

CALOOCAN CITY



2017 - 2025 local climate change action plan



MESSAGE

By now, after several typhoons of high intensity and extraordinary heavy rainfall experienced by our country in the past three years, there should no longer be any uncertainty that climate change is one of the most serious global challenges of the 21st century.

Our city, just like any other cities in the country is extremely vulnerable to the effects of climate change. The Dagat-Dagatan Area which lies below sea level, is of major concern due to the number of population and infrastructure at risk from flooding as experienced during typhoons Ondoy and Yolanda. Some areas were also identified as high risk from landslide due to heavy rains, and if left unattended, will surely cause harm and damage to lives and properties.



At this critical point in time, we have to act now in unison in order to respond to issues that will arise from the vulnerable sectors of the city. Each one of us is a stakeholder who have a responsibility to halt further damage to our city and citizenry.

The **Caloocan City Local Climate Change Action Plan (LCCAP)** was formulated to ensure and strengthen the adaptation and mitigation strategies aimed to address the challenges posed by climate change. The plan will serve as a roadmap that will guide the City Government in implementing climate change and disaster risk sensitive development programs and projects.

Equally important and considered as the centerpiece of the plan is the government's development efforts in addressing the effects of climate change on poverty and the environment; ultimately making climate change initiatives as an agent of sustainable development.

I have ordered a review of our disaster response mechanisms, specifically for earthquakes, flooding, landslides and tsunamis. We are studying programs that will give incentives to people who will relocate to higher grounds in lieu of places in danger of flooding due to rising sea water levels. Furthermore, we are also studying the design and implementation of infrastructure and non-infrastructure programs, in order to physically protect lives and properties.

There are other initiatives that will be unveiled in the coming days, ingenuities that will not only help our environment, but also improve the livelihoods of our citizens.

In facing the most pervasive threat to humanity today, let us all together joined our hands in preserving our resources for the future generations - "*dahil sa Caloocan, TAO ANG UNA*".

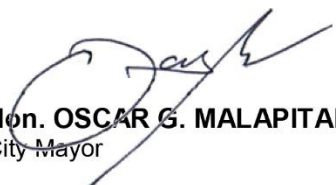

Hon. OSCAR G. MALAPITAN
City Mayor

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BACKGROUND AND RATIONALE

LEGAL MANDATE

Section 1, Article II of the Philippine Constitution states that, “The State shall protect and advance the rights of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature”.

In response to the urgency for action on climate change, the Philippines passed Republic Act 9729, also known as the “Climate Change Act of 2009”. Section 2 states that “it is the policy of the State to afford full protection and the advancement of the right of the people to a balanced and healthful ecology... to fulfill human needs while maintaining the quality of the natural environment for current and future generation.”

The Local Government Unit is mandated to exercise their inherent powers such a police power, as well as share with the national government the responsibility in the management and maintenance of ecological balance in their respective territorial jurisdiction as stated in Section 2a, 15, 3i of Republic Act 7160 or the Local Government Code of 1990.

Section 14 of RA 9729, as amended by RA 10174, provides that, LGUs shall be the frontline agencies in the formulation, planning and implementation of climate change action plans in their respective areas, consistent with the provisions of RA 7160, the National Framework Strategy on Climate Change (NFSCC), and the National Climate Change Action Plan (NCCAP).

THE CALOOCAN CITY CLIMATE CHANGE ACTION PLAN

GUIDING PRINCIPLES

Guided by the National Framework Strategy on Climate Change 2010-2022, Caloocan City adopted the following principles in the formulation of the Caloocan City Local Climate Change Action Plan (LCCAP 2017-2025).

- The City Government envisions a climate-risk resilient city with healthy, safe, prosperous and self-reliant communities, and thriving and productive ecosystems;
- Build the adaptive capacity of communities and increase the resilience of natural ecosystem to climate change, and optimize mitigation opportunities towards sustainable development;
- Take precautionary measures to anticipate, prevent or minimize the causes of climate change and its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures;
- The Plan is risk based, and strategies/ activities shall be formulated, with decisions made based on the causes, magnitude and impact of risks;
- Climate change knowledge is science-based, and shall be drawn from scientific contributions and best practices from communities taking into considerations local circumstances;
- Climate Change strategies shall be adaptation and mitigation, with an emphasis on adaptation as the anchor strategy. Whenever applicable, mitigation actions shall also be pursued as function of adaptation;

- Adaptation measures shall be based on equity, in accordance with common but differentiated responsibility; special attention must be given to ensure equal and equitable protection of the poor, women, children and other vulnerable and disadvantaged sectors;
- Even with inadequate scientific information, anticipatory adaptation measures should be undertaken to prevent or minimize the causes and potential impacts of climate change, whenever necessary;
- The LCCAP shall be sustainable that fulfill human needs while maintaining the quality of the natural environment for current and future generations;
- The principle of complementation shall be observed to ensure that climate change initiatives by one sector do not restrict the adaptation of the other sector;
- It shall recognize the value of forming multi-stakeholder participation and partnerships in climate change initiatives, including with civil society, private sector and other marginalized groups most vulnerable to climate change impacts; and
- Policies and incentive mechanisms to facilitate private sector participation in addressing adaptation and mitigation objectives shall be promoted and supported.

Following the development concepts outlined in the NCCAP, Caloocan City's LCCAP has the following work priorities and targeted outcomes;

Table 1-01: Priorities and Outcomes

Priorities	Outcomes
Food security	- Availability, stability, accessibility and affordability of safe and healthy food amidst climate change.
Water sufficiency	- Resiliency of major water resources and infrastructures; - Efficient management of water supply and demand; - Effective management of water quality promotion and conservation.
Environmental and Ecological Stability	- Achieved resilient ecosystem and environmental stability; - Attained protection and rehabilitation of critical ecosystems, and restoration of ecological services.
Human Security	- Reduced risks for women and men; children, senior citizens, people with disabilities and other vulnerable sector to climate change and disasters.
Climate-Friendly Industries and Services	- Prioritized creation of green and eco-jobs; - Attained sustainable consumption and production.
Sustainable Energy	- Prioritized the promotion and expansion of energy efficiency and conservation; - Achieved development of sustainable and renewable energy; environmentally sustainable transport; and climate-proofing and rehabilitation of energy systems infrastructures.
Knowledge and Capacity Development	- Enhanced knowledge on the science of climate change; - Enhanced capacity for climate change adaptation, mitigation and disaster risk reduction at the local and community level; and - Established gendered climate change knowledge management accessible to all sectors at the national and local levels.

CITY PROFILE

HISTORY

From its beginning as a humble barrio of the town of Tondo, Caloocan is located in a 'libis' (lowland) known as 'Libis Espina' or 'Aromahan'. Its name originated either from the Tagalog word 'look' meaning bay or 'sulok' meaning corner. Caloocan might have meant 'nasa sulok' or in the corner since the city is located where the ends of the old town of Tondo and Tambobong (now Malabon) meet.



