

# Chapter 2: Geophysical Environment

## Geographical Location

The Province of Cavite is situated in Luzon's southern part, the largest island in the Philippines. It belongs to Region IV-A or the CALABARZON region. It is bounded by the provinces of Batangas in the south, Laguna in the east, Metro Manila and Manila Bay in the north, and the West Philippine Sea in the west (Map 2.1).

It is geographically located at latitude (14.2803°) 14° 16' 49" north of the equator and longitude (120.8664°) 120° 51' 59" east of the prime meridian.

## Political Subdivision

Cavite was pronounced as a province under Act No. 2711, otherwise known as the Revised Administrative Code of the Philippine Islands of 1917. Under Section 37 of the mentioned code, the province of Cavite was consisting of territory on the island of Luzon lying on the south side of Manila Bay. It included the municipalities of Alfonso, Amadeo, Bacoor, Bailen, Carmona, Cavite (then capital of the province), Dasmariñas, Imus, Indang, Kawit, Magallanes, Malabon (then City of General Trias), Maragondon, Mendez-Nuñez, Naic, Noveleta, Rosario, Silang, Tanza, Ternate.

The passage of Republic Act 11069 in 2018, divided the province into eight legislative districts, the most in the country. The 1<sup>st</sup> District is composed of Cavite City, Kawit, Noveleta, and Rosario while the 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 6<sup>th</sup> Districts belong to the lone districts of cities of Bacoor, Imus, Dasmariñas, and Gen. Trias, respectively. In the 5<sup>th</sup> district are Carmona, Silang, and Gen. Mariano Alvarez; Amadeo, Indang, Tanza, and Trece Martires City are in the 7<sup>th</sup> district; and in the 8<sup>th</sup> district are the towns of Alfonso, Gen. Emilio Aguinaldo, Magallanes, Maragondon, Mendez-Nuñez, Naic, Ternate and Tagaytay City.

The province is further divided into seven cities and 16 municipalities with 829 barangays. The seven cities include the seat of the Provincial Government – Trece Martires City, the defense frontier – Cavite City, the provincial summer capital – Tagaytay City, the City of Dasmariñas under RA 9723, the City of Bacoor under RA 10160, the City of Imus by RA 10161, and the City of Gen. Trias through RA 10675.

Presidential Decree 1163 declared the City of Imus as the de jure (according to law) provincial capital and Trece Martires City as the provincial government's de facto seat.

On December 03, 1909, during the American regime, Governor-General William Cameron Forbes issued Executive Order No. 124 that annexed Corregidor and the Islands of Caballo (Fort Hughes), La Monja, El Fraile (Fort Drum), Sta. Amalia, Carabao (Fort Frank), and Limbones and all waters and detached rocks surrounding them to Cavite City. These are now major tourist attractions of the

province. Moreover, the adjacent Balut island is under the jurisdiction of the municipality of Ternate.

## Land Area

Land is an important resource that is the basis of many governance-related decisions such as budget, cityhood, and programming. Land, referred to as dry land, is the solid surface of the Earth that is not permanently covered by water. It is an area of ground that is being used for a particular purpose. It excludes the area below inland water bodies. The proper usage of land is a major determinant or guiding force in the progress of a province.

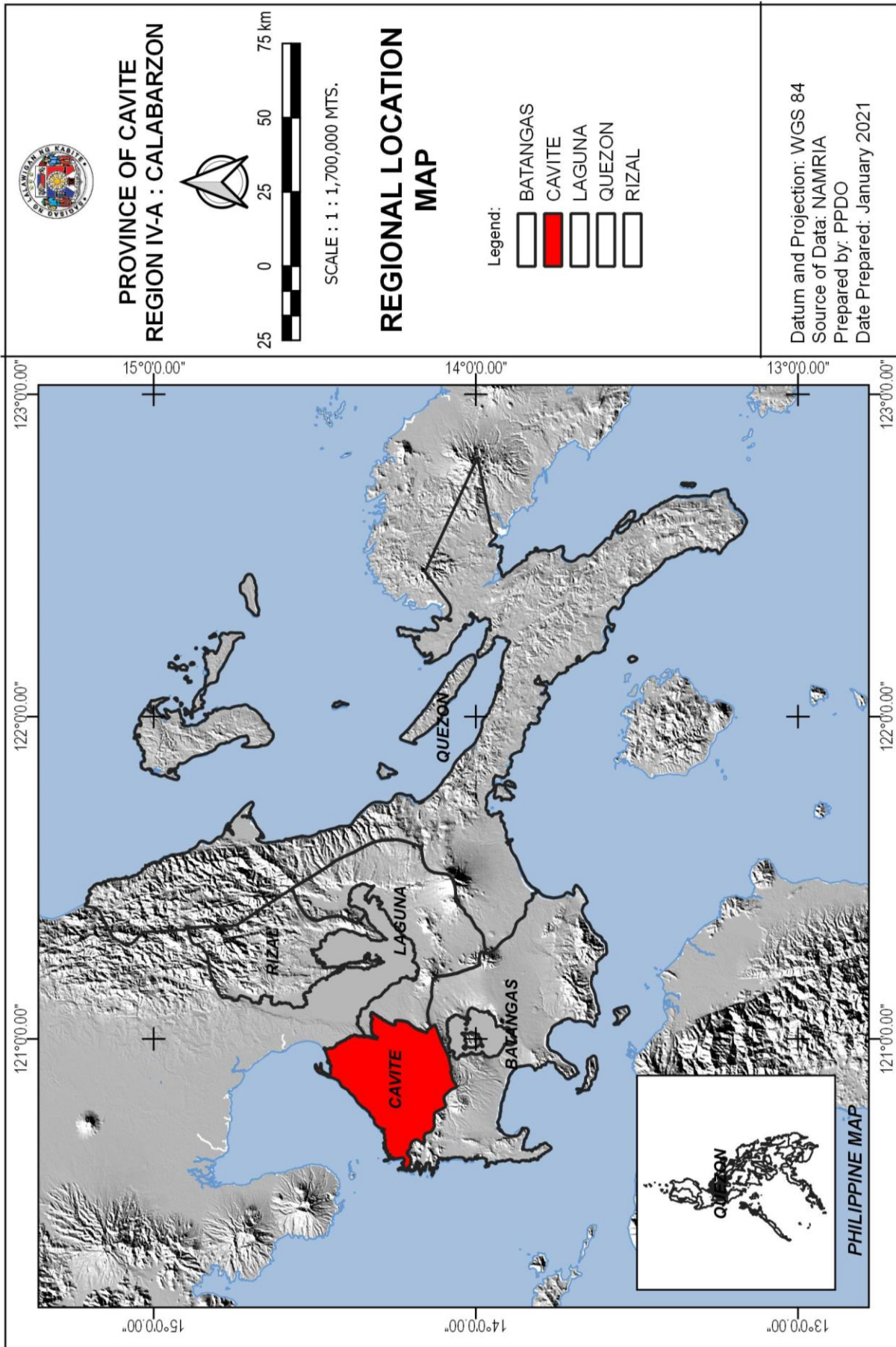
Cavite has a total land area of 142,706 hectares or 1,427.06 square kilometers, representing 8.66% of the region's total land area and 0.42% of the country's total land area. Among the eight districts of the province, the 8<sup>th</sup> District has the largest land area of 572.04 square kilometers, which covers 40.09% of the total land area, and District I has the smallest land area with 36.31 square kilometers or 2.54% of the total provincial land area. The municipalities of Maragondon and Silang have the largest land area of 165.49 and 156.41 square kilometers, respectively, while the municipality of Noveleta has the smallest with 5.41 square kilometers (Table 2.1).

**Table 2.1 Land Area, Number of Barangays, and Income Class by District/City/Municipality, Province of Cavite: 2020**

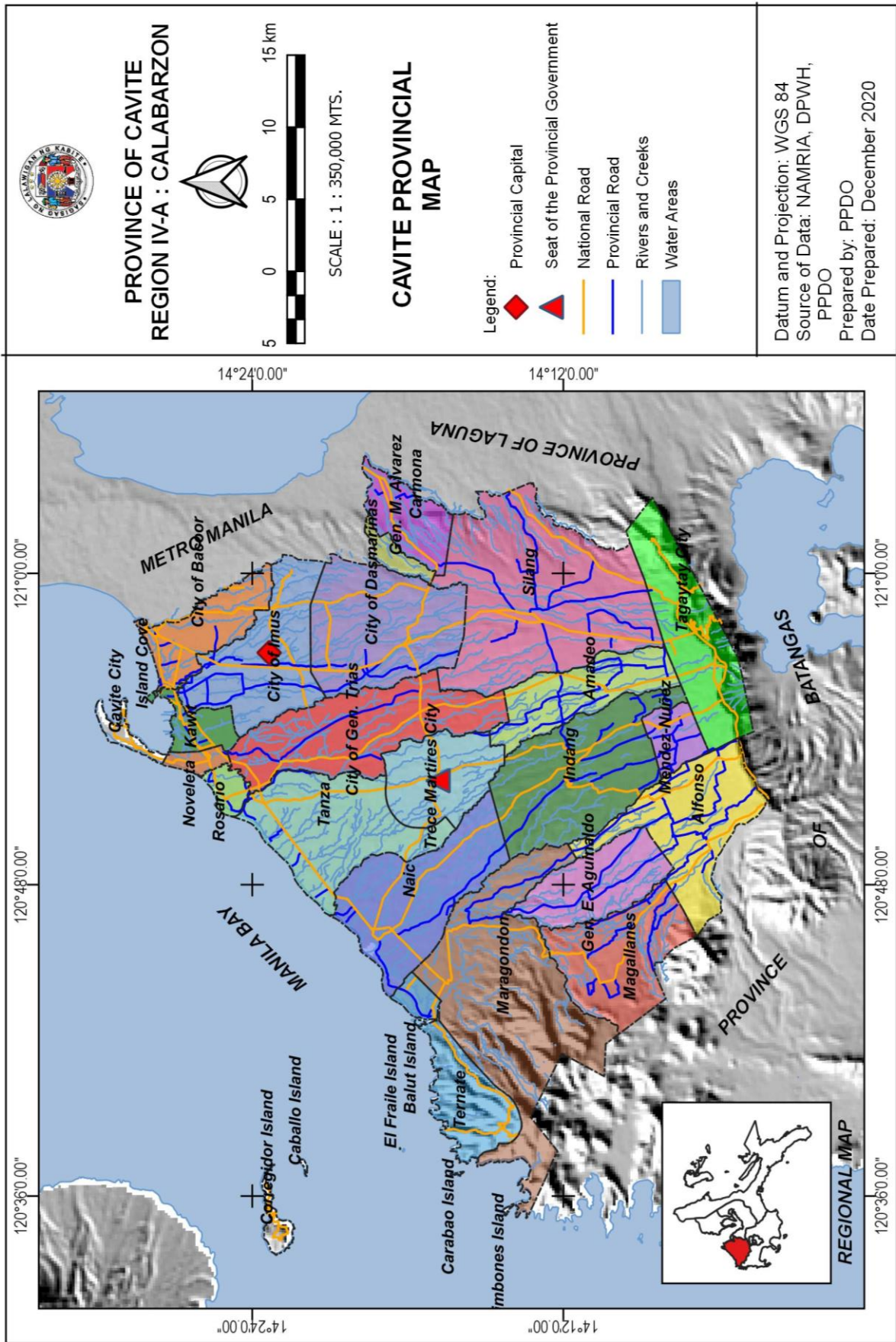
City/Municipality	Land Area (sq.km.)	Land Distribution	Number of Barangays	Income Classification
<b>1<sup>st</sup> District</b>	<b>36.31</b>	<b>2.54</b>	<b>143</b>	
Cavite City	11.83	0.83	84	4 <sup>th</sup> Class
Kawit	13.40	0.94	23	1 <sup>st</sup> Class
Noveleta	5.41	0.38	16	3 <sup>rd</sup> Class
Rosario	5.67	0.4	20	1 <sup>st</sup> Class
<b>2<sup>nd</sup> District</b>	<b>52.40</b>	<b>3.67</b>	<b>73</b>	
City of Bacoor	52.40	3.67	73	1 <sup>st</sup> Class
<b>3<sup>rd</sup> District</b>	<b>97.01</b>	<b>6.80</b>	<b>97</b>	
City of Imus	97.01	6.80	97	3 <sup>rd</sup> Class
<b>4<sup>th</sup> District</b>	<b>82.34</b>	<b>5.77</b>	<b>75</b>	
City of Dasmariñas	82.34	5.77	75	1 <sup>st</sup> Class
<b>5<sup>th</sup> District</b>	<b>196.71</b>	<b>13.78</b>	<b>105</b>	
Carmona	30.92	2.17	14	1 <sup>st</sup> Class
Gen. M. Alvarez	9.38	0.66	27	1 <sup>st</sup> Class
Silang	156.41	10.96	64	1 <sup>st</sup> Class
<b>6<sup>th</sup> District</b>	<b>117.68</b>	<b>8.25</b>	<b>33</b>	
City of Gen. Trias	117.68	8.25	33	1 <sup>st</sup> Class
<b>7<sup>th</sup> District</b>	<b>272.57</b>	<b>19.10</b>	<b>116</b>	
Amadeo	47.90	3.36	26	4 <sup>th</sup> Class
Indang	89.20	6.25	36	1 <sup>st</sup> Class
Tanza	96.30	6.75	41	1 <sup>st</sup> Class
Trece Martires City	39.17	2.74	13	4 <sup>th</sup> Class
<b>8<sup>th</sup> District</b>	<b>572.04</b>	<b>40.09</b>	<b>187</b>	
Alfonso	64.60	4.53	32	1 <sup>st</sup> Class
Gen. E. Aguinaldo	51.03	3.58	14	5 <sup>th</sup> Class
Magallanes	78.60	5.51	16	4 <sup>th</sup> Class
Maragondon	165.49	11.6	27	3 <sup>rd</sup> Class
Mendez - Nunez	16.67	1.17	24	4 <sup>th</sup> Class
Naic	86.00	6.03	30	1 <sup>st</sup> Class
Tagaytay City	66.15	4.64	34	2 <sup>nd</sup> Class
Ternate	43.50	3.05	10	4 <sup>th</sup> Class
<b>CAVITE</b>	<b>1,427.06</b>		<b>829</b>	<b>1<sup>st</sup> Class</b>

Source: Provincial Planning and Development Office

Map 2.1 Location Map, Province of Cavite



Map 2.2 Legislative Map, Province of Cavite



## Topography

### Elevation

Situated at the entrance of Manila Bay, Cavite is characterized by rolling hinterlands punctuated by hills, a shoreline fronting Manila Bay at sea level, and the rugged portion at the boundary with Batangas.

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

The lowest lowland area is the coastal plain. These areas have a shallow ground level of zero to two meters elevation than the high tide level of about 0.8 meters elevation from the mean sea level (MSL). These are the cities of Bacoor and Cavite and Kawit, Noveleta, and Rosario.

Coastal and alluvial plains are considered lowland areas. These areas have a flat ground slope of less than 0.5% and a low ground elevation of two meters to 30 meters. The alluvial plain can be found in the City of Imus and the southern part of the City of Gen. Trias. These cities form the transition area between the coastal plain and the central hilly area. It also covers some areas of Bacoor and the municipalities of Carmona, Kawit, Noveleta, Rosario, and Tanza.

