

# Chapter III. Physical and Natural

## TOPOGRAPHY AND CLIMATE

### TOPOGRAPHY

Cavite is divided into four (4) physiographical areas, namely: the lowest lowland area, lowland area, the central hilly area and the upland mountainous area.

The lowest lowland area is the coastal plain in particular. These areas have extremely low ground level of EL. 0m to EL. 2m compared to the high tide level of about EL. 0.8m from the Mean Sea Level (MSL). These are the municipalities of Bacoor, Kawit, Noveleta and Rosario.

The lowland area consists of the coastal and alluvial plains. These areas have flat ground slope of less than 0.5% and low ground elevation of EL. 2m to EL. 30m. The alluvial plain can be found in the municipality of Imus and southern part of General Trias. Into these municipalities forms the transition area between the coastal plain and the central hilly area. It also covers some areas of Bacoor, Kawit, Noveleta, Rosario and Tanza.

The third topography type is the central hilly area, generally found on the mountain foot slope. It forms the rolling tuffaceous plateau. This topography includes steep hills, ridges and elevated inland valley. The plateau is characterized with ground elevation ranging from 30m to nearly 400m. Its ground slope ranges from 0.5 to 2%. The city of Trece Martires and the municipalities of Dasmariñas, Indang and Silang have this kind of topography.

The last topography type is upland mountainous area, found in Amadeo and Tagaytay City. They are situated at a very high elevation above EL. 400m with slopes of more than 2%. The Tagaytay ridge has a peak elevation of 650m.

Source: *The Study on Comprehensive Flood Mitigation for Cavite Lowland Area*, Japan International Cooperation Agency, 2009

### CLIMATE

Cavite belongs to Type 1 climate based on the Climate Map of the Philippines by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). Being a Type 1, Cavite has two pronounced seasons: dry from November to April and wet during the rest of the year. In the year 2009, the average temperature of the province is at 28.4°C. January, February and December are the coolest months with an average of 26.2°C. The province has received a total of 2,001.2mm of rainfall in 2009. August and September are the rainiest months while minimal rainfall was experienced during the

Figure 3.1. Slope Map, Province of Cavite: 2009

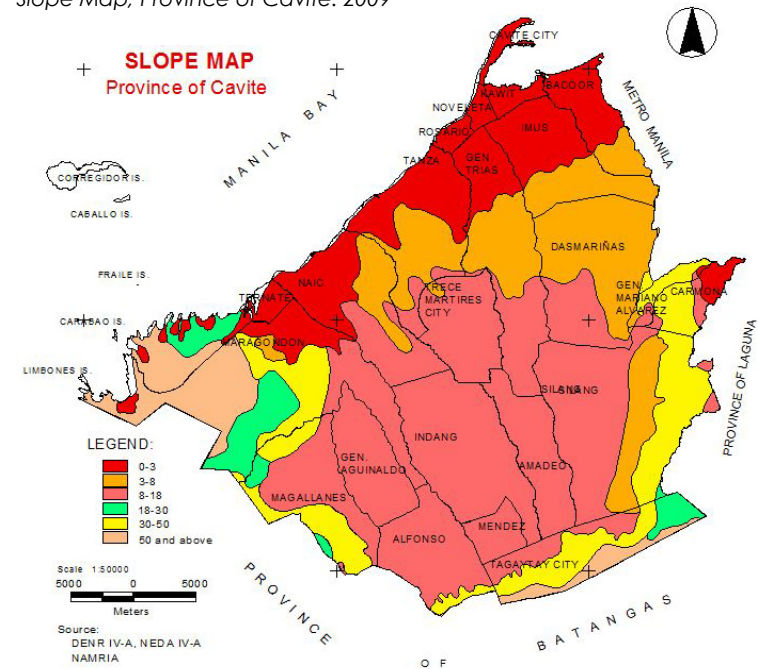


Table 3.1. Average Temperature and Rainfall by Month, Province of Cavite 2009

Month	Average Temperature (°C)	Average Rainfall (millimeters)
January	27.5	52.4
February	27.2	18.2
March	29.1	0.8
April	30.5	5.6
May	29.1	258.4
June	30	325.7
July	29.3	234.2
August	28.4	411.8
September	28.6	433.1
October	28.6	215.4
November	28.7	36.4
December	25	9.2

Source: PAG-ASA, Sangley Point Field Office

## LAND AREA

Cavite occupies land area of 142,706 hectares which is approximately 8.72 percent of CALABARZON's total land area, 2.74 percent of the regional land area and 0.48 percent of the total land area of the Philippines which is 299,404.00 hectares. The municipalities of Maragondon and Silang have the biggest land areas comprising 16,549 hectares and 15,641 hectares, respectively while the municipality of Noveleta has the smallest land area as indicated by 541 has. or 0.38 percent of the provincial total land area (Table 3.2).

