) and land area of 10,569.85	Construction of slope protection/ retaining wall in the area	Access funds to concern national offices. Adopt measures regulating land uses in	Construction of water impounding projects	Reforestation in the area Capacitating / strengthening of BDRRMC (training and provision of disaster gadgets/ paraphernalia) from NGO

	has. Agricultural, residential and forest land affected 2, 016 households affected		the area		
TYPHOON	All barangays 26, 614 individuals affected 6,781 households affected Agriculture areas **12,363.71** hectares affected Public and private infrastructure	Construction of evacuation centers Construction of river control Construction of livestock/ relief park or evacuation center	Adopt measures strengthening partnership with local and foreign investors for the dredging of Cagayan river Adopt legislative measures regarding pre-emptive evacuation and liquor	Dredging of the Cagayan River Construction of drainage system	Provision of early warning system Conduct of regular IEC to all barangays Capacitating / strengthening of BDRRMC (training and provision of disaster gadgets/ paraphernalia) from NGO Access of

	affected		band MOA with groceries, drugstore and transport groups and other institution Adopt measures promoting and encouraging disaster-resilient infrastructure project		livelihood programs and projects coming from national agencies (DOLE, DSWD, DTI, DAR, DA
SOIL EROSION	Barangays San Nicolas, San Antonio, San Juan, Ragan Sur, Ragan Norte, Ragan Almacen,	Construction of flood control and retaining wall	Adopt measures encouraging tree planting activity and regulating	Dredging of the Cagayan River	Plant vetiver grass, bamboo grass and trees Availability of

	Viilaluz, San Jose, San Patricio, Calinaoan Sur, Quibal, San Andres, Visitacion, San Roque having a population of 15, 180 individuals (7,544 males and 7,418 females) and land area of 3,811.44 has. Agricultural, residential and forest land affected		quarry operation Adopt institutionalize contingency plan on soil erosion		heavy equipment Capacitating / strengthening of BDRRMC (training and provision of disaster gadgets/ paraphernalia) from NGO
DROUGHT	All barangays 26, 614 individuals affected 6,781 households affected	Construction of Small Water Impounding Project Construction of Potable water source	Adopt measures requesting national agencies to provide assistance as to then effect of drought	Construction of Small farm reservoir Installation deep wells	Provision of Potable water source (cylindrical pumps and jetmatic pump) Reforestation in water shield areas

			phenomenon Out-sourcing of funds Adopt measure promoting water conservation		Capacitating / strengthening of BDRRMC (training and provision of disaster gadgets/ paraphernalia) from NGO Access of livelihood programs and projects coming from national agencies (DOLE, DSWD, DTI, DAR, DA