The third topography type is the central hilly area, found on the mountain foot slope, and forms the rolling tuffaceous plateau. This topography includes steep hills, ridges, and elevated inland valleys. The plateau has a ground elevation ranging from 30 meters to nearly 400 meters and a ground slope ranging from 0.5% to 2%. The cities of Trece Martires and Dasmariñas, and the municipalities of Gen. E. Aguinaldo, Gen. M. Alvarez, the western part of Ternate, northern parts of Amadeo, Indang, Silang, Magallanes, and Maragondon have this kind of topography.

The last topography type is the upland mountainous area situated at a very high elevation above 400 meters with slopes of more than two percent found in the city of Tagaytay and municipalities of Alfonso, Mendez, southern parts of Amadeo, Indang, Silang, Magallanes, and Maragondon. Mt. Sungay, the highest elevation in Cavite, is about 700 meters above sea level and is located east of Tagaytay City. It is characterized by flat to rugged topography. From Tagaytay ridge northward, the areas adjoin Silang, Amadeo, and Mendez-Nunez, exhibiting flat to rolling topography with gently sloping surfaces while eastern and southern Tagaytay City including Alfonso shows moderate to rugged topography. Portions of Ternate, Maragondon, General Mariano Alvarez, and Magallanes are fairly rugged and 100 to 200 meters above sea level. At Mounts Palay-Palay and Mataas na Gulod, both about 650 meters above sea level, the steepest climb from the creek to the top of the ridge is about 300 meters or about 50% average slope.

Corregidor Island is about 177 meters above sea level.

### Slope

The slope is the degree of inclination of a given area. It is the number of feet the land rises or falls over 100 feet and is written in terms of percentage. The degree of slope affects soil moisture, which influences species selection. It also estimates the erosion potential of the place and helps in selecting the most appropriate planting techniques.

Cavite's slope range is divided into six categories, as prescribed by the National Land Use Committee: level to nearly level, gently sloping to undulating, undulating to rolling, rolling to moderately steep, steep, and very steep.

**Table 2.2 Slope Classification, Province of Cavite**

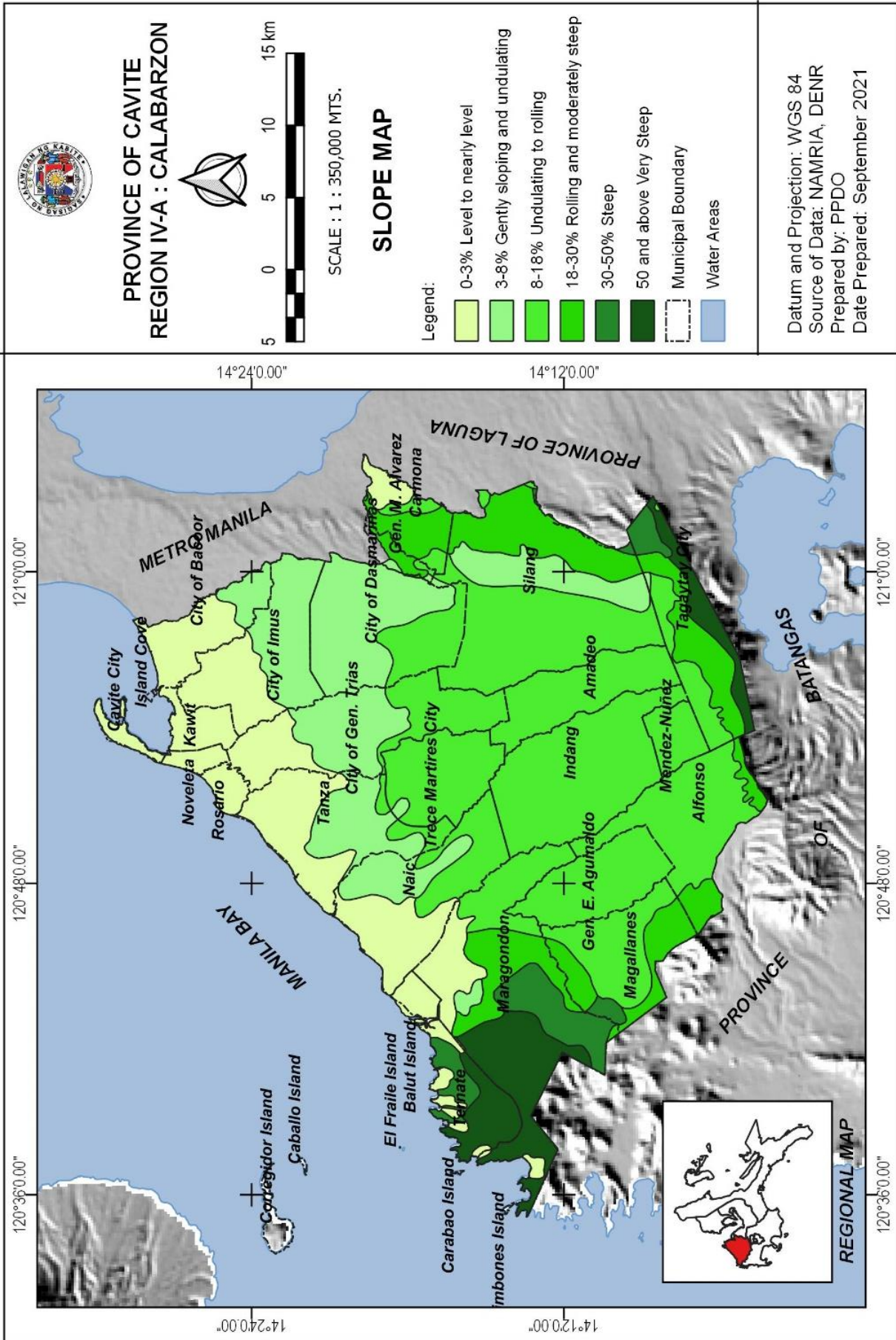
Description	Slope (%)	Area (sq.km.)	Percent Share
Level to nearly level	0 - 3	283.1980	19.84
Gently sloping to undulating	3 - 8	267.7866	18.76
Undulating to rolling	8 - 18	586.2041	41.08
Rolling to moderately steep	18 - 30	154.6783	10.84
Steep	30 - 50	52.0280	3.65
Very steep	≥ 50	83.1650	5.83
<b>Total</b>		<b>1,427.0600</b>	<b>100.00</b>

Level to nearly flat slope ranges from 0-3%, which comprises the cities and municipalities along the province's shoreline. These are Cavite City, Kawit, Noveleta, Rosario, and portions of the City of Bacoor, Tanza, Naic, Ternate, and Maragondon which serve as the municipal fishing grounds of the province. Abound with beaches, heritage sites, and historical markers, these areas are also known as tourist destinations for local and international tourists. Other economic activities in the area include the operation of the fish port, aquaculture, inland fishing, and shipping and navigation. Other areas having portions of these slopes are Carmona, Gen. Mariano Alvarez, and the cities of Gen. Trias, and Imus, primarily suitable for irrigated rice production and freshwater fishponds.

The central transition area with a slope of 3-8%, gently sloping to undulating partly comprises the cities of Trece Martires, Tagaytay, Dasmariñas, Bacoor, Imus, and Gen. Trias and the municipalities of Carmona, Gen. M. Alvarez, Tanza, Maragondon, Naic, and Silang. These areas are for terraced irrigated rice and fishponds, while other areas are suitable for vegetable production, flowering plants, annual crops, and high-value crops. Livestock and poultry production can be a profitable business in Tanza, Naic, Silang, and the City of Gen. Trias.

The undulating to rolling with a slope of eight (8) to 18% comprises the portion of Trece Martires City, Carmona, Gen. M. Alvarez, City of Gen. Trias, Tanza, Tagaytay City, Alfonso, Magallanes, Maragondon, Naic, Silang and the whole municipality of Amadeo, Gen. Aguinaldo, Indang and Mendez-Nuñez. These areas are noted for crop production where bountiful fruit and vegetables are nurtured and harvested. These also serve as pastures and grazing lands for livestock and are also known for agritourism.

Map 2.3 Slope Map, Province of Cavite



The area with a slope of 18-30%, rolling to moderately steep comprises the portions of the City of Dasmariñas, Gen. Mariano Alvarez, Tagaytay City, Alfonso, Magallanes, Maragondon, Silang, and Ternate where crop production is the main economic activity.

The area with a 30-50% slope comprises the portion of Tagaytay City, Magallanes, Maragondon, Silang, and Ternate. These areas are for pasture and perennial trees or those that live for more than two years.

Lastly, on the south-western tip with 50% and above slope are Tagaytay City, Alfonso, Maragondon, and Ternate. These areas are the province's forest areas, which can be used for recreational activities like hiking and mountaineering. It also serves as a place for research studies for students and researchers.

Areas with slopes ranging from 0-3% to 8-18% categories are utilized for commercial, industrial, and tourism purposes. However, some houses and buildings are built in locations with more than 18-30% slope for vacation, retreat, or training purposes

## Geology

The geology or the geologic features of the province is described by the materials the earth is made of, the structure of those materials and the processes acting upon them. This sub-chapter made special emphasis on the physical geology of the province and takes a closer look at the features of the earth and the processes acting on them such as, but not limited to the presence of volcanoes, earthquakes, rocks, mountains, oceans, and just about any present feature within its territorial jurisdiction.

The Mines and Geosciences Bureau identified a total of six geologic units present in the province (Map 2.4). Taal Tuff is situated in the central portion of the province while the northern portion of the province going towards Metro Manila is underlain by the Diliman Tuff, an upper member of the Guadalupe Formation.

From the hilly areas to the south of the province, which includes the ridges of Ternate and Maragondon, and the portions of Magallanes, the Lobo Agglomerate is present. Lobo Agglomerate is now considered part of the upper horizon of the Pinamucan Formation.

Mataas na Gulod Volcanic Complex underlies the portions of the mountainous area to the west of the province, including the mountains of Palay-Palay and Mataas na Gulod. Some portions of the mountainous parts of Maragondon and Magallanes are underlain by Talahib Andesite. Talahib Andesite is considered to be equivalent to the Nasugbu Volcanic Complex, rocks named from the exposures observed in the Looc lead-silver-antimony mine at Looc, nasugbu, Batangas.

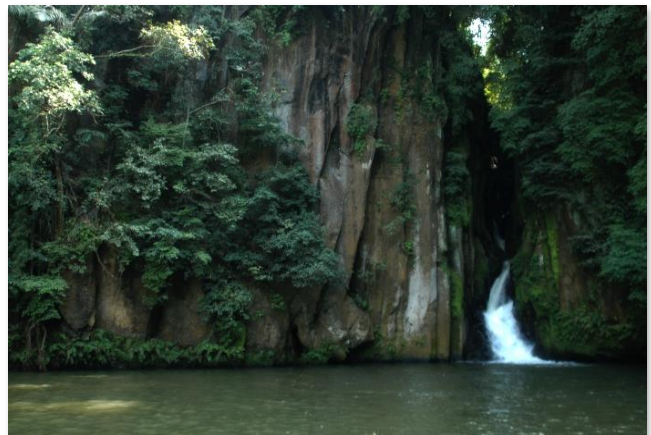
Quaternary Alluvium, the youngest geologic unit in the province, is observed to be abundant in the coastal areas, alluvial plains, and portions of the flat-lying areas in the province.

## Landforms

According to the National Geographic Society, landforms are features on the Earth's surface that are part of the terrain. The four major types of landforms are mountains, hills, plateaus, and plains. Buttes, canyons, valleys, and basins are considered minor types of landforms.

The Philippines, fondly called the "Pearl of the Orient", has a diverse environment, well known for its different landforms. Some of it can be found in the province of Cavite.

The province of Cavite has its share of the mesmerizing beauty of nature that every Filipino can enjoy. Pico de Loro, also known as the Parrot's Beak, is one of the most popular mountains in the Philippines. The wide plains of Cavite, the West Philippine Sea, and the coves and beaches of Nasugbu can be seen at the peak due to its elevation of 688 meters. Mt. Pico de Loro is part of the Mt. Palay-Palay-Mataas-na-Gulod Protected Landscape, the remaining lowland rainforest in Cavite, covering particularly Maragondon and Ternate, and Batangas. Mount Marami, one of the ancient volcanic features of Bataan Arc, Mount Buntis, and Mount Nagpatong, home to Andres Bonifacio Shrine and claim to be the execution site of the said hero, are other notable mountains in Cavite. Another peak in Cavite is Mt. Sungay (Mt. Gonzales) in Tagaytay. The inactive stratovolcano is the highest point in Cavite at 709 meters.



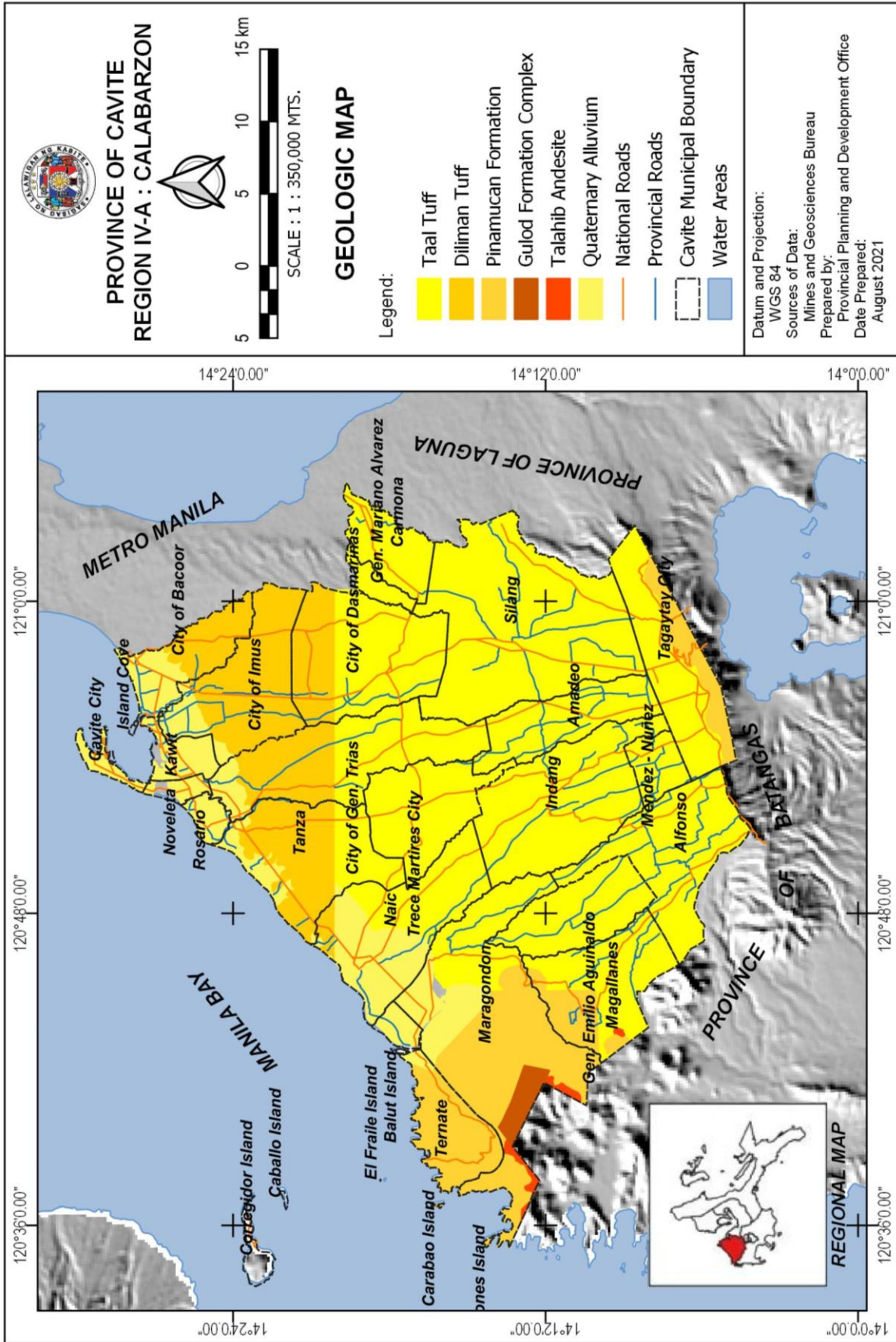
*Lucsuhin National Bridge*

Another notable landform in Cavite is the Lucsuhin National Bridge, locally called Cabag Cave or Lucsuhin Cave, which is a national bridge connecting Barangay Lucsuhin and Barangay Kalubkob in Silang, Cavite. The bridge crosses the Ylang-ylang River and is the first national bridge reported in the country.