At the end of the 18th century, the fishermen of Aromahan climbed the hills to open homesteads in Caloocan. Here, the land was free of thorny plants that infested the banks/ shorelines and although the hill was naturally stony, some form of agriculture was possible and fishermen became farmers.

In 1815, Caloocan was separated from Tondo and became an independent municipality. Its original territory extended to the foothills of Marikina, San Mateo and Montalban in the east; from Tinajeros, Tanza and Tala Rivers in the North; San Francisco del Monte, Sampalok, Sta. Cruz and Tondo in the south; and Dagat-Dagatan or Aromahan in the west.

The first settlers of Libis Espina, mostly oppressed people from Tondo, fought the landlords of Hacienda de Maysilo, the upper lands of the Dagat-dagatan area, the battle for terrestrial rights went on for almost a hundred years. And on August 30, 1896, the Katipuneros led by Gat Andres Bonifacio aided them in the rebellion against their oppressors in what is now known as the "Cry of Balintawak".

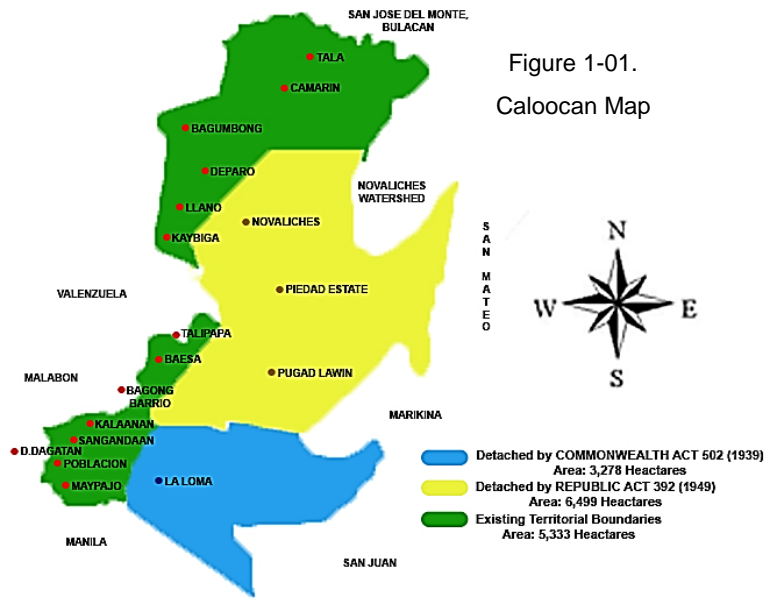
The Filipino forces in Caloocan participated actively in Intramuros siege of the Spanish forces in Manila until their surrender to the Americans on August 13, 1898.

On January 11, 1899, the people of Caloocan showed resistance to coming to terms with the Americans, who were bent on extending their supremacy over the country. The men of Caloocan fought the new invaders on February 23, 1899, victory eluded the local troops on the pretext of Gen. Antonio Luna's rift with Aguinaldo's loyalists.

THE MAKING OF A CITY

In 1901, under the American Regime, Caloocan became one of the towns of the Province of Rizal. Due to the consolidation of several municipalities, Novaliches became part of Caloocan pursuant to Act 942, as amended by Acts 984 and 1008 of the Philippine Commission.

In 1939, pursuant to Commonwealth Act 502, which created Quezon City as Capital of the Philippines, Caloocan lost the following barrios or sitios, namely: Balingasa, Kaingin, Kangkong, La Loma, Malamig, Matalahib, Masambong, San Isidro, San Jose, Santol and Tatalon.



In 1949, boundaries of Quezon City were redefined pursuant to Republic Act 392 as recommended by the Capital City Planning Commission. Caloocan again lost several barrios, namely: Baesa, Bagbag, Bahay-Toro, Banlat, Novaliches, Pasong Tamo, San Bartolome and Talipapa. This explains why the City of Caloocan has two separate territories.

In 1961, the late Mayor Macario B. Asistio, Sr., led the people of Caloocan to turn the historic town into a city through a plebiscite held in accordance with House Bill 6038, which was passed and approved by both chambers of the defunct Philippine Congress.

On February 16, 1962, the Municipality of Caloocan was inducted into Cityhood.

GEOGRAPHICAL LOCATION AND LAND AREA

Caloocan City is situated in the northern part of Metro Manila or the National Capital Region (NCR, Region IV-A), within coordinates of 14°39'4"N latitude and 120°58'18"E longitude. It is divided into two geographic locations with a combined total land area of 5,333.40 hectares.

South Caloocan has an area of 1,362.50 hectares. It is bounded on the north-northwest by Valenzuela, Malabon and Navotas; on the east by Quezon City; and on the south by the City of Manila. The greatest length, north to south of the boundaries is about six kilometers and the greatest width, east to west is seven kilometers.

North Caloocan's total expanse is at 3,970.90 hectares. It is bounded on the north-northwest by the province of Bulacan; on the south-southeast by Quezon City; and southwest by Valenzuela. Its extreme southern boundary is about 1.7 Kilometers apart from the northern extreme boundary of South Caloocan.

The greatest length, north to south of the boundaries is eight kilometers and the greatest width, east to west is ten kilometers.



TERRITORIAL COMPOSITION

The City of Caloocan is divided into 16 zones, which is composed of 188 barangays. It is further divided into two political boundaries, namely: District 1 and District 2. District 1 is composed of 70 barangays, which include Barangays 1 to 4, 77 to 85 and 132 to 188, while District 2 is composed of 118 barangays, which include Barangays 5 to 76 and 86 to 131.

Table 1-02: List of Barangay Zones by Political District

Barangay Zone Congressional District	Barangays	Old District Name / Location
Zone 01 – District I	001 - 004	Sangandaan
Zone 01 – District II	005 - 012	Sangandaan & Dagat-Dagatan
Zone 02 – District II	013 - 024	Poblacion & Dagat-Dagatan
Zone 03 – District II	025 - 035	Sampalukan, Maypajo & Dagat-Dagatan
Zone 04 – District II	036 - 048	Marulas, Barrio Obrero, & Bagong Grace Park
Zone 05 – District II	049 - 058	Bagong Grace Park & Grace Park
Zone 07 – District II	071 - 076	Calaanan West
Zone 07 – District I	077 - 080	Bonifacio
Zone 08 – District I	081 - 085	Bonifacio, & Morning Breeze,
Zone 08 – District II	086 - 093	Calaanan East, Our Lady of Grace, & Barrio Rodriguez
Zone 09 – District II	094 – 105	Calaanan East, Barrio Pacita, & Barrio Galino
Zone 10 - District II	106 – 120	Our Lady of Grace, & Bagong Silang (Old)
Zone 11 – District II	121 – 131	Bagong Silang (Old), Barrio Galino, & Barrio San Jose
Zone 12 – District I	132 – 141	Bagong Barrio
Zone 13 – District I	142 – 155	Bagong Barrio
Zone 14 – District I	156 – 164	Bagong Barrio, Baesa & Talipapa
Zone 15 – District I	165 – 178	Bagbaguin, Kaybiga, Llano, Deparo, Bagumbong, Camarin, & Tala-Bagong Silang Resettlement Project
Zone 16 – District I	179 – 188	Amparo, & Tala (Pangarap, Malaria-Barracks, Tala-NHA)