### LAND RESOURCES AND DISTRIBUTION

Cavite's land resources are categorized into two: forest lands and alienable and disposable lands. Forest lands are being maintained as they play a great role for the ecological balance of the Province aside from the fact that they are home to numerous flora and fauna that needs to be protected and preserved. Correspondingly, the alienable and disposable lands are the built-up areas as well as production areas. These lands are intended for urban, economic and demographic developments

#### Forest Lands

Cavite Province lies in the western monsoon forest zone. This location is very beneficial for the formation of tropical rain forests which are characteristically made through natural vegetation. In 2007, the existing forest area within the province totalled to 8,624.956 hectares. These forest areas were categorized as Protected Landscape under R.A.7586 otherwise known as National Integrated Protected Area System (NIPAS) and the unclassified forest (Non-NIPAS). By virtue of Proclamation Number 1594 on 26 October 1976, a total of 4,000 hectares located in Ternate and Maragondon, Cavite was proclaimed as national park, now known as the Mts. Palay-Palay and Mataas na Gulod Protected Landscape. The park lies in the border of Cavite and Batangas and has three peaks, Palay-Palay, Pico de Loro and Mataas na Gulod. Still, there were five (5) unclassified forests found along Tagaytay Ridge, Maragondon, Magallanes, Ternate and Alfonso (Table 3.3). With regards to the records of mountains, seven were named such as Pico de Loro, Mt. Palay-Palay, Mt. Buntis, Mt. Mataas na Gulod, Mt. Nagpatong, Mt. Hulog and Mt. Gonzales (Table 3.4).

The richness of Cavite's forest provides the abundance of different forest products (Table 3.5). Grass in nature, bamboo, is one of the most available forest products being found in the municipalities of Ternate, Magallanes, Maragondon and General Aguinaldo throughout the year.

#### Alienable And Disposable Lands

Generally, these lands are intended for economic activities broadly



*Pico de Loro: One of the peaks of Mts. Palay-Palay and Mataas na Gulod Protected Landscape which is a favourite destination of hikers and mountain climbers.*



*L to R: Wine Holder, Mug, Lampshade – Some of the house wares derived from bamboo, a major forest product of Cavite.*

Table 3.2. Land Area by City/Municipality, Province of Cavite: 2009

City/Municipality	Land Area (Hectares)	Percent Distribution
<b>District I</b>		
Cavite City	1,183	0.83
Kawit	1,340	0.94
Noveleta	541	0.38
Rosario	567	0.40
<b>District II</b>		
Bacoor	5,240	3.67
<b>District III</b>		
Imus	9,701	6.80
<b>District IV</b>		
Dasmariñas	8,234	5.77
<b>District V</b>		
Carmona	3,092	2.17
Silang	15,641	10.96
Gen. M. Alvarez	938	0.66
<b>District VI</b>		
Trece Martires City	3,917	2.74
Gen. Trias	11,768	8.25
Tanza	9,630	6.75
Amadeo	4,790	3.36
<b>District VII</b>		
Tagaytay City	6,615	4.64
Alfonso	6,460	4.53
Gen. Emilio	5,103	3.58
Indang	8,920	6.25
Magallanes	7,860	5.51
Maragondon	16,549	11.60
Mendez	1,667	1.17
Naic	8,600	6.03
Ternate	4,350	3.05
<b>TOTAL</b>	<b>142,706</b>	<b>100.00</b>

Source: City/Municipal Profiles, Province of Cavite



Table 3.3. Area and Location of Forests, Province of Cavite

City/Municipality	Type of Forest	Area
Tagaytay City	Unclassified Forest	1,779.520 hectares
Alfonso	Unclassified Forest	432.092 hectares
Magallanes	Unclassified Forest	142.014 hectares
Ternate	Unclassified Forest	1,248.700 hectares
Maragondon	Unclassified Forest	5,022.630 hectares
<b>TOTAL</b>		<b>8,624.956 hectares</b>