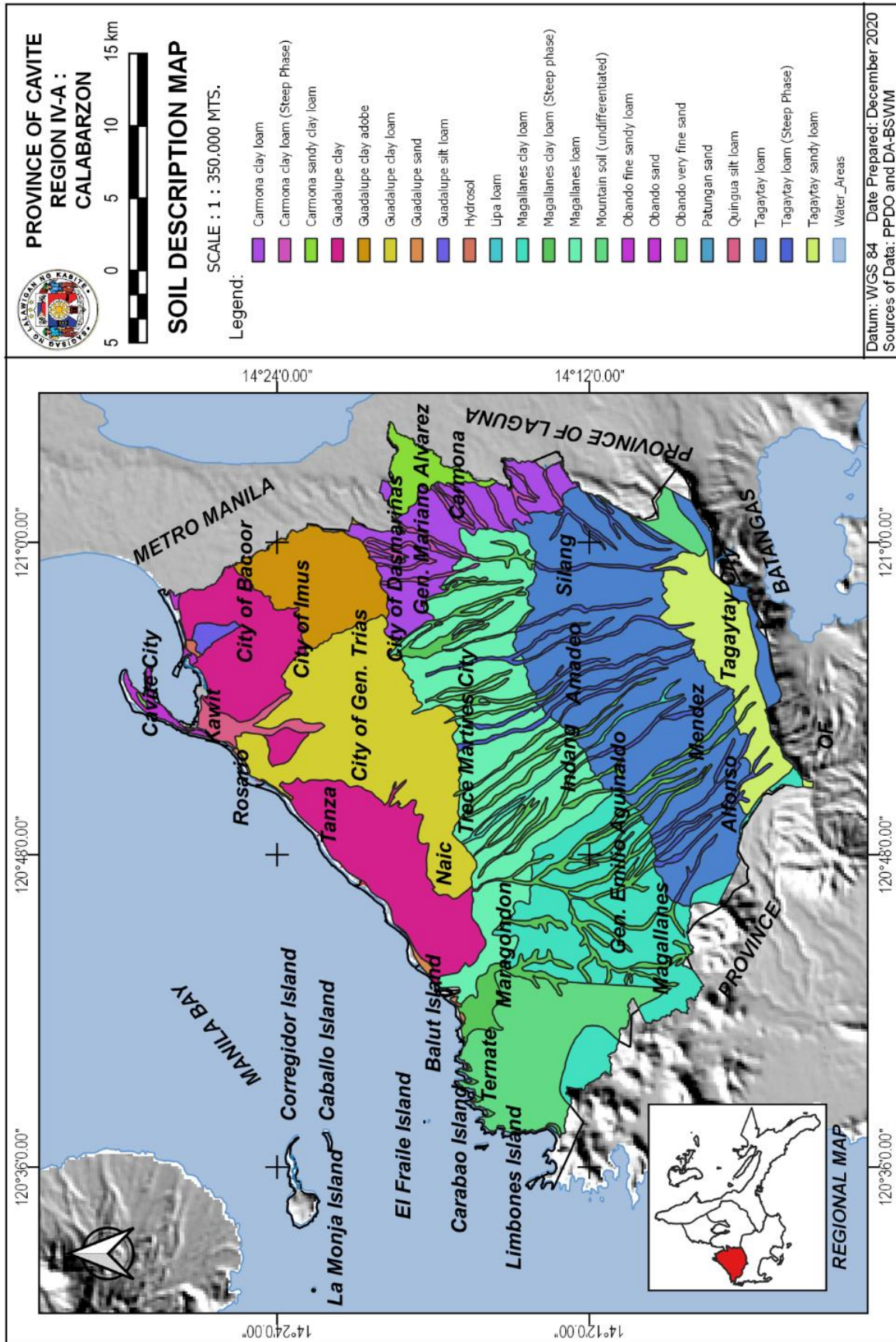
## Soils and Land Capability Classes

Identification of soil characteristics, most importantly, the soil type is instrumental in recommending the best land use for that area. Moreover, if intended for agriculture, knowing the soil type will help identify the most suitable crops to be planted in the area. It will contribute to the achievement of optimized land productivity.

Map 2.4 Geologic Map, Province of Cavite



Map 2.5 Soil Description Map, Province of Cavite





The soil surveys conducted by the Bureau of Soils and Water Management (BSWM) revealed that Cavite is composed of 10 soil types. The lowland area of Cavite is generally composed of Guadalupe clay and clay loam. Guadalupe clay and clay loam are coarse and granular when dry but sticky and plastic when wet. Its substratum is solid volcanic tuff. These soil types are suited to lowland rice and corn; those in the upland are suited for orchards and pasture.

Guadalupe clay adobes are abundant in the southern part of the Cities of Bacoor and Imus, bordering the City of Dasmariñas. The soil is hard and compact and challenging to cultivate, thus making 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. It 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 root crops.

Cavite's eastern side 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 soil is planted with 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 the Malabon and Ylang-ylang Rivers at Noveleta.

The type of soils that dominate the upland areas is Tagaytay loam and Tagaytay sandy loam with mountain soil undifferentiated found on the south-eastern side bordering Laguna province.

On the southern tip of the province, Magallanes clay and Mountain soil undifferentiated with an interlacing of Magallanes clay loam steep phase exist.

The Tagaytay loam contains fine sandy materials, is moderately friable and is 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 a considerable amount of volcanic sand and underlain by adobe clay. Mountain soil undifferentiated is forested with bamboo found on the sea coast. Cavite also has the Patungan sand characterized by pale gray to almost white sand with a substratum of marine conglomerates. It is at Sta. Mercedes in Maragondon and some coastlines of Ternate.

## Land Suitability

Land suitability is the fitness of a given type of land for a defined use. The process of land suitability classification is the appraisal and grouping of specific areas of land concerning their suitability for defined uses.

Land suitability secondary assessment is derived from comparing pre-determined suitability criteria for each of the foreseeable forms of land use with the land resources inventory data.

Forestry plantations:

- slope of less than 30% and the limitations of terrain or rock should be less severe
- no serious erosion hazard irrigated rice/freshwater fishponds:
  - slopes of less than 3% up to 8% if terraced
  - low soil permeability
  - no significant limitation of rock, erosion, soil depth, etc.
  - the presence of problem soil downgrades the suitability but is not necessarily limiting

Cultivated annual crops:

- no significant existing erosion (or a low soil erodibility)
- slopes of less than 8% (benchmark of erosion hazard)
- adequate soil depth (750 centimeters)
- no flooding or poor drainage
- no problem soil
- no serious limitations of terrain or rock

Perennial trees and vine crops:

- as for cultivated annual crops, but can be placed on more erodible slopes, a slope of 18 percent may be allowable

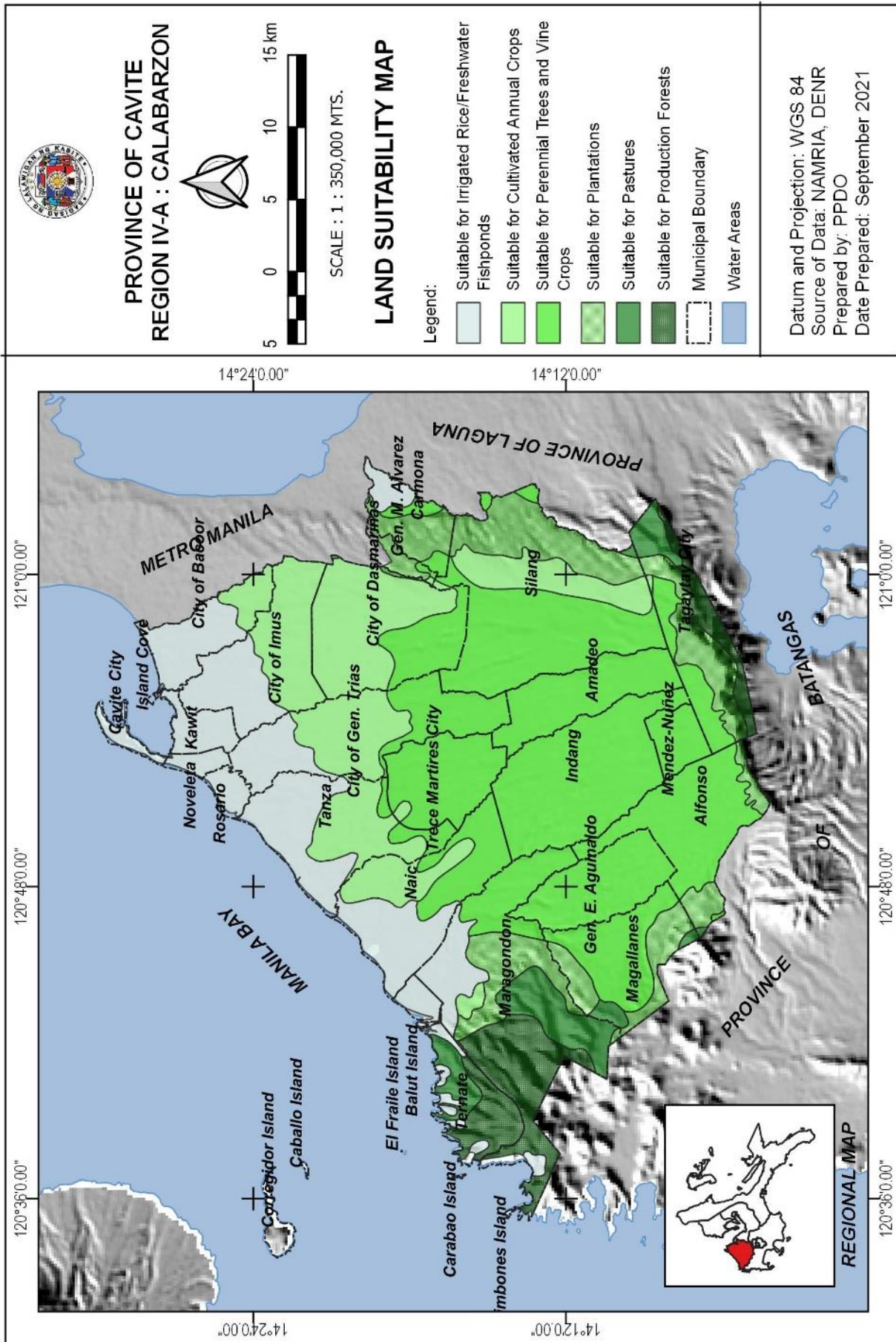
Pastures:

- no serious existing soil erosion
- slopes of less than 18%, if the land is erodible
- slopes of less than 50%, if the land is stable
- no serious limitations of terrain

The land suitability information was from the Land Management Unit (LMU) map from the Bureau of Soils and Water Management (BSWM). This information will be used to determine whether the present land use is in congruence with the suitability of the land for that use (Table 2.3).

The majority of Cavite's area is for highly restricted agricultural use. The lowland areas covering the cities of Imus, Bacoor, and General Trias, and portions of the municipalities of Tanza, Naic, and Rosario are primarily suitable for irrigated rice/freshwater fishponds. The central part of the Province, covering mainly the city of Dasmariñas, large portions of Tanza, Naic, Gen. Aguinaldo, and Trece Martires City are primarily suitable for cultivated annual crops. Cavite's upland area covering the municipalities of Silang, Amadeo, Indang, Alfonso, Magallanes, and a small portion of Gen. Aguinaldo and Maragondon and the City of Tagaytay is principally suitable for perennial tree and vine crop production.

Map 2.6 Land Suitability Map, Province of Cavite



The mountainous portions of the province found at the western side and the area along the Tagaytay Ridge is considered National Integrated Protected Areas System (NIPAS) land which cannot be altered from its natural habitat.

**Table 2.3 Land Suitability by Slope, Province of Cavite**

Description	Slope (%)	Area (sq.km.)	Land Suitability
Level to nearly level	0 - 3	283.1980	<ul style="list-style-type: none"> <li>&gt; Pasture (if land is erodible and stable)</li> <li>&gt; Forestry plantation</li> <li>&gt; Irrigated rice/freshwater fishponds</li> <li>&gt; Cultivated annual crops</li> <li>&gt; Perennial trees and vine crops</li> </ul>
Gently sloping to undulating	3 - 8	267.7866	<ul style="list-style-type: none"> <li>&gt; Pasture (if land is erodible and stable)</li> <li>&gt; Forestry plantation</li> <li>&gt; Irrigated rice/freshwater fishponds (if terraced)</li> <li>&gt; Cultivated annual crops</li> <li>&gt; Perennial trees and vine crops</li> </ul>
Undulating to rolling	8 - 18	586.2041	<ul style="list-style-type: none"> <li>&gt; Pasture (if land is erodible and stable)</li> <li>&gt; Forestry plantation</li> <li>&gt; Perennial trees and vine crops</li> </ul>
Rolling to moderately steep	18 - 30	154.6783	<ul style="list-style-type: none"> <li>&gt; Pasture (if land is stable)</li> </ul>
Steep	30-50	52.0280	<ul style="list-style-type: none"> <li>&gt; Pasture (if land is stable)</li> </ul>
Very steep	≥ 50	83.1650	<ul style="list-style-type: none"> <li>&gt; Production forests</li> </ul>

Source: Bureau of Soils and Water Management (BSWM)

## Land Resources

### Land Classification

Land classification ensures the proper location of various land uses, especially of business, residential, and utility areas. This is executed by highly trained urban planners to ensure the harmonious movement of people and their activities. Land classifications and adherence to them by the public promote balanced development.