Figure 1-03. Barangay Map, North Caloocan

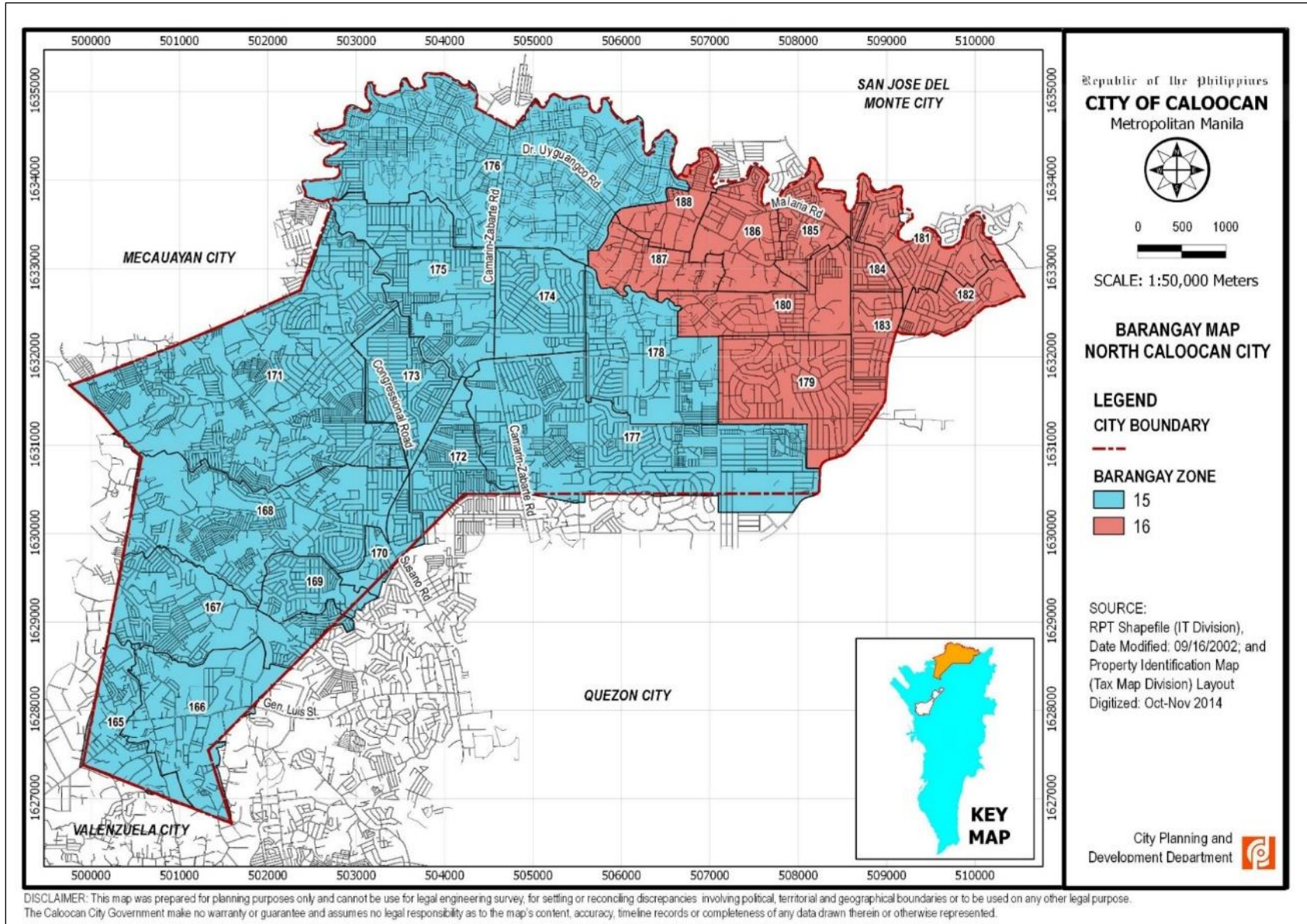
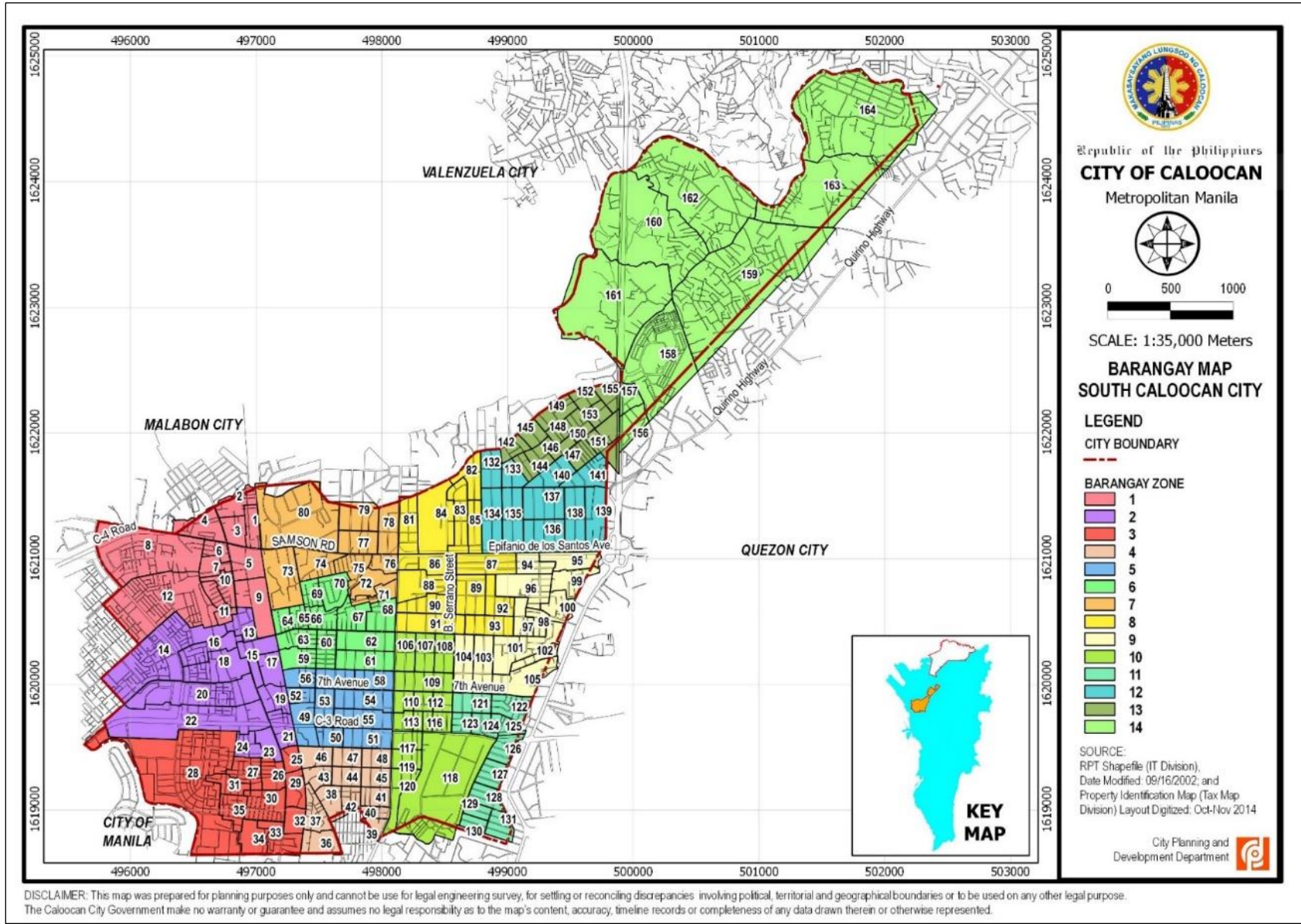


