C. Physical Features

1.Geographical Location

The Municipality of Teresa is one of the 13 municipalities in the province of Rizal. Rizal Province is located directly east of Metro Manila, the premiere megalopolis in the country, and is part of a bigger administrative region called CALABARZON, or the Cavite-Laguna-Batangas-Rizal-Quezon region or Region IV-A (Figure 5).

Teresa is situated about 35 kilometers east of Manila and is geographically located at approximately 14^0 35' north longitude and 121^0 12' east latitude. It is bounded on the north by Antipolo City, on the east by the municipality of Tanay ,Baras to the southeast, Morong to the south, Binangonan to the southwest, and Angono to the west (Figure 6). It can be reached through the Marcos Highway-Sumulong road, Ortigas Avenue Extension-Tikling route, both passing Antipolo City. It is also accessible through the Baras, Tanay, Pililla road network coming from Laguna province.

The municipality of Teresa belongs to the Second District of Rizal along with the municipalities of Baras, Cardona, Jala-jala, Morong, Pililla, Rodriquez, San Mateo, and Tanay (Figure 7).

2. Land Area

Teresa has a total land area of 1,860 hectares which is 1.42% of the total area of the province (Table 19). This figure was from the 2006 Environment& Natural Resource Statistics from the Department of Environment & Natural Resources. This was also based on the land area used for Internal Revenue Allotment (IRA) allocation. Municipal records and documents however, stated that the municipality covers a total land area of 16,198 hectares (Table 20) which stretches up to Quezon Province. Figure 8 shows the overlapping territory of Teresa with the other adjoining municipalities based on the map overlay prepared by the Housing & Land Use Regulatory Board (HLURB).This was attributed to the still unresolved disputed areas with its contiguous municipalities namely Baras, Tanay and Morong. The lack of a complete cadastral map of Teresa has contributed to the confusion as to what is the exact land area of the municipality,Teresa, being a former part of Antipolo and Morong. This means that the urban areas in the municipality are the only areas which are not disputed. The municipal officials are continuing to pursue the municipality's claim over the disputed areas. The urban areas are those in the lower end of the bolo-shaped territory (Figure 8).For CLUP updating, the total land area used is the computer generated map area of 2,121.852 hectares.

Table 19. Land Area, Province of Rizal

City/Municipality	Land Area (Hectares)	Share (%)	Land Area (sq.km)	Share (%)
1.Angono	2,600	1.99	26.22	2.23
2.Antipolo	30,608	23.38	306.10	26.03
3.Baras	2,340	1.79	84.93	7.22
4. Binangonan	7,270	5.55	66.34	5.64

5.Cainta	1,020	0.78	26.81	2.28
6. Cardona	3,120	2.38	28.56	2.43
7.Jalajala	4,930	3.77	44.12	3.75
8. Morong	3,760	2.87	37.58	3.20
9. Pililla	7,400	5.65	69.95	5.95
10. Rodriguez	31,728	23.90	172.85	14.70
11. San Mateo	6,489	4.96	55.09	4.68
12. Tanay	24,337	18.59	200.0	17.01
13.Taytay	3,880	2.96	38.80	3.30
14. Teresa	**1,860**	**1.42**	**18.61**	**1.58**
TOTAL	130,892	100	1,175.96	100

Source: PDPFP 2008-2013

The municipality is composed of nine (9) barangays, namely: Bagumbayan, Dalig, Dulumbayan, May-iba, Poblacion, Prinza, San Gabriel, San Roque, Calumpang – Sto. Cristo (Table 20 and Figure 9). Dalig and Bagumbayan are the largest barangays but they have areas still under dispute with neighboring municipalities.

Table 20. Land Area Per Barangay

BARANGAY	AREA (HECTARES), 1984 *
Bagumbayan	2782.54
Dalig	3145.88
Dulumbayan	661.70
May-iba	1950.64
Poblacion	51.64
Prinza	401.92
San Gabriel	59.28
San Roque	76.50
Cal. Sto Cristo	28.69
Remaining Area(Disputed)	6959.20
Total	16198.00

*Source: *Old SEPP of Teresa, Rizal*
Note: there are also still unresolved barangay disputes

3. Climatic Conditions

The data for climatic conditions were from the Tanay Agromet Station using the data from 2007-2011.

3.1 Climate

Teresa belongs to the Type 1 climate characterized by two pronounced seasons, dry from November to April and wet during the rest of the year.

3.2 Rainfall

Year 2009 recorded the highest rainfall amount with 4,279.8 mm and highest average monthly rainfall at 557.2 mm (Table 21). This can be explained by the unusually heavy rain fall caused by Tropical Storm Ondoy in September 2009.

Table 21. Monthly Total and Annual Climatic Data
Rainfall Amount (mm), 2007-2011

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
2007	42.3	12.6	35.6	19.2	86.1	202.7	187.1	720.7	387.9	292.7	358.5	209.3	2554.7
2008	148.7	77.3	1.0	59.3	364.2	306.2	373.4	392.8	541.9	368.4	337.8	256.1	3227.1
2009	101.3	44.0	58.5	307.1	316.7	530.8	655.6	476.6	1076.0	562.1	118.9	32.2	4279.8
2010	40.4	2.4	-2.0	24.6	61.4	132.2	317.7	311.1	223.0	244.8	311.5	189.9	1859.0
2011	-2.0	12.2	137.3	25.9	243.0	570.6	-2.0	455.2	-2.0	228.7	364.6	-2.0	2037.5
TOTAL	**332.7**	**148.5**	**232.4**	**436.1**	**1071.4**	**1742.5**	**1533.8**	**2356.4**	**2228.8**	**1696.7**	**1491.3**	**687.5**	**13958.1**
MEAN	**83.2**	**29.7**	**58.1**	**87.2**	**214.3**	**348.5**	**383.5**	**471.3**	**557.2**	**339.3**	**298.3**	**171.9**	**2791.6**
STDEV	**52.0**	**30.9**	**57.8**	**123.9**	**135.6**	**195.2**	**197.5**	**153.6**	**369.6**	**135.8**	**102.4**	**97.2**	**987.3**

**NOTE : -2.0 – means data is missing
Source: Tanay Agromet Station

3.3 Temperature

The mean annual temperature is 23.1 degrees Celsius (Table 22). It is coolest in the month of January and hottest in the month of April. The coolest and highest mean monthly temperatures measure 20.3 degree Celsius and 26.2 degree Celsius, respectively.