The land resource of the province is 1,427.06 square kilometers. This is categorized into Alienable and Disposable (A&D) Land and Forest Land. The Alienable and Disposable Land accounts for 1,293.91 square kilometers or 90.67% share of total land resources where economic activities (Agriculture – 55.24% share to A&D) and human settlements (44.76 percent share to A&D) occur. On the other hand, forestland, the land covered with forest or reserved for the growth of forests, is 9.33% or 133.15 square kilometers shared to the total (Table 2.4). It is assumed that land resource is preserved to maintain the ecological balance in the province.

### Alienable and Disposable Lands

As defined by the Philippine Statistics Authority (PSA), alienable and disposable lands refer to those lands of the public domain which have been the subject of the present system of classification and declared as not needed for

forest purposes. It is further classified into production land and built-up areas.

**Table 2.4 Land Classification, Province of Cavite: 2021 - 2030**

Land Classification	Area (sq.km.)	Percentage Share	Percentage Share to Classification
<b>Alienable and Disposable Lands</b>	<b>1,293.91</b>	<b>90.67</b>	
Production Land	714.75	50.09	55.24
Built-up Area	579.16	40.58	44.76
<b>Forest Lands</b>	<b>133.15</b>	<b>9.33</b>	
Classified	53.57	3.75	40.24
Protected Areas	39.28	2.75	
Natural Parks			
Military Reservation	8.09	0.57	
Islands	6.20	0.43	
Unclassified	79.58	5.58	59.76
<b>Total</b>	<b>1,427.06</b>		

Source: Cavite Provincial Development and Physical Framework Plan 2021-2030

The production land is where agricultural activities and food production occur. Most of the areas in Cavite are of this classification (50.09%). Cavite's fertile and alluvial soil types and favorable climatic conditions make it highly suitable for agricultural production. The lowland areas are suited for rice, corn, and vegetable production. The central area is recommended for diversified farming. However, according to the Office of the Provincial Agriculturist, Cavite's agricultural lands are decreasing due to the conversion of these lands to residential/subdivision development and industrial areas.

On the other hand, the built-up areas are comprised of settlement, industrial, commercial, and tourism areas. This area is mainly for the conduct of economic activities as well as for human habitations. It covers up to 40.58% of the total land area of Cavite.

### Forest Lands

The forest lands are those that have either national proclamation to become forest reservations or those lands that are not suitable for any particular use. It may be a factor in topography and elevation. Forest lands are divided into two kinds: classified land, which includes protected areas/natural parks, military reservations, and islands, and unclassified land, also known as the public forest.

Under classified lands, Mount Palay-Palay and Mataas na Gulod National Parks located in Ternate and Maragondon are proclaimed as natural parks, part of Ternate is a military reservation, and Corregidor, Caballo (Fort Hughes), Carabao, Limbones, Sta. Amalia, El Fraile (Fort Drum), La Monja, Balot Island, and Island Cove (PuloniBurunggoy) are named islands in Cavite. Unclassified land includes the Tagaytay ridges with a slope greater than 50%, Magallanes Forest land, and parts of Maragondon.

The national park has the potential for eco-tourism due to its vast diversity of flora and fauna and accessibility. Its development as an eco-tourism destination would enhance

its value as a biodiversity conservation area, open laboratory of scientific, biological, and other research studies, and venue for recreation and public pleasure. However, despite its bright potential, issues and concerns still need to be resolved to balance the exploration and preservation of the park's rich features.

### Protected Areas

Protection land is a portion of land and water set aside for its unique physical, and biological significance managed to enhance biological diversity and protected against destructive human influences or impacts. Protection lands are categorized based on the status of the land. The first category refers to the areas declared under R.A. 7586 (NIPAS Law) as proclaimed National Integrated Protected Area System (NIPAS), including proclaimed critical watershed. The second category is areas classified as to whether the area's elevation is above 100 meters; the slope is higher than 50%; mangrove forest; buffer strips; freshwater swamps and marshes; and lakes and other inland water bodies. These are referred to as the Non-NIPAS areas. The third category is the severely eroded areas, which comprise the area subjected to severe soil erosion.

The only proclaimed national park in Cavite is the Mounts Palay-Palay and Mataas na Gulod National Park declared under Presidential Proclamation No. 1594 in 1976. The declaration aims to preserve the area's natural biodiversity as part of the advocacy to protect the country's natural heritage. Considering the rapid urbanization in the province and Metro Manila, preserving its natural biodiversity is a strategic move. In addition, Cavite's protected areas are dominated by Strategic Crop Sub-Development Zone, with a dedicated land area of 556.90 square kilometers, followed by the Watershed/Forestry Zone with 142.79 square kilometers. Notably, Agro-forestry Zone has a land area of 55.75 square kilometers, while Mounts Palay-Palay-Mataas-na-Gulod Protected Landscape has a land area of 39.73 square kilometers.

Aside from areas considered under NIPAS Law, other areas require rehabilitation, conservation, and sustained development and management and are classified under Non-NIPAS Protected Areas. These are areas with greater than 50% in slope, located along Tagaytay Ridge with an area of 27.07 square kilometers, Magallanes Forest land with an area of 18.606 square kilometers, and an area in Maragondon with a scope of 42.98 square kilometers. Included also in this category are the buffer strips along rivers and escarpments. The province's six main rivers are included; namely, Maragondon River, Labac River, San Juan River, Imus River, Bacoor River, and Cañas River. Included also as protected areas are the nine named islands: Corregidor Island (5.46 sq.km.), Caballo or Fort Hughes (0.27 sq.km.), Carabao (0.56 sq.km.), Limbones (0.24 sq.km.), Sta. Amalia (0.04 sq.km.), El Fraile or Fort Drum (0.01 sq.km.), La Monja (0.0098 sq.km.), Balut in Ternate (0.09 sq.km.), and Island Cove in Kawit with (0.02 sq.km.).

### Mineral Lands

Based on the DENR Mines and Geosciences Bureau records, there are no valid and existing mining contracts and permits under the jurisdictions of the national government. Furthermore, applications for mining contracts and permits in the province have not reached the stage of determination of their mineral resources.

For 2016 to 2021, the corresponding maximum extractable volumes of materials (MEVM) for each quarry permit issued by the Provincial Government of Cavite through the Provincial Mining Regulatory Board is presented below.

**Table 2.5 Commodity and Maximum Extractable Volume of Materials by Mineral Lands, Province of Cavite: 2011 - 2020**

Location	Commodity	MEVM (m <sup>3</sup> )
Brgy. Plnagsanhan B, Maragondon, Cavite	Filing Materials	210,030
Brgy. Plnagsanhan B, Maragondon, Cavite	Conglomerate Materials	246,489
Brgy. Plnagsanhan B, Maragondon, Cavite	Conglomerate Stone and Filing Materials	16,421.55
Brgy. Sapang I, Ternate, Cavite	Conglomerate Stone and Filing Materials	521, 234
Brgy. Salawag, Dasmariñas, Cavite	Filing Materials	65,118
Brgy. Punta, Tanza, Cavite	Filing Materials	89,715
Brgy. Punta, Tanza, Cavite	Filing Materials	50,767
Brgy. Sahud-ulan, Tanza, Cavite	Filing Materials	153,844
Brgy. Sahud-ulan, Tanza, Cavite	Filing Materials	74,184
Brgy. Sahud-ulan, Tanza, Cavite	Filing Materials	183,872

Source: CALABARZON Mining and Minerals Industry Profile – Mines and Geosciences Bureau IV-A

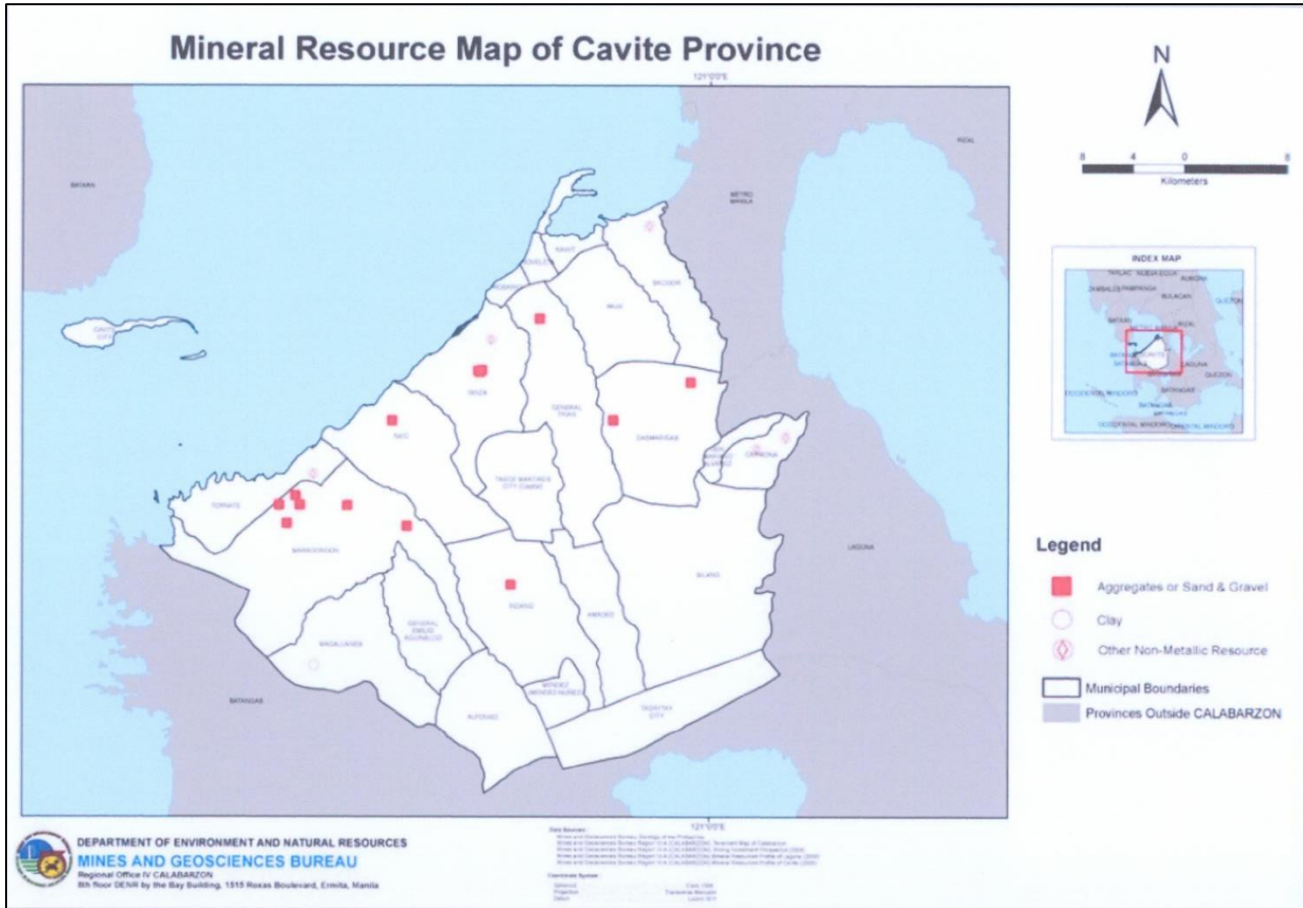
### Mineral Resources

The mineral resources present in the province are predominantly rock aggregates or sand and gravel, clay, and other non-metallic mineral resources. The rock aggregates or sand and gravel are mainly found in the Municipalities of Maragondon, Naic, Tanza, Indang, and the Cities of General Trias, and Dasmariñas as presented in Map 2.7. This non-metallic mineral resource is mainly used in construction as industrial and building materials. The non-metallic mineral resource of clay is present in the Municipality of Magallanes. This commodity is mainly used as industrial and manufacturing materials. Other non-metallic mineral resources (e.g. filling materials) are located in the Municipalities of Tanza, Carmona, Ternate, and City of Bacoor.

**Table 2.6 Mineral Resources, Province of Cavite: 2021**

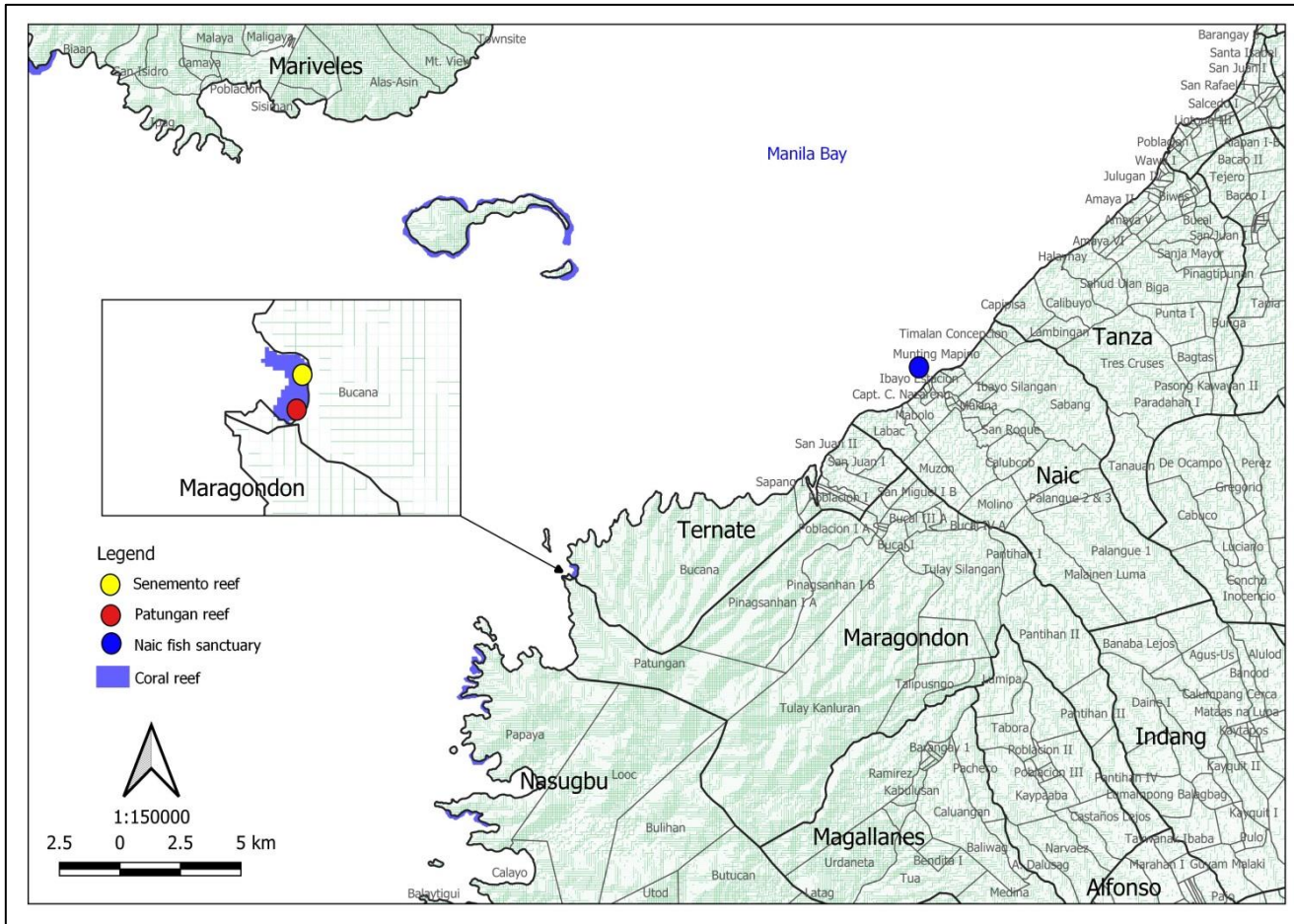
City/Municipality	Minerals
Carmona	Other non-metallic mineral resources
City of Bacoor	Other non-metallic mineral resources
City of Dasmariñas	Aggregates or sand and gravel
City of Gen. Trias	Aggregates or sand and gravel
Indang	Aggregates or sand and gravel
Magallanes	Clay
Maragondon	Aggregates or sand and gravel
Naic	Aggregates or sand and gravel
Tanza	Aggregates or sand and gravel; and other non-metallic mineral resources
Ternate	Other non-metallic mineral resources

Source: Department of Environment and Natural Resources- Mines and Geosciences Bureau (DENR- MGB)



**Map 2.7 Mineral Resource Map, Province of Cavite**

Source: Department of Environment and Natural Resources- Mines and Geosciences Bureau (DENR- MGB) through PGENRO Cavite



**Map 2.8 Coral Reef Locator Map, Province of Cavite: 2021**

Source: Fisheries Resource Management Section (FRMs) - Fisheries Management, Regulatory and Enforcement Division (FMRED), Bureau of Fisheries and Aquatic Resources (BFAR) IV-A through PGENRO Cavite

## Coastal Resources

Cavite boasts a stretch of about 122.574 kilometers of shoreline. It is found along Cavite City, City of Bacoor, Kawit, Noveleta, Rosario, Tanza, Naic, Maragondon, and Ternate. The richness of Cavite’s coastal resources paved the way for our recognition as a major producer of oysters and mussels. The fisherfolks are also active producers of sugpo/bangus. On the western coastlines lie the breathtaking beaches with pale gray sand. Thus, the coastal resource of the province contributes to the economic activities related to fishery and tourism.