Figure 1-04. Barangay Map, South Caloocan



TOPOGRAPHY

South Caloocan

A westward trend of flat lands covers a land area of about 1,001.64 hectares or 74.25% of the whole southern portion of the city, slopes of which ranging from 0% to 3%. Being flat and highly accessible to neighboring cities and municipalities. It is where most of the commercial and industrial establishments in the city can be found.

Along the North Diversion Road, the topography of South Caloocan, gradually changes into gently to moderately sloping to rolling, with slopes ranging from 3 to 18%. Adjacent to residential and industrial areas within the sector, vast tracts of land still exist. In these areas lie the highest point found to be 35.00 meters above mean sea level. The lowest is in the southernmost end of Kaunlaran Village (Dagat-Dagatan Development Project) measuring about 0.993 meters above mean sea level.

North Caloocan

Out of the total land area, 58.49% or 2,322.80 hectares are characterized to have gently to steeply undulating to rolling topography with slopes ranging from 3 to 18%. This terrain is noted in the northern and central portion and gradually transforming into a southward trend of flat lands down to the southwestern tip of the boundary. Several industrial and residential subdivisions have already been developed in these broadly to nearly level lands, because of its proximity to some of the major access roads in the area.

GEOLOGY

Rock Formation

The geologic formation of the two portions of Caloocan City varies in type and characteristics, and are specifically classified as: quaternary alluvium, tuff and tuffaceous sediment, pyroclastic flow deposit, and conglomerates¹. The formation on the eastern half of Metropolitan Manila extending to the coastline of Manila Bay and including a greater part of South Caloocan, is the quaternary alluvium -- consisting of unconsolidated stream-deposited sediments that includes sand, silt, clay or gravel.

Eastward of South Caloocan, large areas consisting of tuff and tuffaceous sediment can be traced, spreading towards the whole eastern side of Metropolitan Manila. Tuff rocks or volcanic ash are composed of pyroclastic materials that have been ejected from a volcano and formed like "welded" rock mass², composed largely of fragments that is less than 4 millimeters (mm) in diameter. Tuffaceous sediments, on the other hand, are a mass of organic or inorganic solid fragmented material that contain 50 percent tuff. This sediment comes from weathering of rock and carried, suspended or dropped by air, water, or ice; or accumulated by any other natural agent forming in layers on earth's surface such as sand, gravel, silt, mud, fill, or loess (silt).

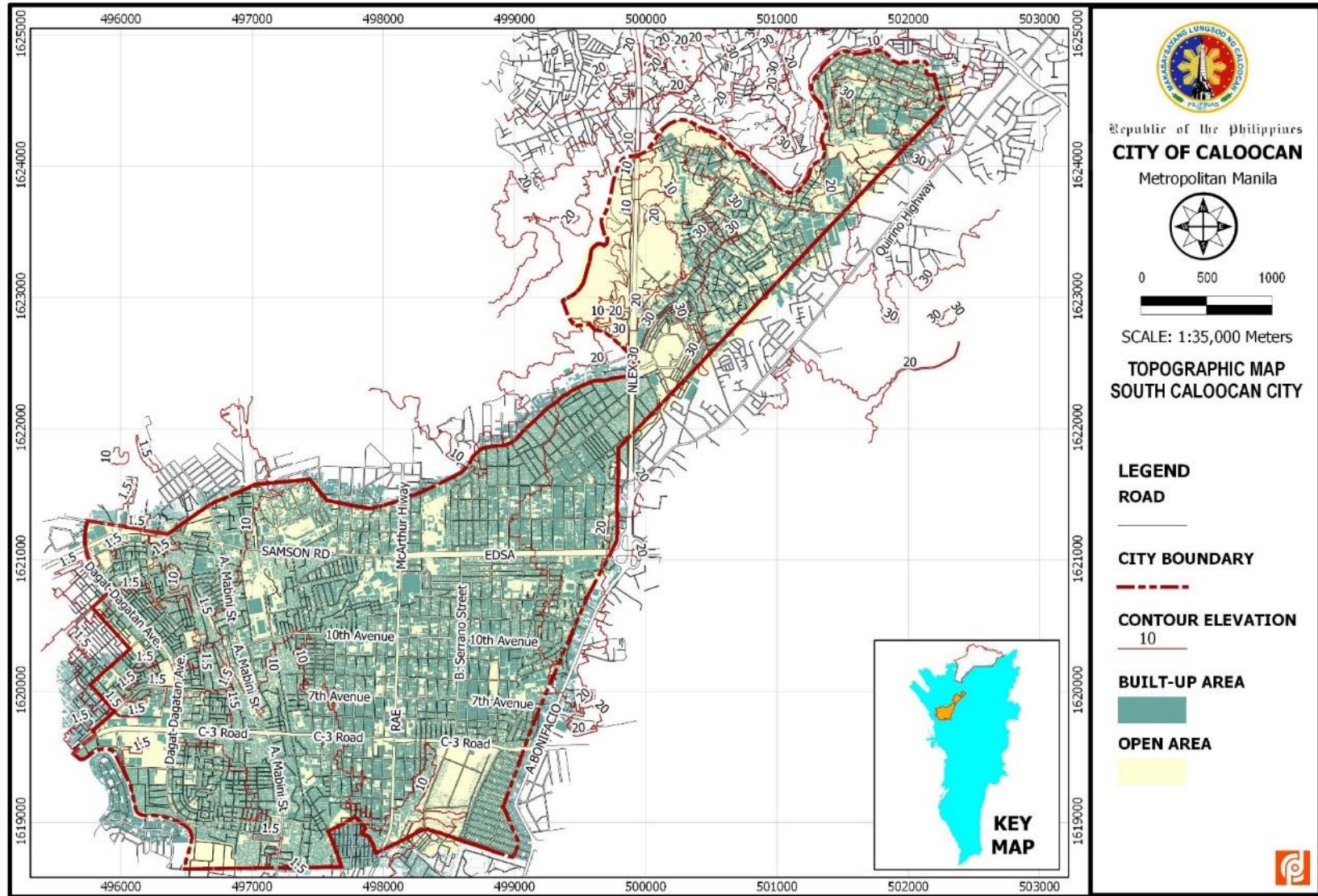
Pyroclastic flow deposit or igneous rocks formed by the lithification of ash flow are likewise present in northern fringes of South Caloocan and in most part of North Caloocan. Lithification is a process by which sediment is converted into sedimentary rock, including cementation and compaction. On the northeast borders of North Caloocan, conglomerate rocks were traced, crossing Tala Estate and extending to the province of Bulacan and the La Mesa Watershed. Conglomerates are coarse grained sedimentary rocks composed of rounded fragments of pebbles, cobbles or boulders³.