Table 22. Monthly Mean and Annual Agroclimatic Data
Temperature (Degrees C), 2007-2011

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
2007	21.5	22.0	23.0	24.4	25.0	24.9	24.0	22.8	23.6	22.9	22.1	22.1	23.2
2008	21.4	21.3	23.1	24.1	23.7	24.0	23.2	23.2	23.2	23.6	22.5	21.1	22.9
2009	20.3	21.8	23.3	23.5	23.6	23.3	23.5	23.5	23.0	22.7	22.9	21.5	22.7
2010	21.1	22.9	-2.0	24.9	26.2	25.0	24.2	23.6	24.2	23.3	23.2	22.1	23.7
2011	-2.0	21.8	21.8	22.9	24.7	23.7	-2.0	23.1	-2.0	23.3	23.0	-2.0	23.0
TOTAL	**84.3**	**109.8**	**91.2**	**119.8**	**####**	**120.9**	**94.9**	**116.2**	**94.0**	**115.8**	**113.7**	**86.8**	**115.5**
MEAN	**21.1**	**22.0**	**22.8**	**24.0**	**24.6**	**24.2**	**23.7**	**23.2**	**23.5**	**23.2**	**22.7**	**21.7**	**23.1**
STDEV	**0.5**	**0.6**	**0.7**	**0.8**	**1.1**	**0.7**	**0.5**	**0.3**	**0.5**	**0.4**	**0.4**	**0.5**	**0.4**

Source: Tanay Agromet Station

3.4Relative Humidity

The men relative humidity is 89 degrees (Table 23). The least humid conditions arediring March and April, the year's hottest months. The most humid condition is during August, the year's wettest month. The town's lowest and highest relative humidity measurements are 82 percent and 94 percent, respectively.

Table 23.Monthly Annual and Total Agroclimatic Data
Relative Humidity (%), 2007-2011

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
2007	90	87	84	84	84	89	91	92	93	92	91	91	89
2008	91	90	86	85	91	88	92	90	91	90	92	89	90
2009	90	89	87	89	89	93	93	93	93	89	89	87	90
2010	89	86	-20	82	82	90	90	91	89	92	92	91	89
2011	-20	87	87	85	88	91	-20	94	-20	90	89	-20	89
TOTAL	**360**	**439**	**344**	**425**	**434**	**451**	**366**	**460**	**366**	**453**	**453**	**358**	**447**
MEAN	**90**	**88**	**86**	**85**	**87**	**90**	**92**	**92**	**92**	**91**	**91**	**90**	**89**
STDEV	**0.8**	**1.6**	**1.4**	**2.5**	**3.7**	**1.9**	**1.3**	**1.6**	**1.9**	**1.3**	**1.5**	**1.9**	**0.5**

Source: Tanay Agromet Station

3.5 Wind Direction and Wind Speed

The municipality's prevailing wind directions vary throughout the years. The mean annual wind direction is the north east directions with 3 meters per second speed (Table 24). It is during the months of December, January and February with the highest wind speed at 4 meters per second. It is during July with lowest wind speed at 2 meters per second.

Table24. Average Wind Direction and Speed (mps), 2007-2011

Year	Jan	Feb	Mar	Apr	May	Jun
	SPD/DIR	**SPD/DIR**	**SPD/DIR**	**SPD/DIR**	**SPD/DIR**	**SPD/DIR**
2007	3/NE	2/NE	2/NE	2/NE	2/W	2/NE
2008	3/NNE	4/NE	2/NNE	2/NE	2/W	2/E
2009	3/NE	3/NE	3/E	2/ENE	2/E	3/W
2010	5/ENE	4/ENE	-2.0	4/E	3/NE	2/NW
2011	-2.0	4/NE	6/NE	5/NE	4/NE	4/E
MEAN	**4/NE**	**4/NE**	**3/NE**	**3/NE**	**3/NE**	**3/E**

Year	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
	SPD/DIR	**SPD/DIR**	**SPD/DIR**	**SPD/DIR**	**SPD/DIR**	**SPD/DIR**	**SPD/DIR**
2007	1/W	2/W	2/W	2/NNE	3/NE	3/NE	2/NE
2008	2/W	2/W	2/W	2/NE	2/NE	3/NNE	2/NE
2009	2/NW	3/NW	3/W	3/W	3/NE	4/E	3/NE
2010	2/NE	3/NW	3/NE	4/NE	4/NE	5/NE	4/NE
2011	-2.0	4/NW	-2.0	4/NNE	5/E	-2.0	5/NE
MEAN	**2/W**	**3/NW**	**3/W**	**3/NNE**	**3/NE**	**4/NE**	**3/NE**

Source: Tanay Agromet Station

4. Geology

4.1 Common Minerals

Common minerals such as calcite and carbonate minerals abound in the municipality which came from limestone as parent material. This represents 10% of the provincial total area for the said mineral (Table 25). The other parent materials are the shale and limestone, basalt, andesite and agglomerate producing common minerals in various modes of formation.

Table 25.Distribution of Rock Type/Parent Materials By Mode of Formation

Parent Material	Common minerals	Mode of Formation	Location		
				Area (has)	% to the Province
Mixed sediments	Mainly quartz and clay	Fluviatile deposition	Teresa	803	4.7
Shale/sandstone	Quartz,clay and some authigenic minerals	Mechanical deposition	Teresa	151	1.3
Limestone	Calcite, carbonate minerals	Chemical deposition	Teresa	420	10.0
Basalt	Feldspar,biotite,hornblende	Volcanic flow effusion	Teresa	126	4.0
Andesite	Quartz, feldspar, biotite hornblende	Volcanic flow effusion	Teresa	291	1.18
Agglomerate	Quartz,feldsparferromagnesian	Accumulation of volcanic ejecta	Teresa	69	0.69

Source: The Physical Environment and AgroSocioEconomics Province of Rizal, DA BSWM Manila

4.2 Soils

Teresa has two types of soils. These are the Antipolo Clay and Binangonan Clay(Figure 10). Antipolo Clay, the most dominant soil type covering 88.42% of the total land area of the municipality, is characterized by a reddish brown, granular and friable soil surface. The surface drainage of the soil is good to excessive but highly susceptible to erosion especially in the upland and steep areas. The soil is more suitable to fruit trees and upland rice because of its desirable features such as deep soil solum, friable soil texture and good internal soil drainage.

Binangonan Clay constitutes the remaining land area and is common in the southwestern portion. Its parent material is from soft limestone material and is related with undulating and rolling terrain. The soil manifests good external drainage but is wanting in internal drainage. Pooir drainability mcauses flooding in the lowlands while the rolling and undulating areas are prone to moderate erosion.

4.3 Slope

The lands in the municipality are generally best suited for agriculture, urban, rural, institutional, infrastructure development (Figure 11). Forty eight percent (48%) of the total land area has level to nearly level slope, 46.5% are undulating to rolling and 5.3% steep slope.