## Coral Reefs

Coral reefs are colonies of tiny living animals found in marine waters that contain few nutrients. It is commonly found at shallow depths in tropical waters and grows best in warm, shallow, clear, sunny, and agitated waters. It delivers ecosystem services to tourism, fisheries, and shoreline protection. It also serves as home to marine life.

As of 2013, the Department of Environment and Natural Resources Region 4A – CALABARZON had mapped a total of 0.1926 square kilometers of coral reef areas in Sitio Pinagkainan and Patungan, Barangay Sta. Mercedes, Maragondon, Cavite. Sitio Pinagkaingan, located in the eastern part of Limbones cove opposite Carabao Island, has a 34% live coral cover dominated by non-Acropora corals (32.60%) and a small population of Acropora corals (1.40%).

Sitio Patungan Munti, the slightly sloping ground and good water visibility at 30 ft. depth, has about 32.76% live coral cover where the “staghorn” corals (20%) are mostly seen. About 40 percent of the species were members of the two largest families, the Pomacentridae and Labridae. A school of fusiliers (*Caesio spp.*) was also observed.

In Santa Mercedes Fish Sanctuary, coral reefs found are of families Acroporidae, Alcyoniina, Agariciidae, Caryophyllidae, Euphylliidae, Paviidae, Fungiidae, Meandrinidae, Montraeidae, Mussidae, Pectiniidae, Pocilloporidae, Poritidae.



Coral Reefs in Limbones Cove  
Image source: [www.choosephilippines.com](http://www.choosephilippines.com) (Photos by: Mike Ajero)

An updated map (Map 2.8) from the Bureau of Fisheries and Aquatic Resources No. IV-A presents the location of coral reefs along the municipality of Ternate and in Corregidor Island, Cavite City.

As shown in the table below, the coral reefs in Cavite City are in fair condition while an assessment still needs to be conducted in the coral reef areas located on Ternate, Maragondon, and Rosario to verify their current condition.

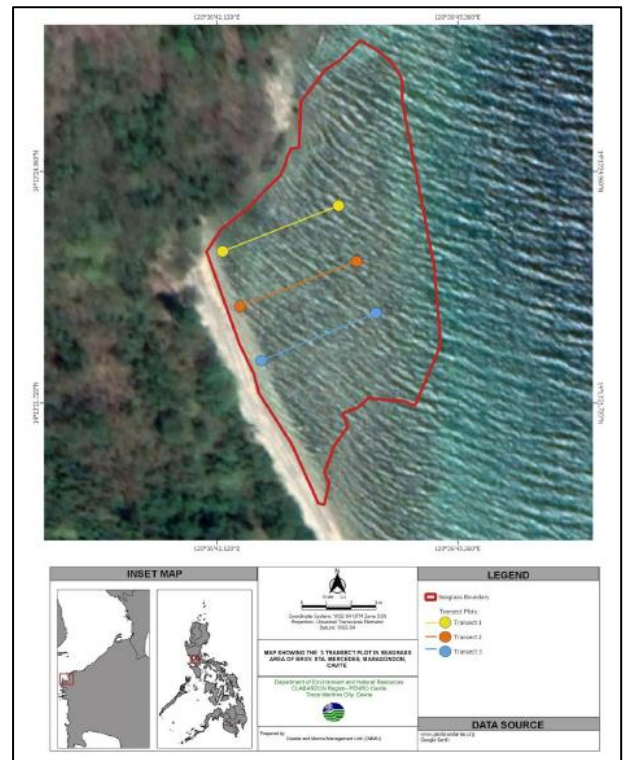
**Table 2.7 Status of Coral Reefs, Province of Cavite: 2021**

City/Municipality	Location	Status
Rosario	Municipal waters	Existing
Cavite City	Corregidor, Caballa Island	Fair condition
Ternate	Municipal waters	For Assessment
Maragondon	Municipal waters	For Assessment

Source: Office of the Provincial Agriculturist, Trece Martires City, Cavite

## Seagrass Communities

The assessment led by the DENR-PENRO Cavite last February 24, 2022, identified the presence of *Thalassia hemprichii*, *Halophila sp.* and *Halodule uninervis* in the 1.05 ha. (approximate) seagrass beds along the coastal areas of Brgy. Sta. Mercedes, Maragondon. Among these species, *T. hemprichii* is the most abundant which covered atleast 75% of the observed seagrass area. The seagrass cover was “fair at 26.06% based on Amran, 2010 data interpretation.” Along with the seagrass, epiphyte and algae were also present in the area where they cover 14.24% and 17.12%, respectively.



**Map 2.9 Seagrass Assessment Map, Province of Cavite, 2021**

Source: Coastal and Marine Management Unit, PENRO – CAVITE

## Mangroves

Mangroves are trees or shrubs that grow in tropical coastal swamps that are flooded at high tide. Mangroves typically have many tangled roots above ground and form dense thickets. Mangroves provide ecological and socio-economic importance in protecting the shoreline and coral reefs, the nursery for fishes, shrimps, crustaceans, and mud crabs, food and sanctuary for marine life, potential eco-tourism sites, protection for reclaimed land and windbreaker during typhoons.

As of 2017, Cavite has a total of 1.21 square kilometers of mangrove areas. These mangrove areas are based on the Bio-ecological assessment of the Department of Environment and Natural Resources – Manila Bay Coordinating Office (DENR) conducted in 2017 located at the City of Bacoor, Noveleta, Ternate, Kawit, and Rosario. The mangrove rehabilitation project is established from 2001 to 2015. Around 1.0209 square kilometers of mangrove areas are planted in the last ten (10) years.

Mangroves in the province are rehabilitated since 2012 through DENR-PENRO. Rehabilitated mangroves are located in City of Bacoor, Kawit, Noveleta, and Ternate. In 2020, 0.7119 square kilometers of mangrove areas were assessed. These are located in Noveleta, City of Bacoor, and Rosario.

The species of Mangroves found in the province are:

1. Bakauan Babae (*Rhizophora mucronata*)
2. Bakauan Lalake (*Rhizophora apiculata*)
3. Bakauan bato (*Rhizophora stylosa*)
4. Banalo (*Thespesia populnea*)
5. Api-api (*Avicennia officinales*)
6. Dampol (*Glochidion littorale*)
7. Batikabra (*Ipomoea pescaprae*)
8. Talisay (*Terminalia catappa*)
9. Aroma (*Acacia famesiana*)
10. Pagatpat (*Sonneratia alba*)
11. Tangal (*Ceriops tagal*)
12. Buta-buta (*Excoecaria agallocha*)
13. Ipil-ipil (*Instia bijuga*)
14. Nipa (*Nypa fructicans*)
15. Palaypay (*Acrostichum aureum*)
16. Lagiwliw (*Acanthus ilifolius*)
17. Maragomon (*Brownlowia tersa*)
18. Kulasi (*Lumnitzera racemose Willd*)

DENR also identified Naic as a Marine Turtles Nesting place for Olive Ridley (*Lepidochelys olivacea*). Conservation and protection efforts include patrolling and monitoring along the coast, transplanting newly laid eggs to hatchery, tagging, and releasing the hatchlings to the sea.

There are also four existing fish sanctuaries in the province located in Sta. Mercedes, Maragondon, Naic Fish Sanctuary, Bulaklakin Fish Sanctuary, Ternate, and Tanza. All fishing activities are prohibited in the fish sanctuaries to allow stocks to recover. It also serves as a feeding and breeding ground for the fishes and is of great importance in the restoration and conservation of habitat.

**Table 2.9 Areas Planted or Rehabilitated and Number of Seedlings/Propagules Planted, Province of Cavite: 2012 – 2018**

Barangay	Area (sq.km.)	Number of seedlings/propagules	Species/Commodity (Mangrove)
<b>2012</b>			
Brgy. Sinaguclasan, City of Bacoor	0.0202	5,050	Bakauan babae Bakauan lalake
Brgy. Binakayan, Kawit	0.0109	2,725	Bakauan babae Bakauan lalake
Brgy. Wakas, Kawit	0.1405	36,250	Bakauan babae Bakauan lalake Api-api
Brgy. San Rafael IV, Noveleta	0.0305	8,750	Bakauan babae Bakauan lalake Api-api
Brgy. Sapang I, Ternate	0.0129	3,225	Bakauan babae Bakauan lalake
Brgy. Pinagsanhan A, Ternate	0.0101	2,525	Bakauan babae Bakauan lalake
<b>2013</b>			
Brgy. San Rafael IV, Noveleta	0.2000	50,000	Bakauan babae Bakauan lalake
<b>2014</b>			
Brgy. San Rafael IV, Noveleta	0.5000	250,000	Bakauan babae Bakauan lalake
<b>2015</b>			
Brgy. Pulborista, Kawit	0.2000	50,000	Bakauan babae
<b>2018</b>			
Brgy. San Rafael IV, Noveleta	0.3800	106,400	

Source: Provincial Environment and Natural Resources Office, Trece Martires City, Cavite

**Table 2.10 Mangrove Areas Assessed and Species of Mangroves, Province of Cavite: 2020**

Specific Place of Assessment	Mangrove Area (sq. km.)	Number of Species	Number of Families	Number of Individuals	Name of Species
Brgy. San Rafael IV, Noveleta, Cavite	0.5740	7	6	121	Api-api Bakauan Babae Bakauan Lalake Pagatpat Kulasi Banalo Aroma
Brgy. Sinaguclasan, City of Bacoor, Cavite	0.1190	2	1	125	Bakauan babae Bakauan lalake
Brgy. Ligdong II, Rosario, Cavite	0.0189	2	2	63	Api-api Bakauan Babae

Source: Provincial Environment and Natural Resources Office, Trece Martires City, Cavite

## Mangrove Forest

Mangrove forest is a community of intertidal plants including all species of trees, shrubs, vines, and herbs found on the coast, swamps, or border of swamps (RA 8550). To date, there are 7 existing mangrove forests located at Bacoor, Cavite City Kawit, Noveleta, Tanza and Naic Cavite having 144.55 hectares. The status of this mangrove forest was maintained by the fisher folks and other organizations in their respective areas. No expansion

of the mangrove forest was recorded from the year 2018 due to the lack of propagules and volunteers in planting mangroves.

**Table 2.11 Status of Mangrove Forest, Province of Cavite, 2021**

Municipality/City	Location	Area (ha)	Status
Kawit	Estuaries, Coastal Areas	30.00	Maintained
Rosario	Isla Bonita Beach Strips	3.15	Maintained
Cavite City	Brgy. 5 Dalahican	2.00	Maintained
Bacoor	Dulo Pulo Sineguelasan	40.00	Maintained
Tanza	Coastal areas	2.27	Maintained
Naic	Beach strips	2.00	Maintained
Noveleta	Brgy. San Rafael	64.5	Maintained
Maragondon		1.00	Maintained
<b>TOTAL</b>		<b>144.92</b>	

Source: Office of the Provincial Agriculturist, Province of Cavite: 2021

## Fish Sanctuaries and Marine Protected Areas (MPAs)

The province also pursues to improve ecological connectivity and sustainability through the establishment of Marine Protected Areas (MPAs) and Fish Sanctuaries. These areas are envisioned in the Philippine Development Plan (PDP) and CALABARZON Regional Development Plan (RDP) as areas that will ensure its sustainability through managed access of small-scale fishermen to designated marine areas and their resources within.

As shown in the table below, there are five fish sanctuaries and MPAs in the province where the three are continuously maintained (municipalities of Rosario, Tanza, and Naic) since their establishment as MPA. Fish Sanctuaries and MPAs in Ternate and Maragondon are still to be assessed for their current status.

**Table 2.12 Fish Sanctuaries and Marine Protected Areas, Province of Cavite: 2021**

Municipality/ City	Name	Location	Area Ha.	Status
Rosario	Rosario Fish Sanctuary	Rosario Fish Sanctuary/Rosario Mun. Water	876.53	Maintained
Tanza	Tanza Fish Sanctuary	Portion of municipal waters of barangay Julugan 1 & 3	45.00	Maintained
Naic	Naic Fish Sanctuary	Bucana Malaki Boundary Bagong Kalsada	20.00	Maintained
Ternate	Bulaklakin Fish Sanctuary	Brgy. Bucana	56.00	For assessment
Maragondon	Maragondon Fish Sanctuary	Santa Mercedes	58.80	Lost Marker
<b>TOTAL</b>			<b>1,056.33</b>	

Source: Office of the Provincial Agriculturist, Province of Cavite: 2021

## Freshwater Resources

Freshwater is one of the most valued natural resources. Effective management to ensure its sustainable source is essential and is a primary concern of the government.

### Surface Runoff

Surface runoff is water from rain or other sources that flows over the land surface and is a principal component of the water cycle. Runoff that occurs on surfaces before reaching a channel is also called overland flow. A land area that produces runoff draining to a common point is called a watershed.

There are six major river watersheds in Cavite such as:

1. Bacoor River Watershed
2. Imus River Watershed
3. San Juan River Watershed
4. Cañas River Watershed
5. Labac River Watershed
6. Maragondon River Watershed

These rivers are known to have various tributaries passing through the different municipalities of the province. These rivers and tributaries generally have a flowing directly from the highlands of Tagaytay City going to Manila Bay with stretches from the City of Bacoor up to the Municipality of Ternate.