¹/ Source: MMEIRS Geological Map (Raster Format), Phivolcs, MMDA, and JICA, _____

²/ Hamblin and Christiansen, *Glossary of Common Geological Terms*, Pearson Education Inc., Upper Saddle River, NJ, 2003

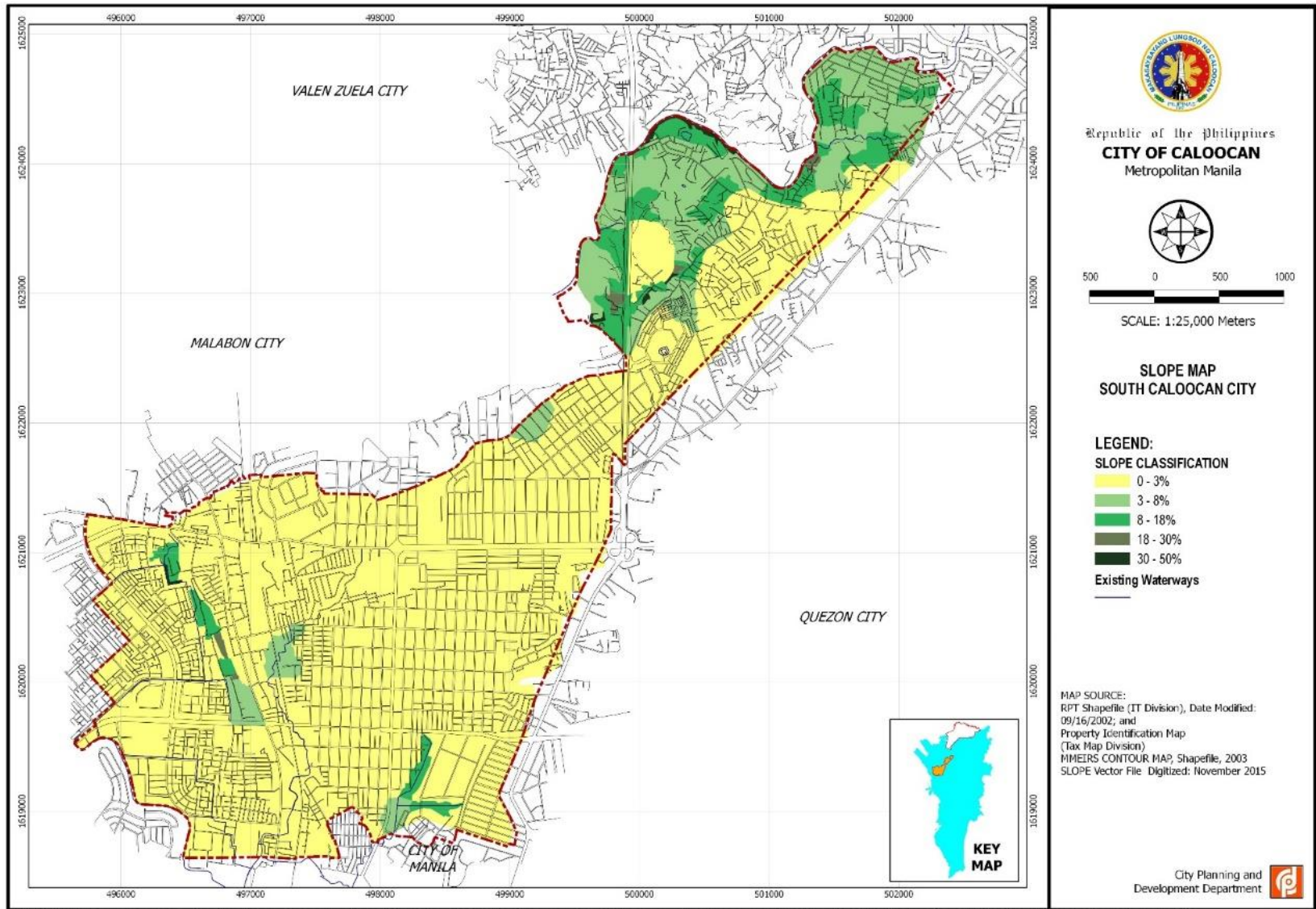
³/Hamblin and Christiansen, *Glossary of Common Geological Terms*, Pearson Education Inc., Upper Saddle River, NJ, 2003

Figure 1-05. Topographic Map, South Caloocan



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Figure 1-06. Slope Map, South Caloocan



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Figure 1-07. Topographic Map, North Caloocan