Figure 3.2. Distribution of Land Resources, Province of Cavite

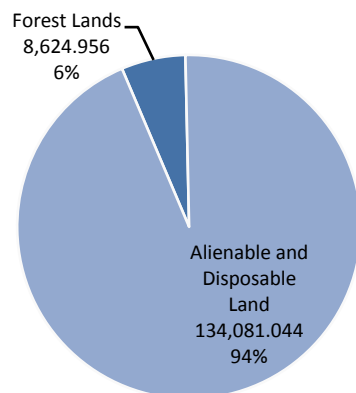


Table 3.4. Mountains in the Province of Cavite

Name	Location
Pico de Loro	Maragondon
Mt. Palay-Palay	Ternate-Maragondon
Mt. Buntis	Maragondon
Mt. Mataas na Gulod	Maragondon
Mt. Nagpatong	Maragondon
Mt. Hulog	Maragondon
Mt. Gonzales	Tagaytay City

Table 3.5. Forest Products, Province of Cavite

Forest Products	Location
Almaciga, Timber, Bamboo rattan, vine, wild plants & animals	Ternate
Timber, Bamboo, Rattan firewood	Magallanes
Bamboo, Usiw, Buho, Rattan Firewood, lumber	Maragondon
Bamboo, Cogon, Rattan, Cabo-negro processed into rope	Gen. Aguinaldo

### STATUS OF LAND USE (GENERAL)

As mentioned earlier, Cavite lands are divided into two classifications, forest lands and alienable and disposable lands. These lands are being used in various ways, either for agriculture, residences, open areas, etc. These actual uses are termed as land-use.

Based on the Cavite Provincial Physical Framework Plan 2005-2010, Cavite’s alienable and disposable lands are further classified into production lands and built-up areas. Production lands in Cavite are intended for agriculture, fishery and mining. On the other hand, built-up areas are mainly for residential areas, commercial, industrial and tourism areas.

### Production Land-Use

Majority of production land-use is into agriculture. Considering that 50.33% of the total provincial land area is engaged into agriculture, it can be generalized that in spite of rapid urbanization in the province, Cavite remains to have an agricultural economy that makes food security attainable. Some of the major crops being produced in the province are rice, corn, coffee, coconuts, cutflowers and vegetables.

Included in the agricultural land use are livestock farms that range from piggeries, poultries, goat farms and cattle farms. The climatic suitability of Cavite makes the province ideal for integrated farming, having crops and livestock rising in one farm.

Fishery is also another major component of the agricultural sector. Having rich marine resources and long coastlines, the province is home to numerous fishery activities. This industry has provided livelihood to many Caviteños. In some lowland and even upland areas, fishery, in the form of fishponds are also producing considerable amount of fish products. Some areas in Cavite are also engaged in fish processing and production of fish products like fish sauce.

Mining is the third component of production land-use in the province. As of 2009, there are 15 mining and quarrying areas operating in Cavite. Extraction includes filling materials, gravel and sand.

### Built-up Areas

The built-up areas are mainly composed of residential and industrial sites. This also includes commercial and business areas where commerce is transpiring. According to the 2007 Census of Population and Housing by the National Statistics Office, there are 611,450 occupied housing units in Cavite.

Moreover, according to the Housing and Land-Use Regulatory Board, there are around 1,224 housing subdivisions with issued license to sell in the province until 2009 which occupies an area of 9,471 hectares.

Meanwhile, the industrial sector also develops rapidly in the Province. For 2009, operational industrial estates cover around 2,939 hectares. Tourism establishments are also considered built-up areas such as golf courses, leisure farms, resorts and the likes.

## STATUS OF LAND AREA CLASSIFICATION

The Province is dominated with production area that accounts for 50.33% of its total land area. It is followed by built-up areas that cover 39.99% of Cavite. Lastly, 9.33% of the province is considered protection lands such as natural parks and forests.

Maragondon and Silang are relatively agricultural municipalities with 10,266 and 9,732 hectares of production land, respectively. Tanza, Imus and Gen. Trias are the municipalities with most area intended for urbanization. Meanwhile, despite relatively small land area, Bacoor and Trece Martires City are dominated with built-up area with only 604 and 523 hectares considered as production land, respectively (Table 3.6).