Table 26. Slope Classification

Barangay	Description	Slope	Area (Has.)
Bagumbayan	Level to nearly level	0-3	103.59

Dalig	Level to nearly level	0-3	532.20
Dulumbayan	Level to nearly level	0-3	42.12
May-iba	Level to nearly level	0-3	74.00
Prinza	Level to nearly level	0-3	143.05
San Gabriel	Level to nearly level	0-3	70.05
San Roque	Level to nearly level	0-3	56.43
Bagumbayan	Undulating to rolling	8-18	82.35
Calumpang/Sto.Cristp	Undulating to rolling	8-18	15.79
Dalig	Undulating to rolling	8-18	375.11
Dulumbayan	Undulating to rolling	8-18	357.16
May-iba	Undulating to rolling	8-18	99.08
Poblacion	Undulating to rolling	8-18	28.20
Prinza	Undulating to rolling	8-18	23.39
San Gabriel	Undulating to rolling	8-18	7.14
Dalig	Steep	30-50	113.17
Total			2,122.84

Source: NAMRIA/PDPFP slope map

4.4 Mineral Resources

The municipality of Teresa is endowed with natural and mineral resources as evidenced by the mining and quarrying activities in the locality (Figure 12). For mining and quarrying, there are three (3) Mineral Production Sharing Agreement (MPSA) permits in the municipality covering 278 hectares. These are the Republic Cement Corporation (2 permits) and Rapid City Realty and Development Corporation. MPSA is a mineral agreement wherein the government shares in the production of the contractor, whether in kind or in value, as owner of the minerals. In return, the contractor shall provide the necessary financing, technology, management and personnel for the mining project. There is one (1) Quarry Permit by South Pacific Chemical Industries covering 4.005 hectares. There is one (1) Mineral Processing permit held by TMC International Corporation (Table 27).

Table 27. Directory of Mines and Quarries in Teresa, Rizal, 2012

Mineral	Commo-dity	Permit Holder	Operator	Type of Permit	Duration of Permit		Area (has.)	Location (Barangay, Municipality)	Status
					Effectivity	Expiration			
Non-metallic	Limestone	South Pacific Chemical Industries, Inc.		QP	1/27/2008	1/27/2013	4.005	May-iba, Teresa, Rizal	Not producing
Non-metallic	Limestone	Republic Cement Corp. (Formerly FR Cement Corp.)		MPSA	8/31/1998	8/30/2023	154.69	Brgy. Dulumbayan Teresa, Rizal	Producing
Non-metallic	Limestone	Republic Cement Corp. (Formerly	FR Cement Corporation/Republi	MPSA	6/23/2000	6/22/2025	36.46	Brgy. Dulumbayan Teresa, Rizal	Not producing

		FR Cement Corp.)	c Cement Corp.						
Non-metallic	Silica sand	Rapid City Realty and Dev't. Corp.		MPSA	9/24/1997	9/24/2022	87.1498	B.O. Pantay, Teresa, Rizal	Producing
Non-metallic		TMC International Corp.		MPP	6/30/2011	6/30/2016		Brgy. May-iba Teresa, Rizal	

Source: Mines & Geo-Sciences Bureau (MGBIV-A)

The municipality is rich in mineral resources. These include tuff, limestone, lime, shale, silica-silliceous rockmass (Table 28).

Table 28. Mineral Resource Inventory, 2011

Commodity	Location	Name of Tenement Holder	Quantity MT	Grade
Tuff	Teresa	Standard Mineral Products	1875000	60% SiO2
Limestone	Antipolo/Teresa	Marble Corporation of the Philippines	1177625250	
Limestone	Teresa	South Pacific Chemical Industries	6500000	94.67%CaCO3
Limestone	Dulumbayan,Teresa	FR Cement, Inc.	37792610	96% CaCO3
Limestone-Lime	May-iba, Teresa	Nin-Bay Mining Co./Standard Mining Products, Inc.	4700000	97.32%CaCO3
Shale	Dulumbayan, Teresa	FR Cement Corp	9174130	51.96%SiO2
Silica-SilliceousRockmass	Dulumbayan, Teresa	FR Cement Corp	9164650	57% SiO2

Source: MGB IV-A

Note: Based on MGB and Private sector technical reports on file as of 2009. Some of the mineral resources inventories are merely "geologic or inferred"reserves based on the rough estimates or interpolated projections and cannot be considered as "measured or positive" reserves until they are confirmed by detailed core drilling and or detailed exploration works.

5. Water Resources

5.1Surface Water Resources

There are three (3) major waterways in the municipality. These include the the May-iba River, Pamanaan Creek, and the Teresa River (Figure 13). The headwaters of May-iba River is in Antipolo City beyond the Teresa-Pinugay Road. May-iba River has an extension called Pamanaan Creek in Barangays Poblacion andCalumpang-Sto.Cristo. Teresa River traverse extends from Barangay Dalig towards Barangays San Gabriel, San Roque and Prinza.

5.2 Ground Water Resources

There are six (6) ground water resources being used by the municipality for its water supply. These are the pump station in Dalig, Bagumbayan (2), San Roque, San Gabriel, and Dulumbayan. Water supply is also being sourced from Manila Water and Morong Water District.

6. Environmental Quality

6.1 Air

The citizens of Teresa complain about the disturbing noise created by quarrying, hauling, and crushing of rocks in quarry sites and cement plants. The sound coming from truck engines moving to and from quarry sites and noise from ball mills, rock crushers, and equipment turbines are definitely unwelcome. Sad to say, this type of inconvenience will remain as long as Teresa hosts mining industries.
Air pollution is blamed against the town's poultry, hog and mining industries. Residences situated along Pantay-Buhangin Road where most poultry and hog industries are located complain of foul smell. Mining related activities such as quarrying and rock crushing are sources of dust particles and smoke effluents, which if inhaled may cause respiratory diseases, such as asthma, bronchitis, etc.

6.2 River System

May-iba River and its downstream extension, Teresa River, are observed to be brownish and muddy. Hog and poultry farms in Antipolo were pointed as the cause of its continued pollution and deterioration. As the river is the source of water used in irrigating rice and croplands, farmers complained of its deteriorating quality. The rivers are also heavily silted with soil and garbage. Industrial and household wastes are the leading source of river pollution. Gone are the days when the people of Teresa were able to take a bath and wash clothes in the river.

6.3 Waste Management

Every day, a person generates 0.3 kg of waste for rural areas, and 0.7 kg of waste for urban areas. The municipality being an urban area, a total of 33014.1 kilos or 33.3 tons of waste per day is being generated. Zero waste management is being promoted in the municipality. Waste segregation and recycling is being practiced at source. Each of the nine (9) barangays has each own Material Recovery Facility (MRF). There is also the Integrated Solid Waste Management MRF operated by the municipal government which produces compost, charcoal, and cement products. There is also a location allotted in the ISWMMRF for hospital wastes. Industrial and commercial firms employ self management of their wastes generated.

6.4 Sewerage

There are 8, 348 households or 88.11% of the total households in the municipality (Table 29) equipped with complete basic sanitation facilities which include a sanitary toilet system as of December 2012 compared to last year with only 79.5% of the total household. There is no centralized wastewater collection and disposal system. Domestic wastewater is disposed through septic tanks.

For the drainage system, there are concrete lined canals. Drainage pipes and culverts along commercial areas provide channels for water which are diverted to the creeks and rivers draining to the Laguna Lake.