Along with these six major rivers, the province's topography allowed 12 major river watersheds to be shaped within its boundaries. Except for the Palico River Watershed, Pasig-Laguna Watershed, and Zapote River Watershed which traverses inter-province boundaries, the entirety of the remaining watersheds is from major rivers found in the province. The watersheds rooted in the rivers identified in the province are classified as medium and small-sized watersheds. The Pasig-Laguna River Watershed is identified as a large-sized watershed, resulting in the traversing of the watershed to the east of the province, specifically, areas in Carmona, City of Dasmariñas, General Mariano Alvarez, Silang, and Tagaytay City. In addition, 18 surface water bodies are present in the province.

Water sources, especially in the upland areas, are abundant due to numerous natural springs, waterfalls, and rivers. These have become beneficial among domestic, tourism, and industrial users. These include Balite Spring (Amadeo), Saluysoy Spring (Alfonso), Matang Tubig Spring (Tagaytay City), Malakas Spring (General Aguinaldo), and Ulo Spring (Mendez).

The province is also endowed with waterfalls such as Palsajingin Falls (Indang), Balite Falls (Amadeo), Malibiclibic Falls (Gen. Aguinaldo), Talon-Butas Falls (Gen. Aguinaldo), Saluysoy Falls (Alfonso), and Tala River (Gen. Aguinaldo). Nowadays, these God-given natural wonders are being utilized for recreational and leisure activities like picnics and gatherings.



Water quality of the rivers is observed to be physically deteriorated due to industrial effluents, domestic sewage, garbage disposal, and other site development projects. Surface waters generally exhibit some discoloration, high

turbidity, and abundance of suspended materials during the rainy season. Therefore, river rehabilitation is indispensable to counteract the situation.

**Table 2.13 Major Rivers in Cavite**

Name	Length (km)	Point of Origin	Drainage Location
1. Bacoor River	12.3	Pintong Gubat, Molino passing Tanzang Luma, Salinas and Panapaan	Bacoor Bay Bacoor Bay
2. Imus River	38.4	North of Tagaytay passing Balite, Sabutan, Biga, Silang, Palapala, City of Dasmariñas, Pasong Bayog, San Agustin and connects to Pasong Bayog passing Salitran, Baluctot, Anabu II & Anabu I going to Tanzang Luma, Palico, Imus down to Salinas and Mabolo, Bacoor toward drainage. Tributaries that started from Bucal going to San Agustin join/connect Imus River in Pasong Bayog. Tributaries found in Baluctot also drain at Imus River.	
3a. San Juan River	39.0	Maitim, Amadeo passing Maitim, Lalaan I, Silang, Dagatan, Banaybanay, Calubcob, Panungyanan, Javalera, Biclatan, Manggahan, Jaime Baker; Buenavista, Pasong Kawayan, Bacao, Gen. Trias; Sta. Rosa, Noveleta and Putol, Kawit. Tributaries are at Bucandala and Panamitan.	Bacoor Bay Kawit
3b. Ilang-Ilang River		Pasong Camachile River which started from Santiago passing San Gabriel connects with San Juan River; San Jose, the City of Dasmariñas converging with San Juan River at Bacao, Gen. Trias	
4. Cañas River	38.9	From Kaybagal, Tagaytay City passing Loma, Amadeo going to Polanan River, San Agustin, Gregorio, Osorio, Lucbanan, Conchu, Inocencio, Trece Martires City; Alingaro, Gen. Trias passing Lubluban River, Santol, Bucal to Julugan, Tanza. Also, from Tagaytay City going to Salaban, Amadeo; Balagbag, Mahabang Kahoy, Limbon, Alulod, Indang and connects to Paradahan, Tanza	Manila Bay Julugan, Tanza
5. Labac River	30.5	Other tributaries are found in Buna Lejos, Limbon connecting in Alulod. Two contributory rivers located in the upland area. Starting from Buna Lejos, Indang passing Buna Cerca to Calumpang River going to Palangue, Naic to Kay-alamang River passing San Roque down to Labac River.	Manila Bay
6. Maragondon River	35.6	Patutong Malaki, Tagaytay City passing Habulin River, Barangays II & III, Mendez going to Kayquit, Indang straight to Banaba Cerca going to Malainen Bago, Naic	Manila Bay Ternate
		Multi-sources Banaba Lejos passing Pantihan I & II. Tributaries are: Habulin River passing East Tambo to Banaba Lejos; From Palocpoc passing Lumamong and Banaba Lejos; Magay River to Maragondon River; Narvaez River passing Tabora to Maragondon River; Matagbak Buruhan River passing Sinaliw na Munti and Sinaliw na Malaki; Aliang River in Magallanes starting from Kaytitinga joined Narvaez River passing Tabora; Another river (unnamed) from west of Kaytitinga and Aliang River passing Magallanes and joined Tabora to Maragondon River	

Source: Provincial Government Environment and Natural Resources Office, Trece Martires City

**Table 2.14 Major River Watersheds in Cavite**

Name	Size Classification	Cities/Municipalities Traversed	Approximate Area (sq.km.)
Maragondon River Watershed	Medium-sized watershed	Alfonso, Cavite City (thru Balut Island) Gen. Emilio Aguinaldo, Indang, Magallanes, Maragondon, Mendez-Nuñez, Naic, Tagaytay City and Ternate	0.3213
Pasig-Laguna River Watershed	Large-sized watershed	Carmona, City of Dasmariñas, Gen. Mariano Alvarez, Silang and Tagaytay City	145.2184
Camachile-Ylang-Ylang River Watershed	Medium-sized watershed	Amadeo, City of Dasmariñas, City of Gen. Trias, City of Imus, Kawit, Noveleta, Rosario, Silang and Tagaytay City	129.4278
Canas River Watershed	Medium-sized watershed	Amadeo, City of Gen. Trias, Indang, Rosario, Silang, Tagaytay City, Tanza and Trece Martires City	111.8525
Imus River Watershed	Medium-sized watershed	City of Bacoor, City of Dasmariñas, City of Imus, Kawit, Silang and Tagaytay City	101.6504
Caisobo River Watershed	Small-sized watershed	Indang, Maragondon, Mendez-Nuñez, Naic, Tagaytay City, Tanza and Trece Martires City	99.1721
Timalan River Watershed	Small-sized watershed	Indang, Naic, Tanza and Trece Martires City	45.3212
Palico River Watershed	Medium-sized watershed	Alfonso and Magallanes	42.2016
Zapote River Watershed	Small-sized watershed	City of Bacoor, City of Dasmariñas and City of Imus	37.6914
San Juan River Watershed	Small-sized watershed	City of Imus, City of Gen. Trias, Kawit and Noveleta	14.1541
Unnamed(1)	Small-sized watershed	Tanza	10.4609
Unnamed(2)	Small-sized watershed	City of Dasmariñas, City of Imus and Kawit	10.1024

Source: NAMRIA through DENR-PENRO Cavite

**Table 2.15 List of Surface Water Bodies by Receiving Water Body, Province of Cavite: 2021**

Surface Water Bodies	Location	Classification	Category
<b>Manila Bay</b>			
Manila Bay	Cavite	Class SB	Marine Water
Imus River	Cavite	Class C	Principal River
Ilang-Ilang/ Ylang-ylang River	Cavite	Class B/C	Principal River
Cañas River	Cavite	Class C	Principal River
Labac/ Labac-Balsahan River	Cavite	Class C	Principal River
Maragondon River	Cavite	Class C	Principal River
Timalan River	Cavite	Class C	Minor River
Calibuyo River	Cavite	Class C	Minor River
<b>Labac River</b>			
Haboling River	Indang	Class B	Tributary River
Caisobo/ Obispo River	Indang	Class B	Minor River
<b>Cañas River</b>			
Balite River	Amadeo-Indang	Class B	Tributary River
Indang River	Amadeo-Trece	Class B	Tributary River
Pulonan River	Amadeo-Trece	Class B	Tributary River
Saging/ Cyalinmang/ Alemang/ Kay-Allamang River	Naic	Class C	Tributary River
<b>Zapote River</b>			
Molino River	Bacoor	Class C	Tributary River
<b>Imus River</b>			
Silang River	Silang-Amadeo	Class C	Tributary River
<b>Ylang-ylang River</b>			
Rio Grande River	General Trias	Class C	Tributary River

Source: Provincial Government – Environment and Natural Resources Office, Trece Martires City, Cavite

## Groundwater Resources

Groundwater is one of the best sources of freshwater for human and animal consumption. By definition, groundwater is the water found underground in the cracks and spaces in soil, sand, and rock. It is stored in and moves slowly through geologic formations of soil, sand, and rocks called aquifers.

The natural ground elevation or terrain affects the amount of groundwater in an area, as well as the water extraction demand depending on industrial and residential demand.

The vast number of deep wells in the province has become a major source of concern about the decreasing amount of groundwater resources in Cavite. The towns of Naic, Tanza, and Ternate and the cities of Dasmariñas, Bacoor, Imus, and Gen. Trias highly depend on artesian wells. These have become their major source of water. These have caused saltwater intrusion in the aquifers due to the over-extraction of water. In a study made by the Japan International Cooperation Agency (JICA), the groundwater in Cavite is depleting at a rate of 1-meter water level decrease per year. In the upland areas of the province, groundwater is tapped mainly for domestic use through local water supply systems.

Based on the geological studies in Cavite, most of the groundwater is stored in the pyroclastic rock reservoir and little in the volcano and clastic rock. Potable water is not

reported in the nearshore due to the presence of alluvium deposits, which may be brackish and saline and are not safe for drinking and other domestic use. Another source of groundwater is called infiltrated rainfall, which serves as the direct source of most near-surface aquifers. Inflow from the surface water reservoir and irrigation water also contributes to the groundwater.

Freely-flowing wells occur in the 30-meter elevation of Southern Tanza and the lower portions of nearshore Naic and Ternate, while in the City of Imus, it is at the elevation of about 15 meters.

## Land Use

As defined by PSA (n.d.), land use is the manner of utilizing the land, including its allocation, development, and management.

## Existing Settlement Pattern (Initial Growth Area)

As one of the first areas in the country to be settled in and developed, the municipalities along the coastal areas of the province such as Cavite City, Noveleta, Kawit, Rosario, and Bacoor became one of its earliest settlement areas. It could be due to the shipyard building facilities that employed skilled Filipinos during the Spanish period and the American Naval Bases, Sangley, and Fort San Felipe, during the American presence. The development of infrastructure projects, the proliferation of employment opportunities, and its proximity to Manila largely contributed to the large population and high urban densities.

In addition, the areas on the eastern side of Cavite continue to be on the heavy side of the province's population growth since these are adjacent to job prospects, and educational facilities and serve as a gateway towards Manila and Laguna, another industrialization hub in the CALABARZON Region. These are mainly the Cities of Bacoor, Dasmariñas, and Imus. As an effect, there is a need to plan out their future development that would ensure balance and environmental sustainability in the context of the whole Province.

## Existing Production Areas

The province is a predominantly agricultural area, with almost 50% of its land being a production area. The municipalities of Maragondon, Magallanes, Gen. Aguinaldo, Alfonso, Indang, Mendez-Nuñez, Amadeo, and Silang are the primary sources of its food supply.

Existing land production areas are stressed for various reasons such as exploitative use of land, use of land other than its suitable use, and conversion of prime agricultural lands for purposes other than production. Even the mandated protection lands are deforested due to the illegal cutting of trees, encroachment of informal settlers, and other unsustainable activities.

## Existing Protection Areas

The 8<sup>th</sup> District of the province has enough land to become the future settlement area; however, most protected areas are in this District.

Located in Maragondon, Cavite, Mounts Palay-Palay-and-Mataas-na-Gulod was declared a National Park by Proclamation No. 1594 on October 26, 1976. It is a protected area in a range of low hills on the border between the densely populated provinces of Cavite and Batangas. It has three peaks, Palay-Palay, Pico de Loro, and Mataas-na-Gulod. The last remaining lowland evergreen rainforest in Cavite is in the northern part of Mt. Palay-Palay. The habitat covers 60% of the park. There are also areas of arable land, small settlements and rural gardens, and some kaingin.

A delicate balance between the use of production lands and the preservation of protected lands is, therefore, a critical requirement to attain sustainability in the development process. The sustainable development process requires a long-term sustainable land use framework plan.

## Land Cover

As important as land use, land cover is a vital factor, as it presents spatial information on different types (classes) of physical coverage of the Earth's surface. For the province, NAMRIA provided the 2020 Land Cover Map (Map 2.10) from the digital interpretation of the 2016 to 2021 Sentinel-2 satellite with a 10-meter resolution. Corresponding statistics of the map are shown in Table 2.12 indicating the

extent of various land cover types such as closed/open forest, brush/shrubs, annual/perennial crops, and built-up areas, among others.

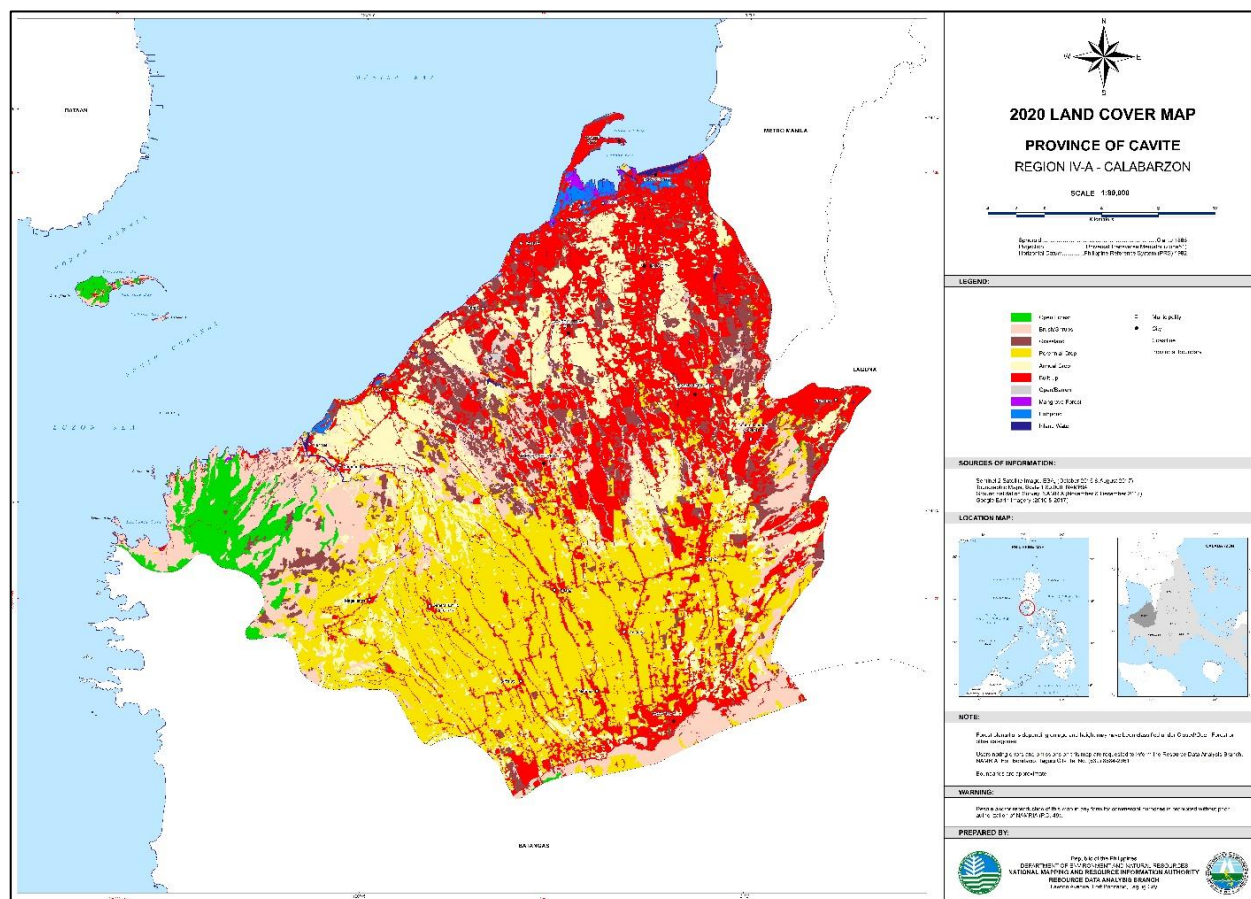
**Table 2.16 Land Cover Statistics, Province of Cavite: 2020**

Land Cover Classification	Area (sq. km.)	Percentage Share
Forest	46.13	3.62
Closed Forest	-	-
Open Forest	43.67	3.42
Mangrove Forest	2.46	0.19
Brush/Shrubs	188.72	14.77
Grassland	106.00	8.30
Annual Crop	197.74	15.48
Perennial Crop	373.20	29.21
Open Barren	3.61	0.28
Built-up	344.03	26.93
Fishpond	7.46	0.58
Marshland/Swamp	-	-
Inland Water	10.69	0.84
<b>Total</b>	<b>1277.58</b>	<b>100.00</b>

Source: National Mapping and Resource Information Authority (NAMRIA), Taguig City

As shown in Table 2.16, elements dominating the land cover of the province are areas with perennial crops and built-up with 373.20 sq. km. and 344.03 sq. km., respectively. All brush/shrubs, grassland, and annual crop areas do not exceed 200 sq. km. Elements covering the least spatial areas are forest, inland water, fishpond, and open barren areas.