Table 3.6. Land Area Classification by City/Municipality, Province of Cavite

City/Municipality	Total Area of Production Land(Hectares)	Total Area of Protection Land(Hectares)	Total Built-up Area (Hectares)	Total Area (Hectares)
<b>District I</b>				
Cavite City			1,183	1,183
Kawit	450		890	1,340
Noveleta	54		487	541
Rosario	27		540	567
<b>District II</b>				
Bacoor	604		4,636	5,240
<b>District III</b>				
Imus	2,057		7,644	9,701
<b>District IV</b>				
Dasmariñas	2,556		5,678	8,234
<b>District V</b>				
Carmona	609		2,483	3,092
Silang	9,732	57	5,852	15,641
Gen. M. Alvarez	336		602	938
<b>District VI</b>				
Trece Martires City	523		3,394	3,917
Gen. Trias	5,158		6,610	11,768
Tanza	1,897		7,733	9,630
Amadeo	4,550		240	4,790
<b>District VII</b>				
Tagaytay City	1,272	2,707	2,636	6,615
Alfonso	6,046	103	311	6,460
Gen. Emilio				
Aguinaldo	3,710	1,079	314	5,103
Indang	7,755		1,165	8,920
Magallanes	5,571	1,861	428	7,860
Maragondon	10,266	4,298	1,985	16,549
Mendez	1,055		612	1,667
Naic	7,290		1,310	8,600
Ternate	312	3,210	829	4,350
<b>TOTAL</b>	<b>71,829</b>	<b>13,314</b>	<b>57,063</b>	<b>142,706</b>

Source: City/Municipal Comprehensive Land-Use Plan, 2004

## SOIL

Cavite is composed of several soil types according to soil surveys conducted by the Bureau of Soils and Water Management (BSWM). Classification of soil types in a specific area is a very important consideration in identifying its most fitted land-use. This way, utmost productivity can be achieved.

The lowland area of Cavite is generally composed of Guadalupe clay and clay loam. It is characterized as coarse and granular when dry but sticky and plastic when wet. Its substratum is solid volcanic tuff. These types of soils are suited to lowland rice and corn while those in the upland are suited for orchard and pasture. Guadalupe clay adobes are abundant in the southern part of Bacoor and Imus bordering Dasmariñas. The soil is hard and compact and difficult to cultivate that makes it generally unsuitable for diverse cropping. It is very sticky when wet and granular when dry. Forage grass is advised for this type of soil. Hydrosol and Obando sand are found along Bacoor Bay. The shoreline of Rosario, Tanza, Naic and Ternate are lined with Guadalupe sand.

The central area principally consists of Magallanes loam with streaks of Magallanes clay loam of sandy texture. This is recommended for diversified farming such as the cultivation of upland rice, corn, sugarcane, vegetables, coconut, coffee, mangoes and other fruit trees. The steep phase should be forested or planted to rootcrops. The eastern side of Cavite consists of Carmona clay loam with streaks of Carmona clay loam steep phase and Carmona sandy clay loam. This type of soil is granular with tuffaceous material and concretions. It is hard and compact when dry, sticky and plastic when wet. This type of soil is planted to rice with irrigation or sugarcane without irrigation. Fruit trees such as mango, avocado and citrus are also grown in this type of soil. Guingua fine sandy loam is found along the lower part of Malabon and Alang-ilang River at Noveleta.

The type of soils that dominate the upland areas are Tagaytay loam and Tagaytay sandy loam with mountain soil undifferentiated found on the south-eastern side bordering Laguna province. Also on the southern tip are Magallanes clay and Mountain soil undifferentiated with interlacing of Magallanes clay loam steep phase. The Tagaytay loam contains fine sandy materials, moderately friable, and easy to work on when moist. In an undisturbed condition, it bakes and becomes hard when dry. About one-half of this soil type is devoted to upland rice and upland crops. On the other hand, Tagaytay sandy loam is friable and granular with considerable amount of volcanic sand and underlain by adobe clay. Mountain soil undifferentiated is forested with bamboos found in the sea coast. Cavite also has the Patungan sand characterized by pale gray to almost white sand with substratum of marine conglomerates which are found at Sta. Mercedes in Maragondon and in some coastlines of Ternate.