Table 29. Households in Teresa with Sanitation Facilities, 2012

Barangay	No. of Households	No. of Households With Sanitary Toilets	No. of Households W/out Sanitary Toilets
Dalig	1844	1701	143
Bagumbayan	1636	1449	187
Dulumbayan	1463	1334	129
May-iba	1299	1137	162
San Gabriel	858	742	116
San Roque	731	632	99
Prinza	678	586	92
Poblacion	521	451	70
Cal-Sto.Cristo	444	381	63
Total	9474	8348	1126

Source: MHO

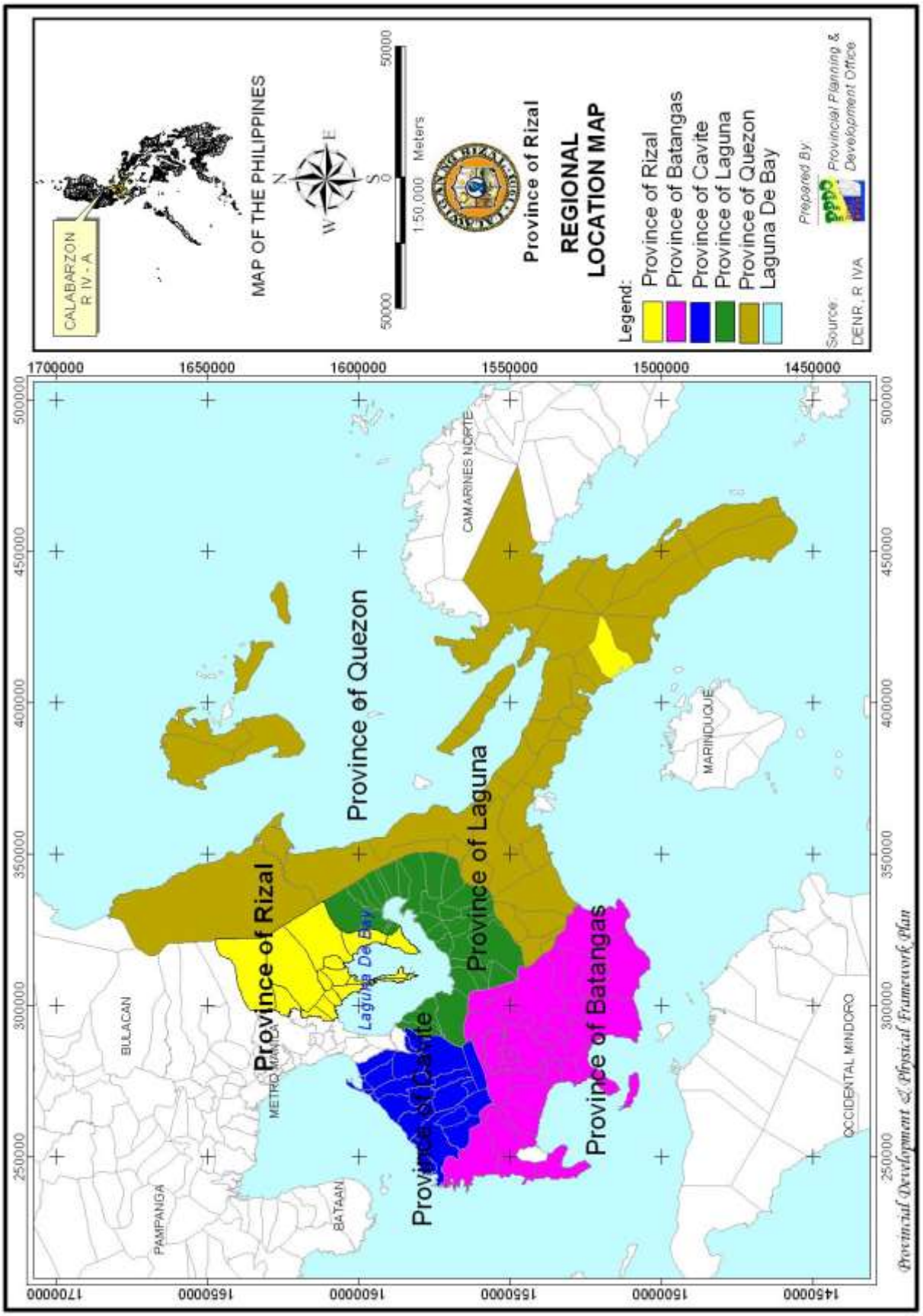

Figure 5. Regional Location Map