It should be noted that land cover statistics (esp. forest and built-up data) should not be confused with land classification data since land cover classifies its elements through spatial or satellite images.



**Map 2.10 Land Cover Map, Province of Cavite: 2020**

Source: National Mapping and Resource Information Authority (NAMRIA)

## Climate

Based on the PAGASA Cavite, is identified to belong to Climate Type I. Cavite has two pronounced seasons, dry from November to April and wet for the rest of the year. The province is included in the Philippine areas that are shielded by mountain ranges but are open to rains brought in by Habagat and tropical cyclones.

Based on the PAGASA Sangley Point Observation Center data, the maximum average temperature of the province was between 24.7° Celsius and 31.8° Celsius with a mean of 28.4° Celsius. The hottest temperature is observed in April and May while it is coldest in January. The vapor pressure is at 30.4 millibars and relative humidity of 78% annually. Wind usually comes from east-southeast with a constant speed of three miles per second.

It can be observed that the average temperature is increasing until 2021 when an average of 28.4 ° was monitored. The increase in temperature can be attributed to continuous global warming in the world, wherein as the concentrations of greenhouse gases increases, the Earth incessantly warms.

**Table 2.17 Historical Average Monthly Temperature, Province of Cavite (Sangley Station): 2016 – 2020**

Month	Mean Temperature (°C)				
	2017	2018	2019	2020	2021*
January	27.0	27.9	27.8	27.9	26.7
February	26.9	28.5	28.0	27.6	27.2
March	28.5	28.9	29.3	29.7	28.3
April	30.0	30.8	31.4	31.2	30.0
May	30.9	32.0	31.0	31.4	30.0
June	30.1	29.1	31.0	30.8	29.4
July	28.7	28.2	29.4	30.2	28.3
August	29.5	28.9	28.6	29.3	28.3
September	29.3	29.2	28.8	30.3	28.3
October	28.8	30.0	29.8	28.9	28.3
November	29.9	29.5	28.9	28.6	28.3
December	27.8	28.2	28.4	28.3	27.2
<b>Annual</b>	<b>29.0</b>	<b>29.3</b>	<b>29.4</b>	<b>29.5</b>	<b>28.4</b>

\*Weather Spark website (Data sourced from PAGASA Sangley Point Observation Center)

Source: Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) Sangley Point Observation Center, Cavite City

**Table 2.18 Historical Amount of Rainfall, Province of Cavite (Sangley Station): 2017 – 2021**

Month	Rainfall (mm)				
	2017	2018	2019	2020	2021*
January	52.5	16.4	5.7	4.2	16.9
February	5.4	0.8	2.0	31.6	11.1
March	6.4	105.8	2.4	2.0	9.4
April	39.3	0.2	3.6	0.0	18.5
May	186.4	20.0	61.9	190.2	139.1
June	105.1	723.0	271.1	268.9	264.5
July	467.2	757.3	309.8	230.4	422.4
August	323.0	427.2	622.9	214.2	457.2
September	382.7	194.7	330.1	130.9	341.8
October	196.1	72.8	33.2	375.7	224.3
November	116.4	13.7	149.8	203.6	110.5
December	57.1	132.9	119.5	123.9	62.7
<b>Annual</b>	<b>1,937.6</b>	<b>2,464.80</b>	<b>1,912.0</b>	<b>1,775.6</b>	<b>2,078.4</b>

Sources: Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) Sangley Point Observation Center, Cavite City, \*PAGASA Website

Most torrential rains are experienced in August, and there is almost no rain at the onset of the year in April except in 2017 and 2021. The heaviest in three years was experienced in August 2021. It was due to rain showers brought by the super typhoon "Hinnamnor" with a local name "Henry"- which absorbed the tropical depression "Gardo" (International Name: "Maria") that intensified the effects of the southwest monsoon or "hanging habagat.

## Projected Climate Change

Since Climate Change is inevitable, the respective LGUs should brace themselves for its effects and implement the necessary mode of action to adapt or mitigate its eventualities, one of which by knowing the right information and essential data related to it.

Based on the publication "Climate Change in the Philippines" (PAGASA 2011), the seasonal rainfall changes in the province in 2020 and 2050 under medium-range emission is 92.31 mm in 2020 and 101.40 mm in 2050, an increase of 9.09 mm of rainfall.

Global sea-level rise is another hazard caused by the melting of ice glaciers and mountain ice caps and the thermal expansion of ocean waters. At the local level, sea-level rise is also attributed to groundwater resources' over-extraction for drinking and domestic purposes, which causes subsidence. Sea-level rise causes flooding of low-lying coastal areas, coastal erosion, and saltwater intrusion into the barangay's groundwater resources.

Data from NOAA/Laboratory Satellite Altimetry TOPEX, J1, and J2, shows that the province has an observed sea-level rise of about 7 mm/year (September 1992-June 2012) or about 56mm from 2012-2020 or a total of 266 mm up to 2050. In its proper perspective, the global sea-level rise for the past century was around 0.17 meters.

On the other hand, the number of dry days in the province is projected to lessen from 6,635 days for 2020 projections to 6,565 days for 2050, meaning wetter days is ahead for the province. Also, the frequency of extreme events (El Niño and La Niña) or days with temperatures more than 35° Celsius—is expected to be 1,697 days in 2020 and expected to increase to 2,733 days by 2050. The projected change in the number of hot days and dry days in the province are relatively related, as the hot days in the province are expected to increase by 169% in 2020 and 334% in 2050 from the 1971-2000 baseline while the number of dry days is expected to increase in by 9.75% in 2020 and 10.71% in 2050 from the 1971-2000 baseline. It is also associated with the decrease of rainfall during the DJF, MAM, and SON seasons in 2020 and 2050, which negates the increase in rainfall during the JJA season. In addition, the number of extreme daily rainfall events is expected to increase by 50% in both 2020 and 2050 from the 1971-2000 baseline. It indicates that extreme rainfall events in the province between 2020 and 2050 may last up to nine days.

**Table 2.19 Frequency of Extreme Events under Medium-Range Emission, Province of Cavite (Sangley Station): 2020 and 2050**

	Observed (1971 – 2000)	Projected	
		2020	2050
Number of Days with Temperature greater than 35 °C	630	1,697	2,733
Number of Dry Days	7,352	6,635	6,565
Number of Days with Rainfall greater than 300 mm	0	4	2

Source: Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

## Natural Hazards and Constraints

### Hydrometeorological Hazards

Hydrometeorological hazards are phenomena caused by natural processes and atmospheric, hydrological, or oceanographic phenomena. Most hydrometeorological hazards in the province are caused by tropical cyclones, rains, and storms, resulting in floods, rain-induced landslides, and storm surges. The hydrometeorological and geologic hazards present in the province are tsunami, flooding, storm surge, ground shaking, ground rupture, liquefaction, earthquake-induced landslide, rainfall-induced landslide, and volcanic hazard.

Flooding is a spilling over of water onto land that is regularly dry. Floods can occur during weighty downpours, when sea waves come onshore, or when dams or levees break. Generally, flooding in Cavite is only experienced in low-lying towns and coastal towns of the province based on the study conducted. There are major rivers in the province that serves as catchment areas. They catch the water volume coming from the upland municipalities of the province in the occurrences of heavy rains, typhoons, and other environmental phenomena. Densely populated regions are in high danger of floods. Development of structures, expressways, carports, and parking areas builds overflow by decreasing the amount of downpours consumed by the ground.

Incessant rains not only affect coastal-lying areas but also mountainous or high-altitude areas within a municipality or province. It has resulted in several rain-induced landslides in the past. The City of Bacoor, City of Imus, City of Dasmariñas, Carmona, Silang, City of General Trias, Amadeo, Indang, Tanza, Trece Martires City, Alfonso, General Emilio Aguinaldo, Magallanes, Maragondon, Mendez-Nuñez, Naic, Tagaytay City, Ternate. In addition, most localities exposed to rain-induced landslide are located in the upland area of the province, which has higher slopes that are most susceptible to rain-induced landslide. The exposure of the City of Bacoor and the City of Imus to these hazards are located in and near the river and coastal edges of the cities.

Cavite, being bounded by the West Philippine Sea on the west and having an extremely low ground-level elevation of 0m to 2m at the lowest lowland area, is exposed to storm surge. One documented major storm surge occurred at the peak of Typhoon Sening on October 10-15, 1970,

and had an actual height of 3-5 m (PAGASA, 2004). Storm surge causes coastal flooding, often aggravated by storm runoff.

### Geological Hazards

On the other hand, geologic hazards are large-scale, complex natural events that happen on the land caused by extreme weather conditions and activities taking place in the earth's interior. These hazards may occur suddenly, or slowly. Among the geologic hazards, ground shaking, ground rupture, earthquake-induced landslide, liquefaction, tsunami, and volcanic hazards exist in the province.

One of the main hazards emanating from an earthquake is ground motion or ground shaking. The passage of seismic waves causes ground shaking, especially surface waves near the earthquake's epicenter are responsible for the most damage during and after the earthquake. The intensity of ground shaking depends on local geologic conditions in the area, the size of the earthquake, the larger the earthquake, the more intense the shaking and the duration of the shaking, and the distance from the epicenter. The distance factor depends on the type of material underlying the area. Part of the West Valley Fault traverses part of the Cavite Province, along the Municipalities of Carmona and Silang, all of the province's municipalities and cities are affected by ground shaking.

In addition to ground shaking, earthquakes cause damage in other ways, the most significant of which are liquefaction, earthquake-induced landslides, tsunami, and ground ruptures.

Carmona and Silang are susceptible to ground rupture in the province. These areas are traversed by active faults resulting in the occurrence of ground rupture.

Earthquake-induced landslide-prone areas in the province are the City of Dasmariñas, Carmona, General Mariano Alvarez, Silang, Indang, Trece Martires City, Alfonso, General Emilio Aguinaldo, Magallanes, Maragondon, Tagaytay City, Ternate, and Mendez-Nunez. Areas in Carmona and Silang are along the West Valley Fault resulting in the occurrence of this hazard, while Tagaytay City has steeply sloping areas such as the Tagaytay Ridge. Deeply incised rivers are also present in the province that are prone to this hazard.

Liquefaction takes place when loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking. Coastal areas in the province located in Cavite City, Noveleta, Kawit, Rosario, City of Imus, City of Bacoor, Carmona, City of General Trias, Tanza, Maragondon, Naic, and Ternate are prone to liquefaction.

The marine industry and built-up areas in the affected areas will be damaged by the tsunami. As it occurs in the water zones, the coastal areas of Cavite City, Kawit, Rosario, Noveleta, City of Bacoor, City of Imus, City of General Trias, Maragondon, Naic, and Ternate are susceptible to a tsunami.

Lastly, due to the province’s proximity to Taal Volcano Tagaytay City, Alfonso, Mendez, Amadeo, Silang, and portions of Magallanes, General Emilio Aguinaldo, City of General Trias, Carmona, City of Dasmariñas, Indang and Trece Martires City are susceptible to volcanic hazard.

These areas are calculated to be within the 30km radius of the volcano.

**Table 2.20 Summary of Hazard Characterization by City/Municipality, Province of Cavite:2021**

City/Municipality	Flood	Rainfall-induced Landslide	Storm Surge	Ground Shaking	Ground Rupture	Earthquake-induced Landslide	Liquefaction	Tsunami	Volcanic Hazards
<b>1<sup>st</sup> District</b>									
Cavite City	■		■				■		
Kawit			■				■		
Noveleta			■				■		
Rosario			■				■		
<b>2<sup>nd</sup> District</b>									
City of Bacoor	■				■		■		
<b>3<sup>rd</sup> District</b>									
City of Imus	■			■			■		
<b>4<sup>th</sup> District</b>									
City of Dasmariñas	■			■		■			■
<b>5<sup>th</sup> District</b>									
Carmona	■			■			■		■
Gen. M. Alvarez	■			■	■		■		■
Silang	■			■			■		■
<b>6<sup>th</sup> District</b>									
City of Gen. Trias	■			■			■		■
<b>7<sup>th</sup> District</b>									
Amadeo		■		■					■
Indang		■		■			■		■
Tanza	■	■		■			■		■
Trece Martires City	■	■		■			■		■
<b>8<sup>th</sup> District</b>									
Alfonso	■	■		■			■		■
Gen. Emilio Aguinaldo	■	■		■			■		■
Magallanes	■	■		■			■		■
Maragondon	■			■			■		■
Mendez-Nuñez	■			■			■		■
Naic	■			■			■		■
Tagaytay City	■			■		■	■		■
Ternate	■			■			■		■

## Environmental Management

Cavite has the Cavite Environment Code (Provincial Ordinance No. 001-S-2008) that guides the province in formulating and implementing programs with the ultimate goal of safeguarding and conserving the land, mineral,

marine, forest and other natural resources of the province. In each aspect of environmental management, Cavite also enacted specific ordinances in support of the Environment Code.