## FORESTRY

### THE MOUNTS PALAY-PALAY AND MATAAS NA GULOD PROTECTED LANDSCAPE

Cavite is very fortunate to have an area which is considered to be a biologically rich. In 1976, by virtue of Presidential Proclamation No. 1594, the Mounts Palay-Palay and Mataas na Gulod were declared to be national parks. The declaration aims to preserve the natural biodiversity of the area as part of the advocacy to preserve the country's natural heritage. The national park was later named as the Mounts Palay-Palay and Mataas na Gulod Protected Landscape.

The entire landscape is composed of more or less 4,000 hectares. The preservation of its natural biodiversity is a strategic move considering the rapid urbanization happening in the province of Cavite and the nearby Metro Manila. Known to be a good source of water, it is of utmost importance to preserve and rehabilitate the damaged portions of the national park.

The national park is approximately located within the geographic coordinates of 14°12' to 14°17' north latitude and 120°38' to 120°42' east longitude. The park covers four (4) barangays (Sapang, Pinagsanhan, Patungan and Papaya) and seven (7) sitios (Malauyas, Caynipa, Caytako, Cacabay, Magabe, Murangdalig and Hamilo). Different portions of the park can be found in three municipalities (Ternate, Maragondon and Nasugbu) under two provinces (Cavite and Batangas).

### The Mounts Palay-Palay and Mataas na Gulod Protected Landscape Management Zones

The Park is divided into 10 management zones that ensure a balanced land-use for the park. These are as follows:

#### 1. **Strict Protection Zone – 250 hectares**

This special zone has high biodiversity value. The area is strictly protected with no man-made interventions or changes are allowed except for scientific studies and/or ceremonial or religious use by indigenous communities. Getting any flora or fauna specie from the area is strictly prohibited. On the other hand, introduction of foreign flora or fauna is likewise not allowed. The strict protection zone is concentrated around the Mts. Palaypalay/Mt. Pico de Loro and abutting the Calumpang Point Naval Reservation.

#### 2. **Sustainable Use Zone – 1,995 hectares**

This zone covers the largest area of the park. The area can be utilized for sustainable livelihood of the surrounding communities such as gathering of medicinal leaves and roots and the likes. Only natural propagation is allowed in this area and only species that are already present can be cultivated. Furthermore, harvesting will be controlled to maintain natural equilibrium. A portion of the stretch of the Mamba/Cacabay River can be found in this zone.

#### 3. **Restoration Zone – 280 hectares**

This area was considered a degraded zone which needs to be restored to regain its rich natural habitat. This area will be subjected to activities, fire control, cogan

suppression and reforestation to name some. Reforestation will be limited to native species of trees. Once rejuvenated, the area will change its management zone classification. A portion of the stretch of the Palicpican River is located in this zone.

#### 4. **Habitat Management Zone – 270 hectares**

This is an area with significant habitat and specie value. This zone is subjected to management practices so as to maintain specific condition or habitat for rare, threatened and endangered species. Human habitation and sustainable use maybe allowed if they play a habitat management role. A portion of the stretch of the Palicpican River is located in this zone.

#### 5. **Multiple Use Zones - 268 hectares**

This area can be utilized for controlled settlement, traditional/sustainable land use, agriculture and income generating activities but should fall within the prescribed activities in the management plan. A portion of the Mamba/Cacabay River is part of this zone.

#### 6. **Buffer Zone – 250 hectares**

Under the RA 7568, buffer zones are defined as “identified areas outside the boundaries of and immediately adjacent to designated protected areas that need special development control in order to avoid or minimize harm to the protected area.” With respect to the Mounts Palay-Palay and Mataas na Gulod Protected Landscape, its buffer zone includes the Calumpang Point Naval Reservation, Palicpican Bay, the Caylabne and Puerto Azul Resorts, the rest of Barangay Sapang A of Ternate, Cavite, the rest of Barangays Pinagsanhan A, Pinagsanhan B and Patungan of Maragondon and Barangay Payapa of Nasugbu, Batangas.

#### 7. **Recreational Zones – 185 hectares**

This area is considered to be of high recreational, educational or environmental awareness value. If the regulating bodies will allow, in consideration of their management plan, activities like eco-tourism, recreational, conservation education or public awareness activities can be done. In this area, facilities like visitor's center, nature trails and food centers can be established. The revenues generated from it can be used to finance programs in benefit of the Park.