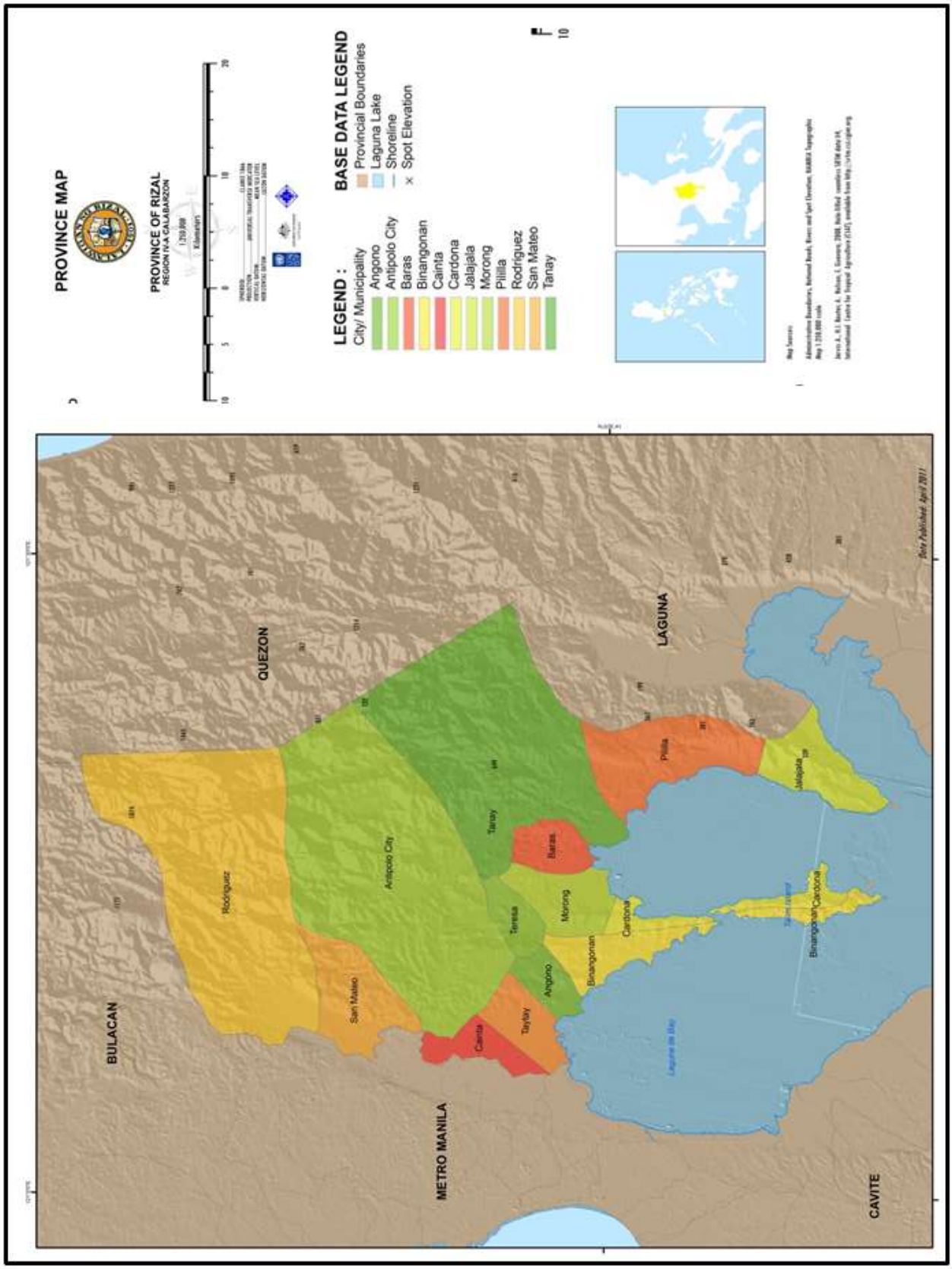

Figure 6. Map of Rizal Province

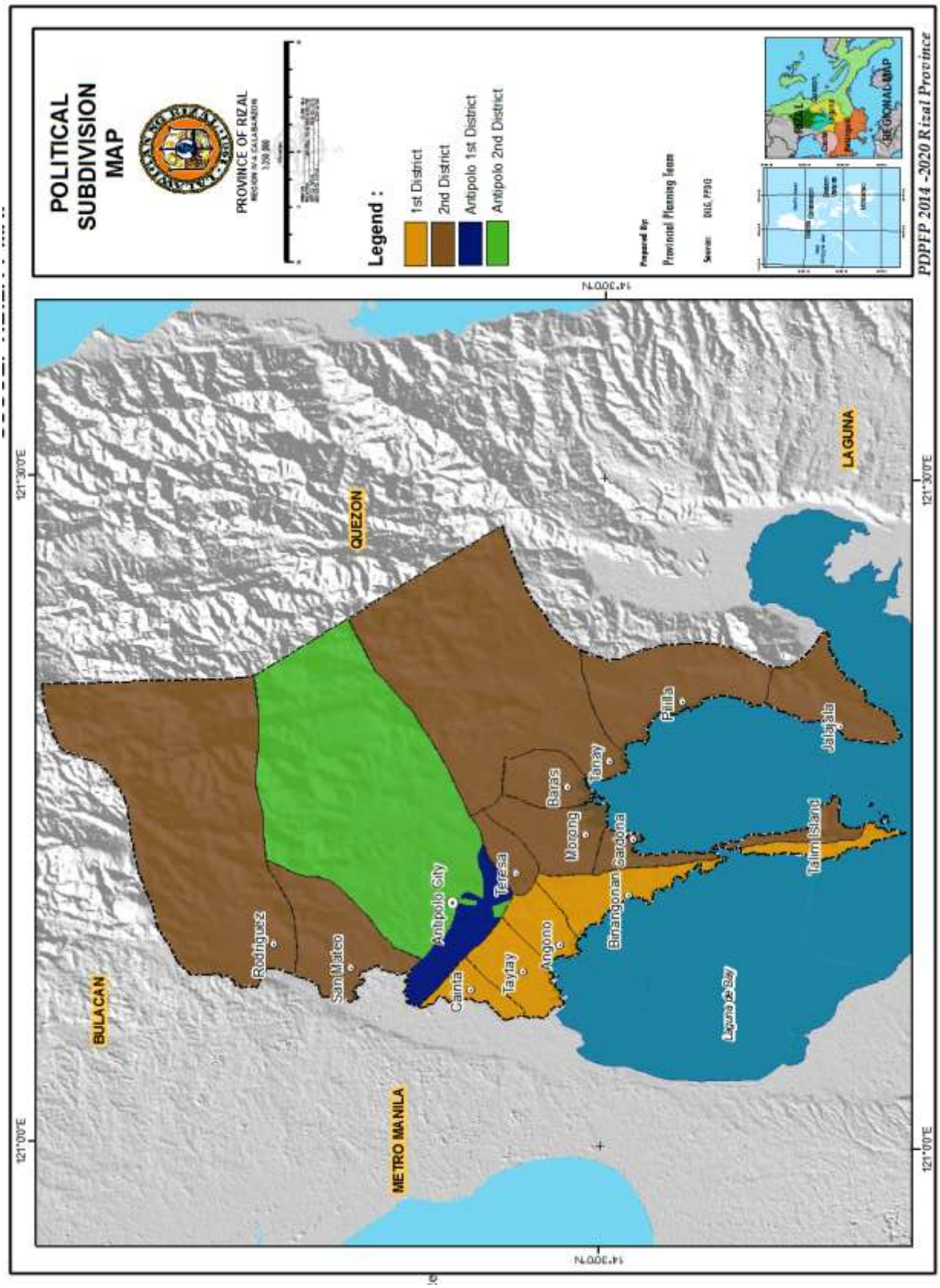

Figure 7. Political Subdivisions Map, Rizal Province

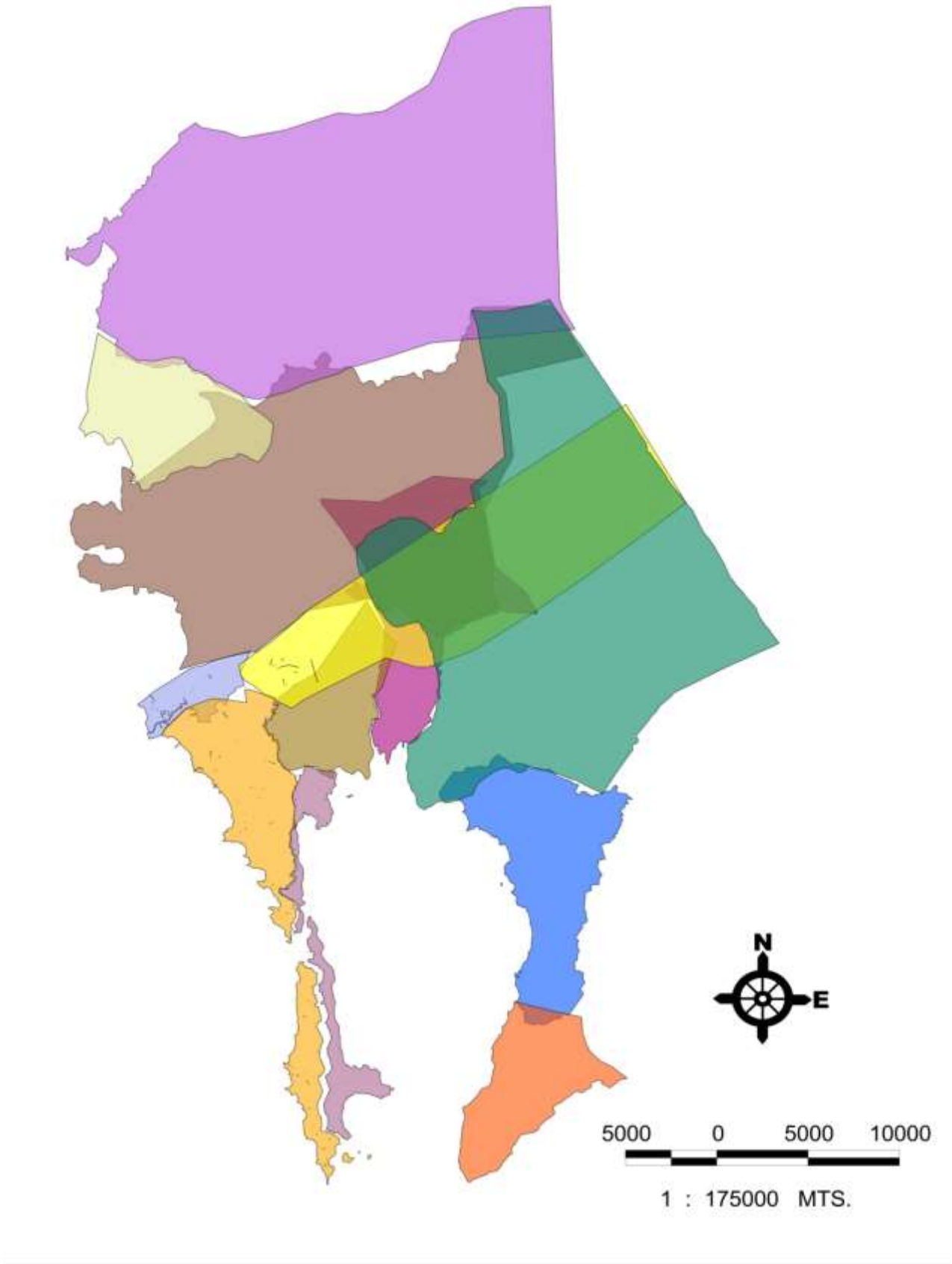