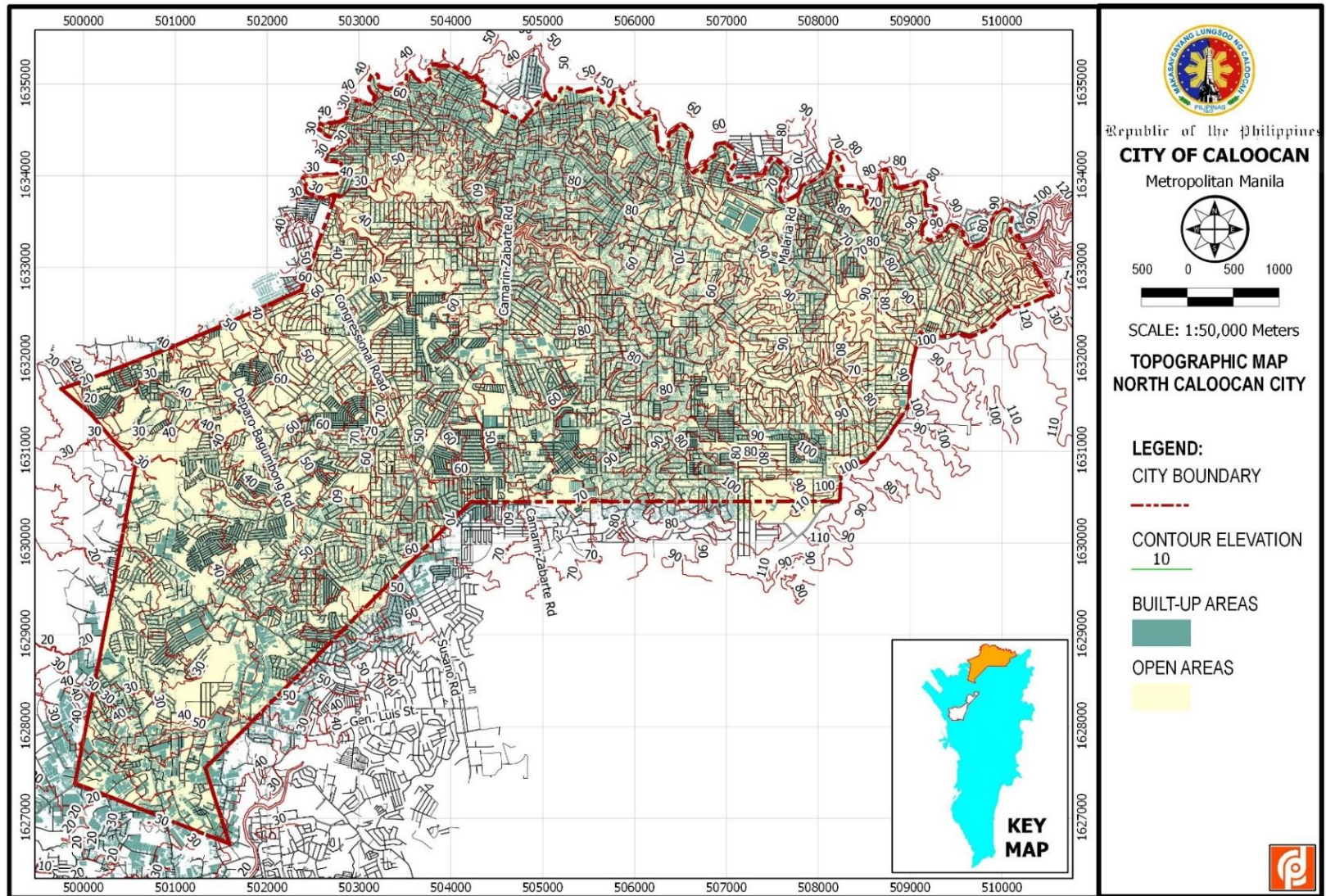
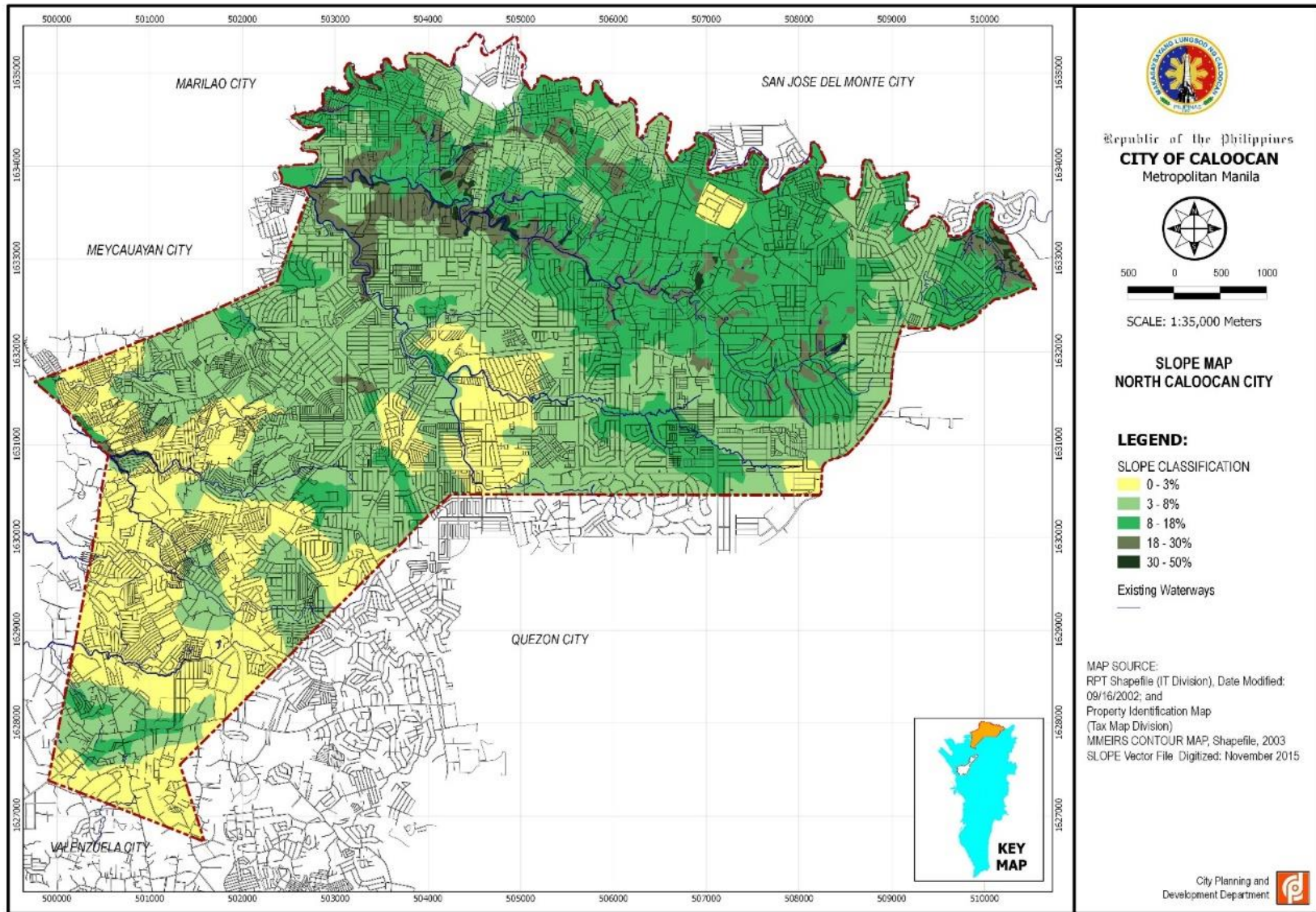


Figure 1-08. Slope Map, North Caloocan



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Table 1-03: Land Area Distribution by Type of Geology

Geologic Forms	North Caloocan	South Caloocan	Total
Conglomerates	460.45		460.45
Pyroclastic Flow Deposit	3,069.03	65.53	3,134.56
Quarternary Alluvium		866.96	866.96
Tuff & Tuffaceous Sediment	441.41	430.02	871.43
Total	3,970.90	1,362.50	5,333.40

GEOMORPHOLOGY

Basic Soil Types

Soil is unconsolidated rock material over bedrock, containing an admixture of organic matter and capable of supporting vegetation.