**Table 2.21 Legislations on Environmental Management, Province of Cavite: as of 2021**

Ordinance/ Resolution No.	Year	Title
004	2002	An Ordinance prohibiting the smoking and selling of cigarettes in all public and private primary and secondary schools and within a radius of 100 meters from the school compound, premises and providing penalties for violations thereof
001	2003	An Ordinance prohibiting the improper disposal of used oil generated from automotive and industrial lube oil and petroleum sludge, providing penalties for violation thereon and other purposes
004	2005	An ordinance to curtail illegal activities of professional and illegal squatters in the province of Cavite
005	2005	An ordinance creating the Cavite Youth Development Council
007	2005	An Ordinance prescribing safety measures in the refueling at any gasoline station within the territorial jurisdiction of the Province of Cavite and providing penalties for violation thereof
005	2006	An Ordinance regulating the operation of all junkshops and other similar business establishments and individuals engaged in buying and selling of metals with monetary value within the province of Cavite and for other purposes
004	2007	An Ordinance on the establishment of animal quarantine checkpoints for foot and mouth disease and other zoonotic diseases at strategic entry points in the Province of Cavite and imposing fees thereof
001	2008	Cavite Environment Code
005	2011	An Ordinance adopting the National Code on Sanitation in the Province of Cavite
001	2012	An Ordinance for the implementation of anti-dengue campaign at the barangay level
003	2012	An Ordinance adopting the Manila Bay Oil Spill Contingency Plan

Ordinance/ Resolution No.	Year	Title
007	2012	An Ordinance prohibiting, regulating, prescribing certain uses of plastics for goods and commodities that end up as residual wastes and promoting the use of eco-bags and other environment-friendly practices as an alternative and providing penalties for violations thereof
026	2012	An Ordinance regulating cigarette smoking within the Provincial Capitol compound of Cavite and providing penalties thereof
007	2013	An ordinance establishing the "Greening Program" within the province of Cavite
008	2013	Water Consumers Protection Ordinance of Cavite
015	2013	An ordinance creating the Water Quality Management Are (WQMA) Governing Board for Imus-Ylang-ylang-Rio Grande River pursuant to DENR Administrative Order no. o2, Series 2013
021	2013	An ordinance amending certain Provisions of Provincial Ordinance No. 007-2012 otherwise known as an Ordinance Prohibiting, Regulating and Prescribing certain uses of Plastics for Goods and Commodities that end up as Residual Wastes and promoting the use of Eco Bags and other environment friendly practices as an alternative and providing penalties for violation thereof
038	2013	An ordinance amending the Provincial Ordinance No. 2008-001, otherwise known as the Cavite Environment Code, specifically, Article XII, Organization, Section 104 and 105
061	2014	An ordinance establishing the Provincial Clean Air and Anti-Smoke Belching Program and appropriating funds and providing fines and penalties thereof
129	2015	An ordinance requiring all car wash facilities operating within the territorial jurisdiction of the province of Cavite to install septic tanks in their respective premises and providing penalties for violations thereof
167	2017	An ordinance prohibiting the littering of solid wastes in the province of Cavite and providing penalties for violation thereof
006	2019	Ordinance prohibiting any person, business, firm, corporation or association to conduct balloon releasing activity in violation of RA 9003 or the Ecological Solid Waste Management Act of 2000 and prescribing penalties thereof.
126	2019	An ordinance prohibiting the Littering of Solid Waste in the province of Cavite and providing penalties thereof
173	2019	An ordinance to regulate the use and disposition of plastic bags and other plastic products for goods and commodities, promoting the use of eco bags and other native reusable bags and providing penalties for violations thereof
126	2019	An Ordinance Prohibiting the Littering of Solid Waste in the Province of Cavite and Providing Penalties for Violation thereof
249	2019	An Ordinance Establishing the "Ang Barangay Kontra Dengue (ABKD) Brigade" in Every Barangay of the Province of Cavite, Defining Its Roles and Functions in the Dengue Prevention and Control Program and Appropriating Funds Thereof
251	2019	An Ordinance Establishing the Water Conservation Programs in the Province of Cavite
261	2020	An Ordinance Institutionalizing the "Plant a Love Tree Program" by Requiring Couples to Plant Trees as Requisite for Securing Marriage License
264	2020	An Ordinance Declaring Every Third Friday of Each Month as Provincial Clean-up Day for the Prevention of Dengue in the Province of Cavite
282	2020	An Ordinance Prohibiting Spitting and Expelling of Saliva, Mucus, Phlegm, and Other Substances in All Public Utility Vehicles and Public Places Within the Territorial Jurisdiction of the Province of Cavite and Providing Penalties for Violations Thereof
338	2021	An Ordinance Creating African Swine Fever (ASF) Task Force and for the Adoption and Implementation of Bantay ASF sa Barangay "BABay ASF" Program Providing Powers Thereof, and For Other Purposes
1780	2021	A Resolution Approving the Cavite Ten-Year Solid Waste Management Plan 2019-2028

Source: Cavite Ten-Year Solid Waste Management Plan (SWMP) 2019-2028; Sangguniang Panlalawigan (SP)

## Solid Waste Management

Management of solid waste is a major environmental concern of the government. The Republic Act 9003 stipulates the law on proper ecological disposal of solid waste, which does the least harm to the environment. In support of this, the provincial government has enacted Executive Order No. 29 requiring all cities and municipalities of the province to establish waste reduction and recovery schemes and to convert their open dumpsites to controlled ones. It is complemented by Provincial Ordinance No. 007-2012 which regulates the use of plastics and promotes the use of environmentally friendly packaging and practices.

The Republic Act No. 9003 or the Ecological Solid Waste Management Act created the Provincial Solid Waste Management Board.

Solid wastes are collected and disposed to sanitary landfills or managed open dumpsites. As of 2020, the province owns and uses 147 operational garbage trucks, compactors, and mini dump trucks for its garbage collection system with capacities of 10/8 square meters and four square meters, respectively. The disposal activities also employ around 529 people acting as garbage collectors, street cleaners, and office support staff.

The following table shows the status of solid waste management compliance in the province. As of 2021, all the cities and municipalities in Cavite, except for Trece Martires City and General Emilio Aguinaldo, have their solid waste management plan approved.

**Table 2.22 Status of Solid Waste Management Plan Compliance by City/Municipality, Province of Cavite: 2021**

City/Municipality	Year Covered	NSWMC Resolution No.	Status
<b>1<sup>st</sup> District</b>			
Cavite City	2015-2025	847 Series of 2016	Approved
Kawit	2015-2024	316 B Series of 2017	Approved
Noveleta	2015-2025	844 A Series of 2017	Approved
Rosario	2015-2026	836 Series of 2016	Approved

City/Municipality	Year Covered	NSWMC Resolution No.	Status
<b>2<sup>nd</sup> District</b>			
City of Bacoor	2014-2023	111 Series of 2014	Approved
<b>3<sup>rd</sup> District</b>			
City of Imus	2015-2024	692 B Series of 2017	Approved
<b>4<sup>th</sup> District</b>			
City of Dasmariñas	2015-2025	538 A Series of 2016	Approved
<b>5<sup>th</sup> District</b>			
Carmona	2018-2027	182 Series of 2015	Approved
Gen. Mariano Alvarez	2019-2028	846 Series of 2016	Approved
Silang	2015-2025	837 Series of 2016	Approved
<b>6<sup>th</sup> District</b>			
City of Gen. Trias	2015-2024	833 Series of 2016	Approved
<b>7<sup>th</sup> District</b>			
Amadeo	2019-2028	N/A	Submitted (Under Review -NSWMC)
Indang	2016-2025	834 Series of 2016	Approved
Tanza	2015-2025	838 Series of 2016	Approved
Trece Martires City	2017-2026	537 B Series of 2017	Approved
<b>8<sup>th</sup> District</b>			
Alfonso	2015-2025	845 B Series of 2017	Approved
Gen. Emilio Aguinaldo			
Magallanes	2015-2024	314 B Series of 2017	Approved
Maragondon	2015-2024	835 Series of 2016	Approved
Mendez-Nuñez	2016-2025	722 B Series of 2017	Approved
Naic	2016-2025	840 A Series of 2017	Approved
Tagaytay City	2016-2025	848 A Series of 2017	Approved
Ternate	2015-2025	843 Series of 2016	Approved

Source: Provincial Government-Environment and Natural Resources Office Cavite

The succeeding table shows the frequency of garbage collection, type of waste collected, and solid waste facilities in the province of Cavite. As of 2021, the City of Dasmariñas and the Municipality of Gen. Mariano Alvarez were able to acquire land which was dedicated to disposal

facilities. All other cities and municipalities dispose in sanitary landfills present in the adjacent provinces such as Laguna, Batangas, and Rizal. All cities and municipalities, except City of Bacoor have centralized material recovery facilities (MRF).

**Table 2.23 Garbage Collection and Disposal Location by City/Municipality, Province of Cavite: 2021**

City/Municipality	Type of Garbage Collected	Frequency of Garbage Collection	Current Disposal Facilities
<b>1<sup>st</sup> District</b>			
Cavite City	Not indicated	Daily Collection	San Mateo, Sanitary Landfill
Kawit	Not indicated	Monday to Saturday	Kay-Anlog, Calamba City, Laguna
Noveleta	Not indicated	Monday to Sunday	Navotas Landfill
Rosario	Biodegradable and Non-biodegradable	Daily Collection	Pilotage Trading and Construction Sanitary Landfill, San Pedro City, Laguna
<b>2<sup>nd</sup> District</b>			
City of Bacoor	Not indicated	Daily Collection	Rizal Provincial Sanitary Landfill and San Mateo Sanitary Landfill
<b>3<sup>rd</sup> District</b>			
City of Imus	Not indicated	Once a week	San Mateo Sanitary Landfill
<b>4<sup>th</sup> District</b>			
City of Dasmariñas	Not indicated	Daily Collection	City Government (Brgy. Salawag, City of Dasmariñas)
<b>5<sup>th</sup> District</b>			
Carmona	Not indicated	Daily Collection (Barangay and Municipal Collection)	Brgy. Santonio, San Pedro City, Laguna
Gen. Mariano Alvarez	Biodegradable and Non-biodegradable	Daily Collection	Municipal Government (Brgy. Olaes, Gen. Mariano Alvarez)
Silang	Not indicated	Twice a week (Población) Once a week (Barangays)	Bauan Sanitary Landfill, Bauan, Batangas
<b>6<sup>th</sup> District</b>			
City of Gen. Trias	Not indicated	Daily Collection	Kay-Anlog, Calamba City, Laguna
<b>7<sup>th</sup> District</b>			
Amadeo	Residual Waste	Monday to Saturday	Taysan, Batangas
Indang	All types of waste (segregated) and residuals	Daily Collection	Purok I, Kay-Anlog, Calamba City, Laguna
Tanza	Biodegradable and Non-biodegradable	Daily Collection	Pilotage Trading and Construction, Inc., Brgy. Santonio, San Pedro, Laguna
Trece Martires City	Not indicated	Daily Collection	Brgy. Alipit, Sta. Cruz, Laguna



City/Municipality	Type of Garbage Collected	Frequency of Garbage Collection	Current Disposal Facilities
<b>8<sup>th</sup> District</b>			
Alfonso	Residual Waste	Monday, Tuesday, Thursday, and Friday	Taysan/Bauan Landfill Batangas
	Biodegradable Recyclable Waste (Poblacion)	Tuesday and Friday Wednesday and Sunday	
	Residual Waste Residual Waste of 27 Barangays	Monday and Thursday Once a month	
Gen. Emilio Aguinaldo	Biodegradable Non-Biodegradable	Monday and Tuesday Wednesday and Thursday	Brgy. San Isidro Rodriguez, Rizal
Magallanes	Non-Biodegradable Biodegradable	Tuesday and Thursday	Taysan, Batangas
Maragondon	Residual Waste	Monday, Tuesday, Thursday and Friday	Brgy. San Jose Sico, Batangas City, Batangas
Mendez-Nuñez	Biodegradable, Non-Biodegradable, Residual, Toxic Waste	Monday to Friday (Route/Barangay Schedule and types of waste collection)	Bauan Solid Waste Management Inc.
Naic	All types of Waste	Monday to Saturday (Route Schedule)	Taysan, Batangas
Tagaytay City	Not indicated	Daily Collection	Brgy. Alipit, Sta. Cruz, Laguna
Ternate	Not indicated	4 times a week	Calamba, Laguna

Source: City/Municipal Environment and Natural Resources Office (C/MENRO) thru the Provincial Government-Environment and Natural Resources Office Cavite

**Table 2.24 Location and Status of Material Recovery Facility by City/Municipality, Province of Cavite: 2021**

City/Municipality	Central Material Recovery Facilities (CMRF)/ Ecological Center Location	Status
<b>1<sup>st</sup> District</b>		
Cavite City	Bagong Pook, San Antonio, Cavite City	Functional
Kawit	Brgy. Aplaya, Kawit	Functional
Noveleta	Brgy. Poblacion, Noveleta	Functional
Rosario	Brgy. Kanluran, Rosario	Functional
<b>2<sup>nd</sup> District</b>		
City of Bacoor	None	-
<b>3<sup>rd</sup> District</b>		
City of Imus	Brgy. Buhay na Tubig, Imus City, Cavite (Ecology Center) Pedro Reyes St. Malagasang I-A, Imus City, Cavite (Imus City Composting Facility)	Functional
<b>4<sup>th</sup> District</b>		
City of Dasmariñas	Brgy. Luzviminda II, Dasmariñas City, Cavite (Ecology Center) Brgy. Zone III, Dasmariñas City (Ecology Center II)	Functional
<b>5<sup>th</sup> District</b>		
Carmona	Brgy. Lantic, Carmona, Cavite (Carmona Ecology Center)	Functional
General Mariano Alvarez	Brgy. Olaes, GMA Brgy. Poblacion 5, GMA Brgy. Poblacion 1, GMA	Functional
Silang	Brgy. Tubuan I, Silang	Functional
<b>6<sup>th</sup> District</b>		
City of General Trias	Brgy. Sampalucan, City of General Trias, Cavite (City Centralized Public Market)	Functional
<b>7<sup>th</sup> District</b>		
Amadeo	Brgy. Poblacion 5, Amadeo	Functional
Indang	Brgy. Banaba Lejos, Indang	Functional
Tanza	-	-
Trece Martires City	Brgy. De Ocampo, Trece Martires City, Cavite (Central Composting and Waste Recycling Facility)	Functional
<b>8<sup>th</sup> District</b>		
Alfonso	Brgy. Marahan I, Alfonso	Functional
General Emilio Aguinaldo	Sitio Pugot, Brgy. Lumipa, Gen. Emilio Aguinaldo	Functional
Magallanes	Sitio Kayhabol, Brgy. Ramirez, Magallanes	Functional
Maragondon	Brgy. Layong Mabilog, Maragondon	Functional
Mendez-Nuñez	Maysili Road, Brgy. Asis 2, Mendez	Functional
Naic	Brgy. Sabang, Naic	Functional
Tagaytay City	-	Functional
Ternate	Sitio UI-Ong, Brgy. Sapang I, Ternate	Functional

a 5 Barangay MRF w/ MOA and 5 Barangay MRS w/ MOA

b can be considered as MRF

Source: City/Municipal Environment and Natural Resources Office (C/MENRO) thru the Provincial Government-Environment and Natural Resources Office Cavite