Figure 8.Teresa's Overlapping/Disputed Boundaries With Neigboring Municipalities

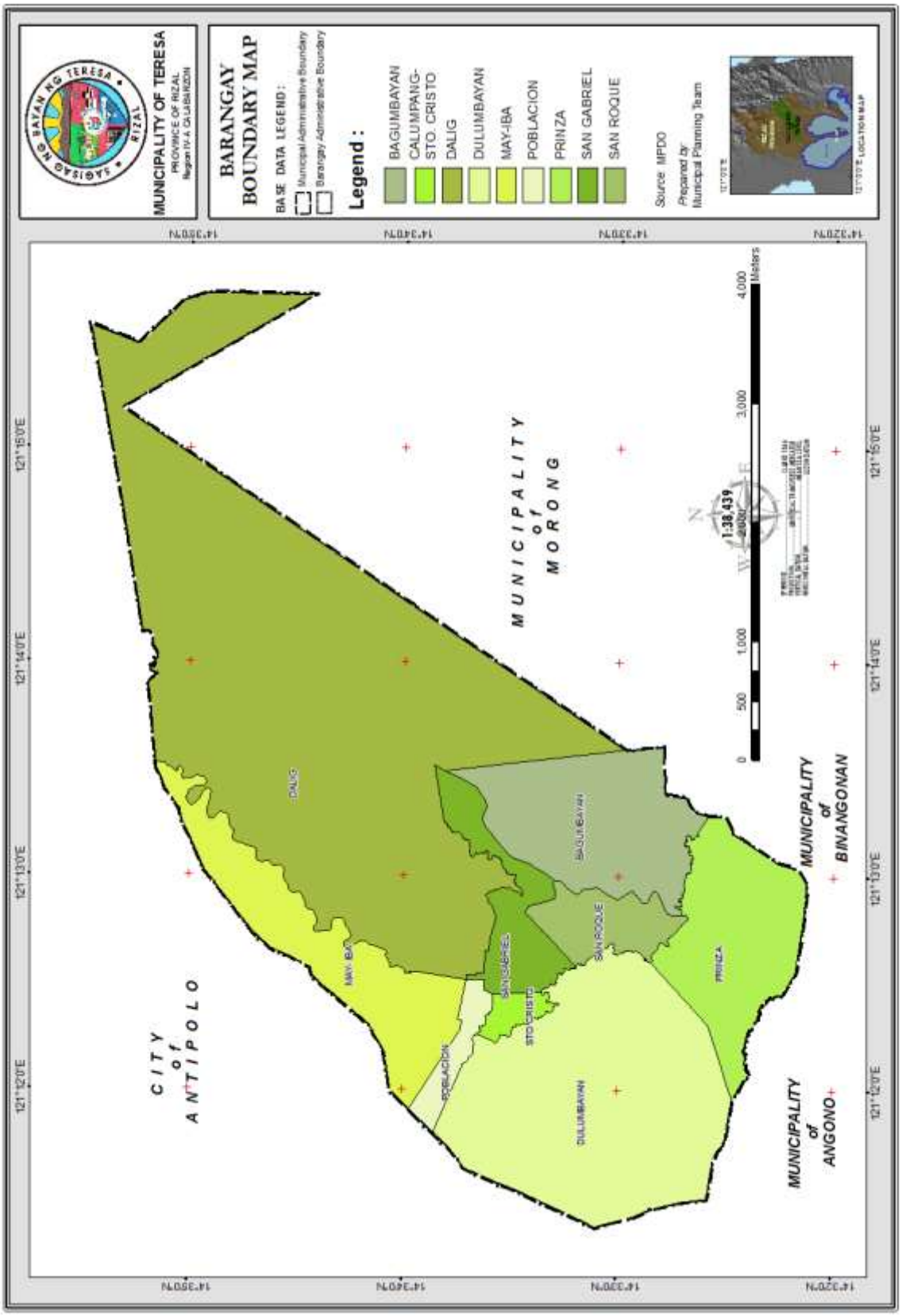

Figure 9.Administrative Map of Teresa

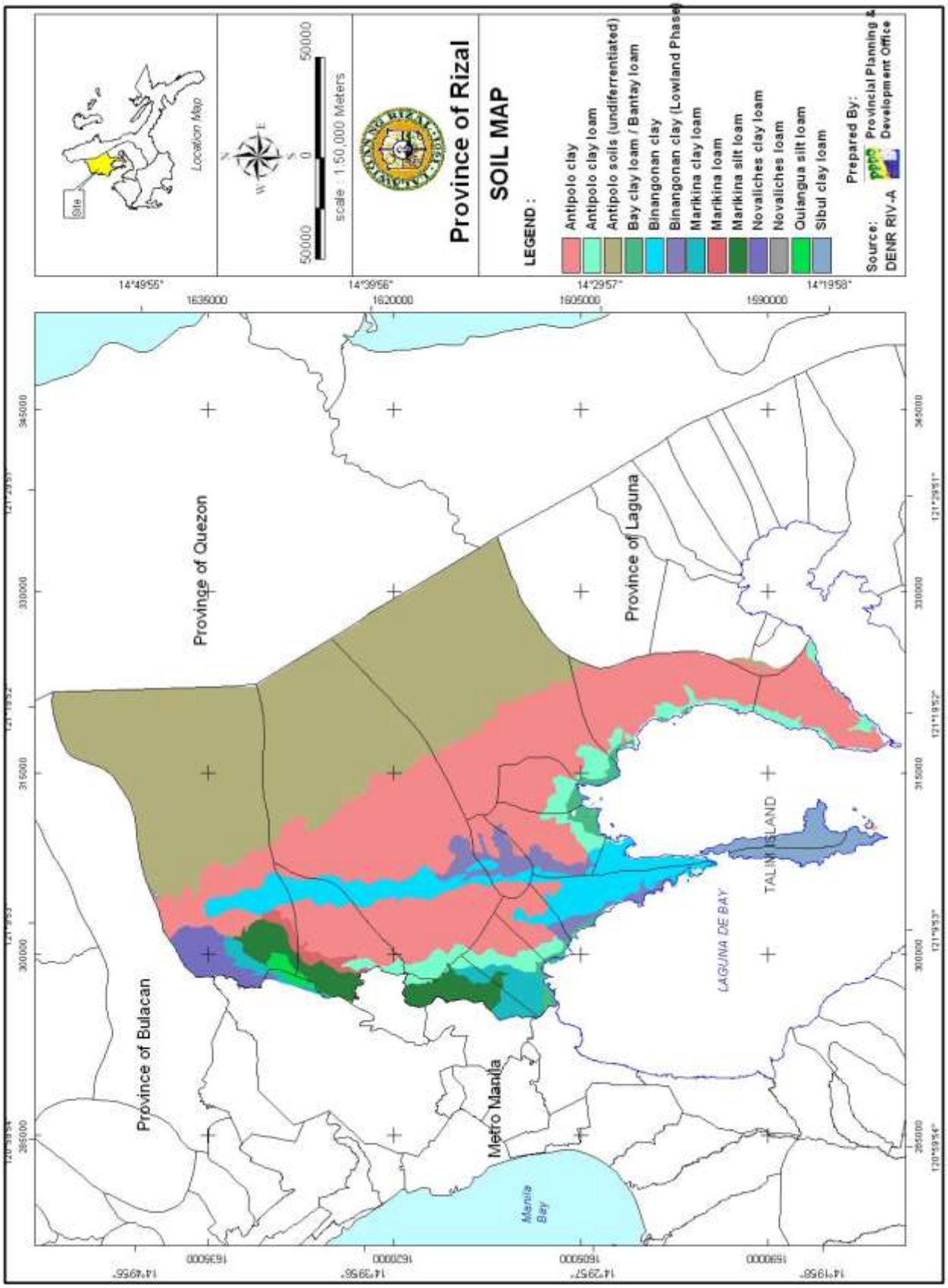

Figure 10.Soil Map of the Province