Soil found in Caloocan City predominantly fall under the Novaliches series. This series is found in both South and North Caloocan. In area distribution,

- Novaliches clay loam - the largest coverage with an area of 2,538.87 hectares or 47.60% of the total land area
- Novaliches clay loam adobe - 1,195.94 hectares or 22.42% of the total area
- Novaliches loam - 869.70 hectares or 16.31% of the total area
- Prensa clay loam - about 522.25 hectares 9.79% or 9.79% of land falling under the Prensa series
- Hydrosol type - remaining 206.64 hectares representing 3.87% of the land area

The Novaliches Series

(See Table No. 1-3 and 1-4)

- Covers 96.13% of the total land area of the city
- Light reddish brown, reddish brown to bright reddish brown in color
- Surface and subsoil are friable in consistency and granular in structure
- Spherical concretions are present in the subsoil and underneath are tuffaceous material of varying degrees of disintegration and weathering
- Tuffaceous material is exposed by extensive erosion in some places.
-

Table 1-04: Land Area Distribution by Soil Type, Caloocan City⁴

Type no.	Soil Type	Land Area		% Distribution		Characteristics
		(in hectare)		South	North	
		South	North			
11	Novaliches Loam	-	869.70	-	21.90	Poor in organic matter, surface soil is friable and easily eroded

⁴ Source: Based on Topographic Map prepared by Almar Surveying Co., Inc., 1987

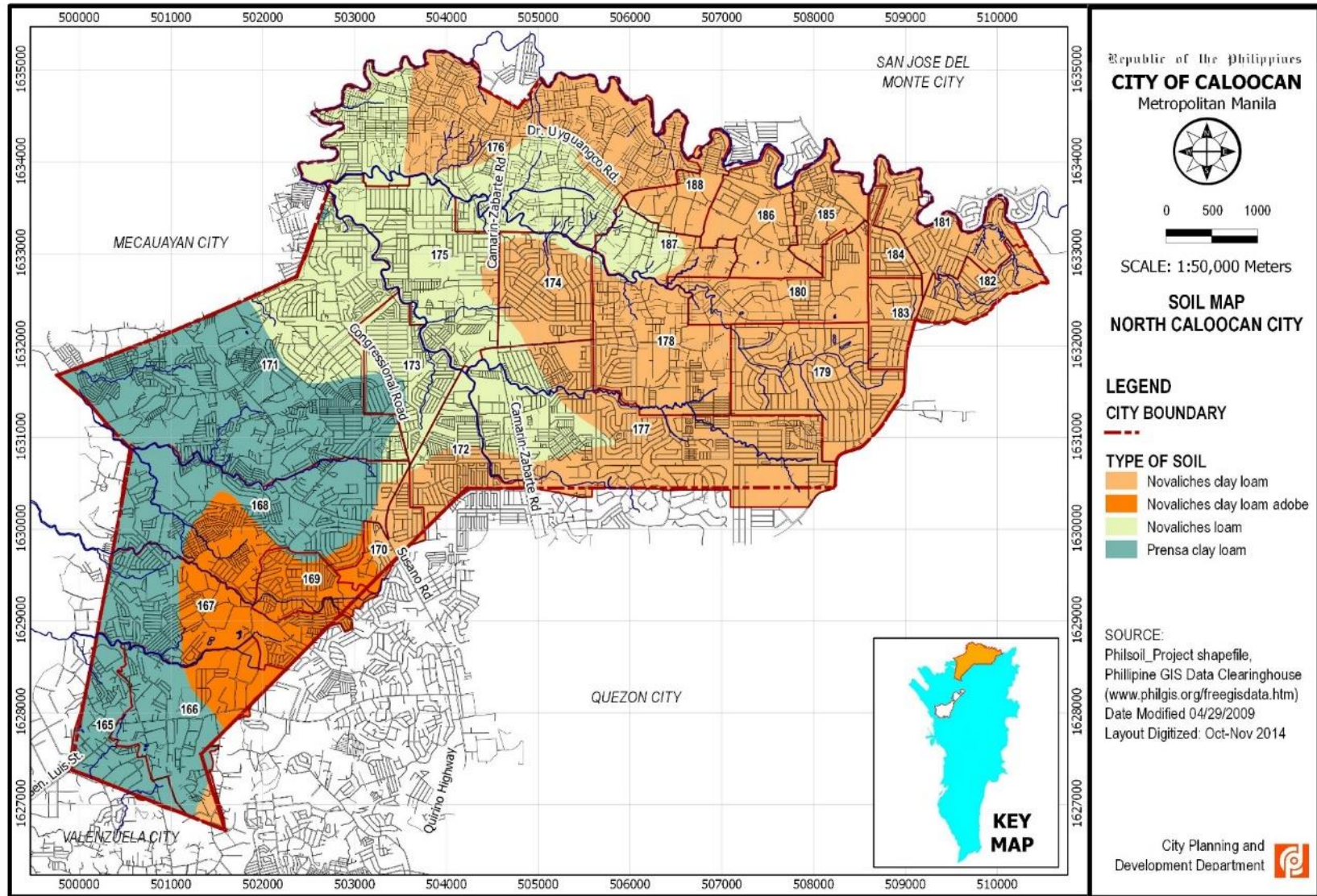
Type no.	Soil Type	Land Area		% Distribution		Characteristics
		(in hectare)		South	North	
		South	North			
12	Novaliches Clay	368.22	2,170.65	27.02	54.66	Surface soil is friable when dry and slightly sticky when wet, substratum are highly weathered tuffaceous materials
17	Novaliches Clay, Loam and Adobe	787.64	408.30	57.81	10.28	Surface soil is friable and in some places shallow, substratum is compact volcanic tuff / adobe rock
6	Prensa Clay	-	522.25	-	13.15	Surface soil is loose and granular, presence in some places of volcanic tuffaceous materials used for building purposes
1	Hydrosol (Rizal)	206.64	-	15.17	-	Former body of water now a reclaimed area, presence of salt intrusion

Table 1-05: Soil Characteristics⁵

Soil Type	Depth (in cm.)	Characteristic
Novaliches Loam	20 – 40	Reddish brown, friable and fine to coarse granular loam. Concretions are present and the soil is comparatively poor in organic matter. Being friable, the soil is easily eroded.
	40 – 60	Brownish red, friable and granular clay loam with concretions and gravel.
	60 – 111	Light brick to rusty red.
	111 – below	Varying degrees of weathering.
Novaliches Clay Loam	12 - 29	Red to light reddish brown clay loam, granular and friable when seemingly dry and slightly sticky when wet. Presence of brown concretions in considerable amount.
	54 - 81	Brick red clay loam to clay with gravel reddish brown concretions
	100 - 150	Highly weathered tuffaceous material
Novaliches Clay Loam Adobe	0 - 5	Brown loose and friable loam to clay loam.
	5 -20	Dark brown granular clay loam with gravel and concretions
	20 - 35	Adobe clay loam with concretions and gravel, highly weathered tuff.
	60	Weathered adobe rock, slightly compact
	Downward	Compact and massive adobe rock
Prensa Clay Loam	20 – 25	Brown to dark yellowish brown clay loam, loose and granular with plenty of spherical iron concretion.
	40 – 50	Gray, light yellowish gray to dull grayish brown, loose and gravelly clay grading to sandy clay with plenty of concretions.
	50 – downward	Gravelly clay, light grayish brown or dark brown in color.