#### 8. **Alienable and Disposable Zone/ Puerto Azul Zone – 502 hectares**

This zone can be used for commercial activities as in the case of Puerto Azul Zone.

#### 9. **Marine and Coastal Zone**

10. **Other management zone as maybe used in the management plan and approved by the Secretary**

Table 3.7. Reforestation Projects, Province of Cavite: 2009

Reforestation Project	Location	Land Area Covered (in hectares)
Upland Development Program	Brgy. Pinagsanhan, Maragondon	20
Upland Development Program	Brgy. Pinagsanhan, Maragondon	18
Upland Development Program	Brgy. Sapang, Ternate	14
Upland Development Program	Brgy. Pinagsanhan, Maragondon	20
Regular Reforestation Project	Sitio Tala, Pinagsanhan, Maragondon	50
Regular Reforestation Project	Brgy. Pinagsanhan, Maragondon	22
Regular Reforestation Project	Sitio Mamba, Pinagsanhan, Maragondon	10
Regular Reforestation Project	Sitio Malauyas, Sapang, Ternate	44

**Park Management Programs and Activities**

The Department of Environment and Natural Resources engaged to the following activities in view of its Mounts Palay-Palay and Mataas na Gulod Protected Landscape protection, rehabilitation and preservation:

1. Biodiversity and Habitat Rehabilitation
  - a. Scientific Researches
  - b. Socio-Economic Studies Program
  - c. Information and Education Campaign
  - d. Conservation and Management Scheme
2. Park's Management
  - a. Protection Management Scheme
  - b. Disaster Management
  - c. Realistic System of Economic Instruments

**REFORESTATION PROJECTS**

In order to maintain and enhance the natural resources of the Province, the Department of Environment and Natural Resources in coordination with the Provincial Government-Environment and Natural Resources Office are conducting various reforestation projects.

Reforestation projects are concentrated in municipalities where protected areas currently exist like in Maragondon and Ternate. It is in these two municipalities where the Mts. Palay-Palay and Mataas na Gulod National Park can be found. These areas also made possible the presence of bulk-water resource in Cavite and thus, have to be maintained.

For 2009, the number of hectares of reforested land totalled to 198 hectares (Table 3.7).

Source: Provincial Environment and Natural Resources Office (PENRO), Trece Martires City

## MINERAL RESOURCES AND RESERVES

### NON-METALLIC RESOURCES

The greater parts of Cavite are composed of volcanic materials, tuff, cinders, basalt, breccias, agglomerate and interbeddings of shales, and sandstones. The dormant and active volcanoes (Taal) are within these volcanic areas and have been the sources of volcanic materials which form the Tagaytay Cuesta. The drainage systems are deeply entrenched in the tuffs, eroding thin interbedded sandstones and conglomerate rocks which are the sources of little reserves of sand and gravel in the larger stream. Adobe stone quarries also flourish in the tuff areas.

Cavite coastal areas have marl and conglomerate sedimentary rocks and some igneous rocks which are prominent in the high, mountainous regions of western part of the province. Black sands are found in Kawit while Noveleta has its own salt products. Magallanes has gravel deposits while reserves of sand and gravel materials are found in Alfonso, Carmona, Gen. Aguinaldo, Naic, Ternate, Maragondon and Silang (Table 3.8).

Table 3.8. Mineral Deposits, Province of Cavite

City/Municipality	Mineral Deposits	Location
Alfonso	Gravel, Sand	Mabuhay, Ulong Tubig
Carmona	Gravel, Sand, Clay	
Gen. Aguinaldo	Gravel, Sand Adobe, Boulders	Batas-Dao, Lumipa Batas-Dao Kaymisan & Lumipa
Kawit	Black Sand	San Sebastian
Ternate	Gravel and Sand Boulders Banda-Banda	Bucana, San Jose, San Juan, Poblacion Sapang
Magallanes	Gravel Deposit	Ramirez, Urdaneta
Maragondon	Manganese, Iron Gravel, Sand	Tulay, Mabato Caingin
Naic	Sand	
Noveleta	Salt	San Rafael, Tibagan, Malaking Ilog, Matindig
Silang	Sand	

Provincial Government-Environment and Natural Resources Office (PG-ENRO)  
Trece Martires City

Source: S