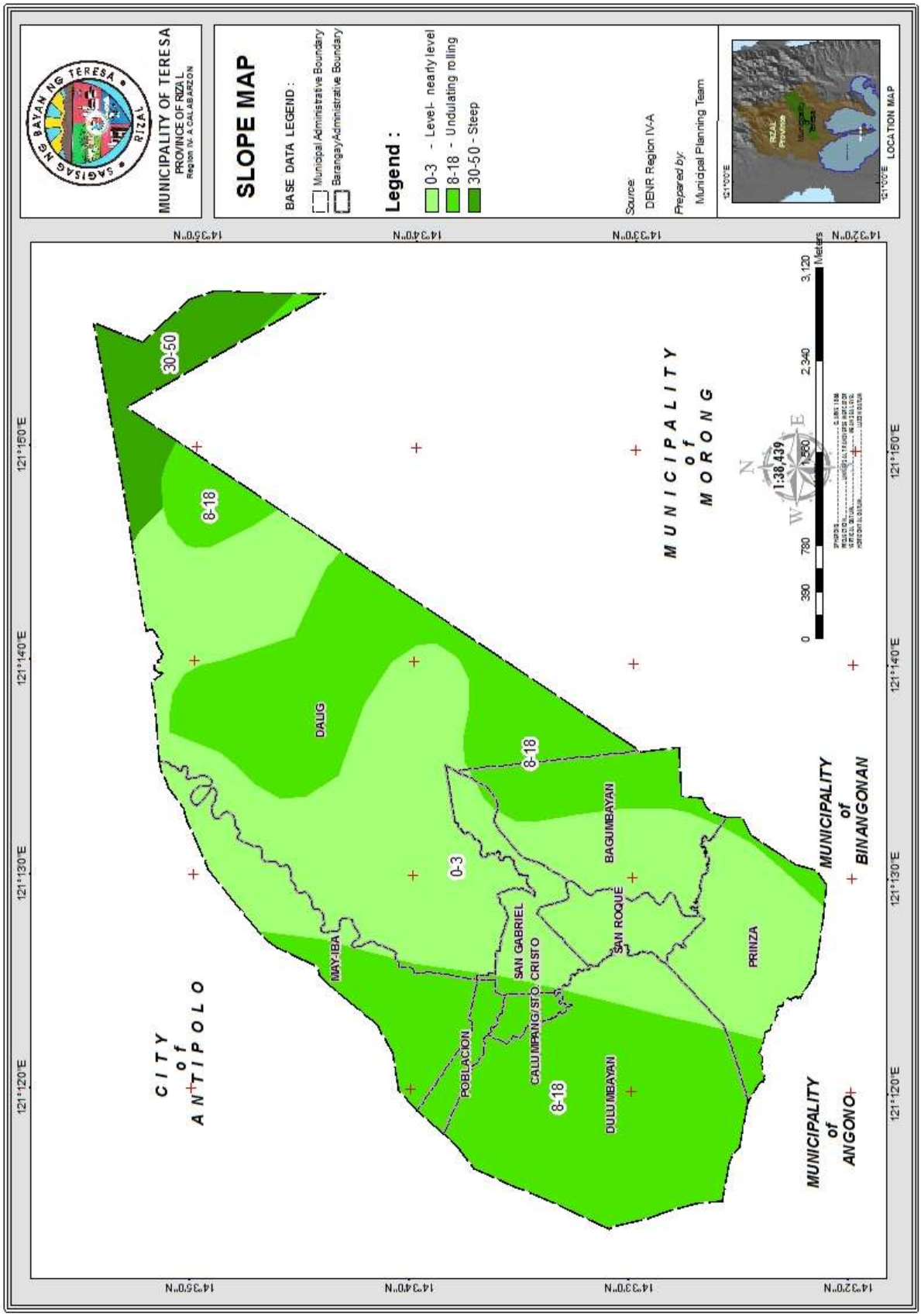

Figure 11. Slope Map of Teresa

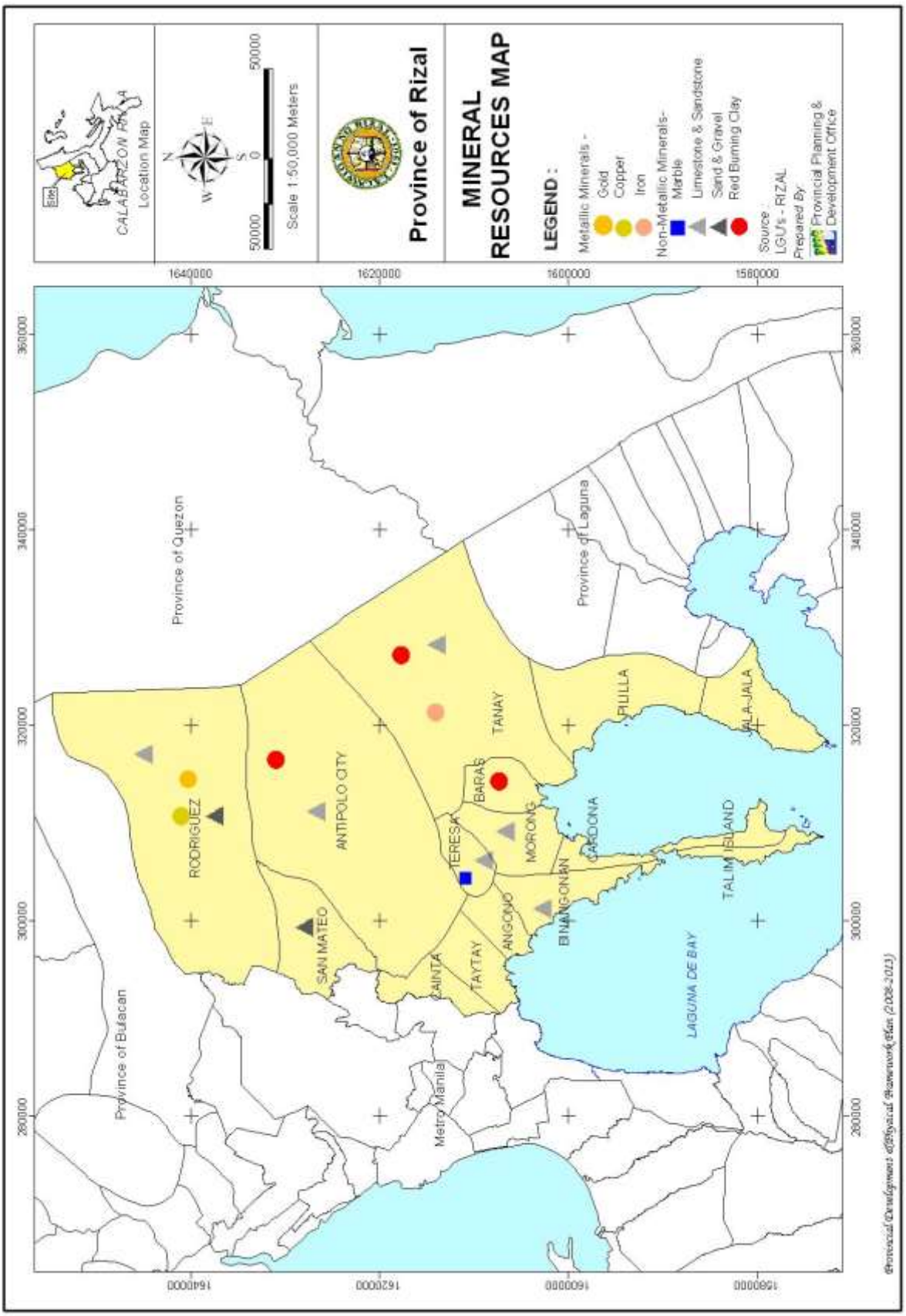

Figure 12. Mineral Resources Map of Rizal Province

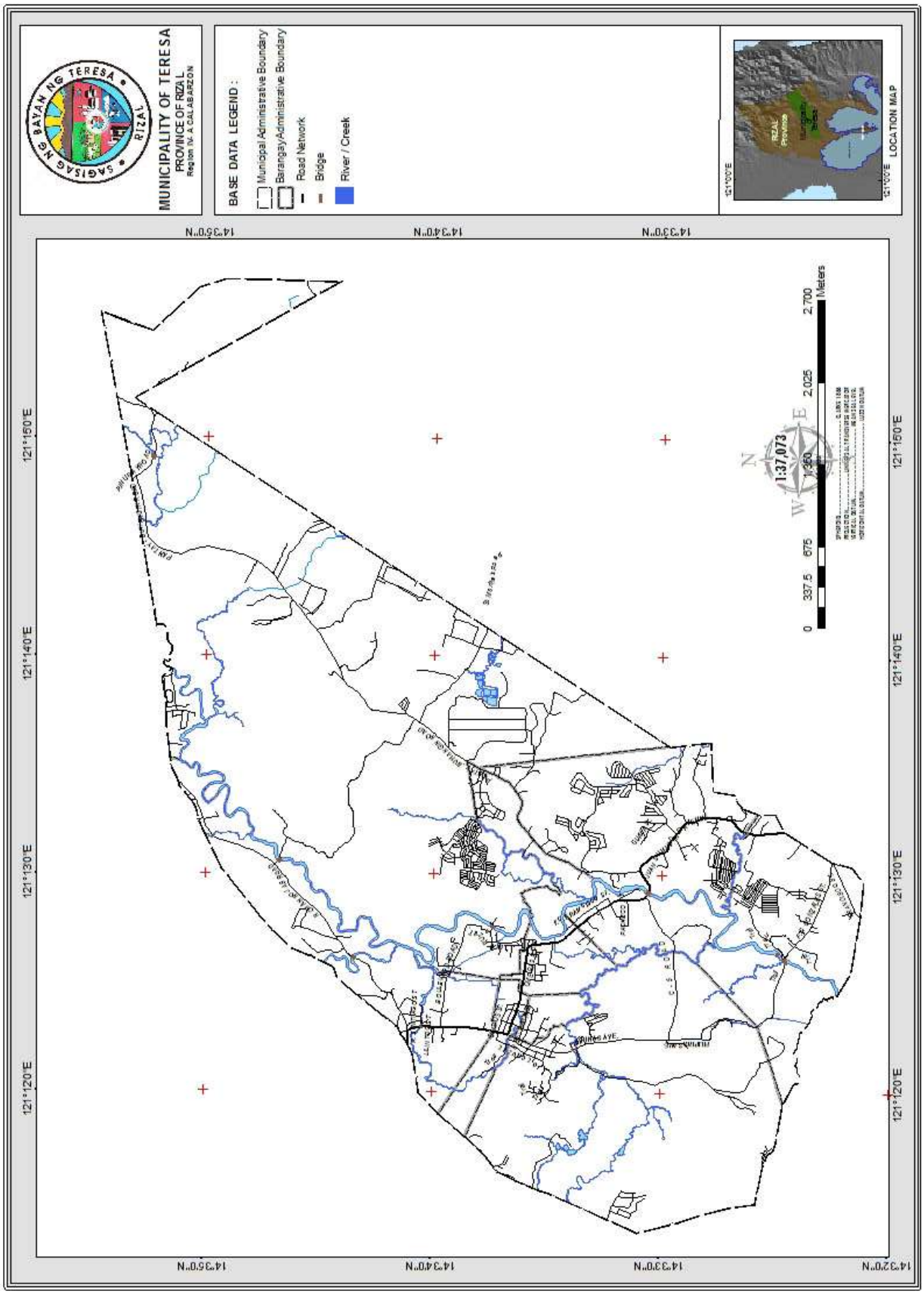

Figure 13. Surface Water Resources Map