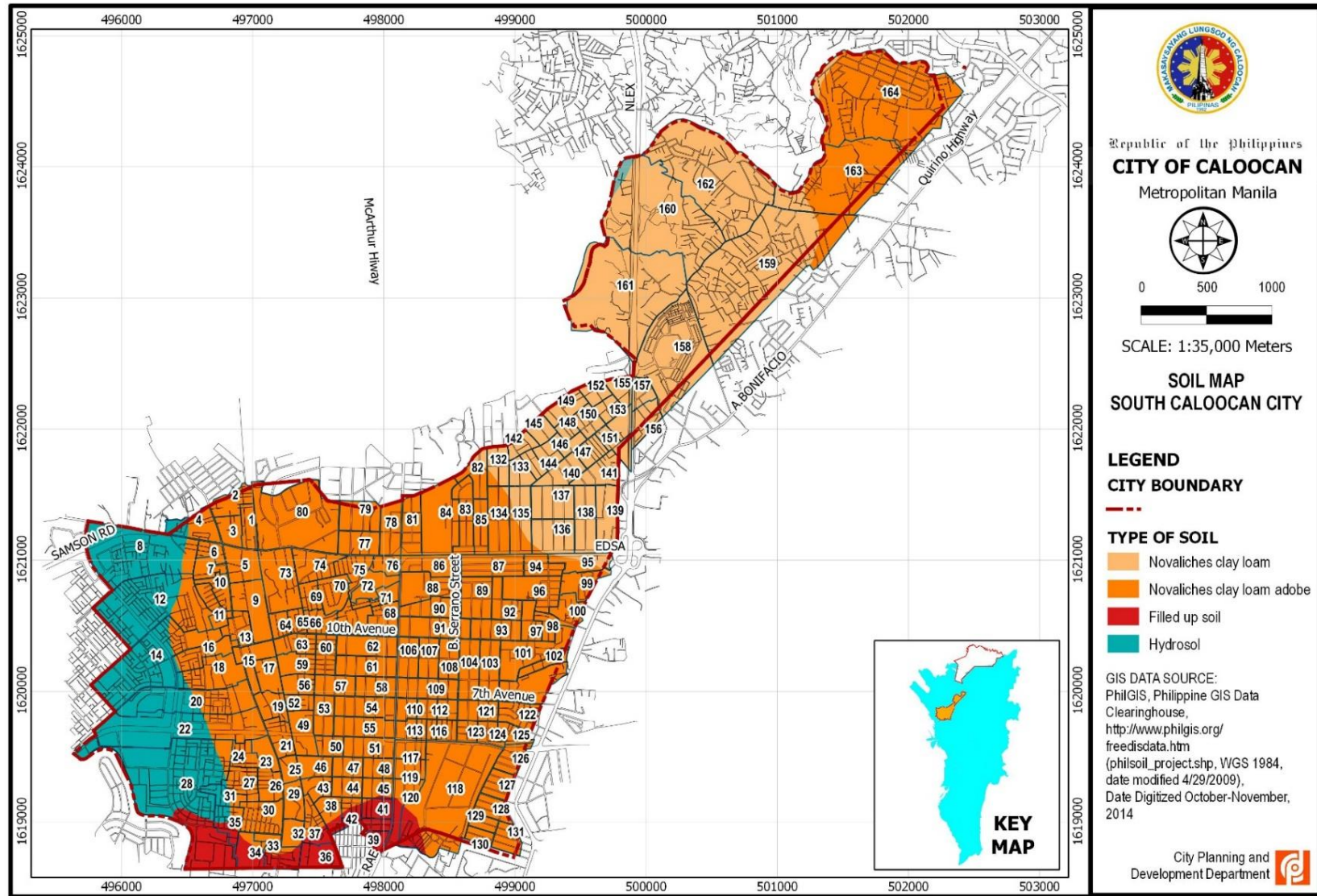
⁵ Soil Map based on Bureau of Soils Report, 1935

Figure 1-09. Soil Map, North Caloocan



DISCLAIMER: This map was prepared for planning purposes only and cannot be used for legal engineering survey, for settling or reconciling discrepancies involving political, territorial and geographical boundaries or to be used on any other legal purpose. The Caloocan City Government make no warranty or guarantee and assumes no legal responsibility as to the map's content, accuracy, timeline records or completeness of any data drawn therein or otherwise represented.

Figure 1-10. Soil Map, South Caloocan



DISCLAIMER: This map was prepared for planning purposes only and cannot be used for legal engineering survey, for settling or reconciling discrepancies involving political, territorial and geographical boundaries or to be used on any other legal purpose.

NATURAL SURFACE DRAINAGE

Natural surface drainage or surface waters are all “waters, which are open to the atmosphere and subject to surface runoff” (par. jj. Section 4, Article 2, RA 9275). Caloocan City has a total of 68.9 kilometer-length (km length) of surface waters that either have natural course (creeks and rivers) or constructed to serve as drainages to remove excess water from soil surfaces.

South Caloocan has about a total of 5.0 km length of open drainage canals that serve mainly the reclamation area comprising Kaunlaran Village (Dagat-Dagatan Development Project) and nearly 11.3 km length of natural surface water coursing through different natural river systems that exist in the northern part of Metropolitan Manila.

In North Caloocan, all surface waters consist of natural streams of different width and length. A total of 52.7 km length of these waters crosses or starts within the City’s territorial boundaries. Names and descriptions of these surface waters are shown in the table below.

Table 1-06. River Systems⁶

River System	Approx. Length (l.m.)	Midline Coordinate (Latitude / Longitude)	Covered Barangays (Old Districts)	Description
SOUTH CALOOCAN				
Tinajeros - Tullahan River	5250	14°40'56"N / 121°00'42"E	160, 162, 163, 164 (Baesa, Santa Quiteria, Barrio Talipapa)	5.25 km river (length within boundary line only), that divides territories of Valenzuela City and South Caloocan City, and receives drainage outflow from Barangays Nagkaisang Nayon, Gulod, San Bartolome, Bagbag, Talipapa and Baesa in Quezon City
DDDP Peripheral Canal 1 (From C3 Road northward to Buklod ng Nayon Sangandaan)	2163	14°39'15"N / 120°58'44"E	8, 12, 14, 22 (Kaunlaran Village, Poblacion, Sangandaan)	2.16 km peripheral canal cutting across Dagat-Dagatan Development Project (Kaunlaran Village), located along Talakitok, Tanigue, Tamban, Bangayngay, Salaysalay, Lapu-Lapu Ext, and Sabalo Streets.
DDDP Peripheral Canal 2 (From Tawilis St. Kaunlaran Village southward to J.P. Rizal Maypajo)	792	14°38'27"N / 120°58'10"E	28, 31, 35 (Kaunlaran Village, Maypajo)	0.79 km peripheral canal cutting across Dagat-Dagatan Development Project (Kaunlaran Village), located along Tawilis, Tuna, and Talilong Streets.
Lapu-Lapu Extension Lateral Canal	535	14°39'19"N / 120°57'51"E	8, 12 (Kaunlaran Village)	0.53 km lateral canal cutting across Dagat-Dagatan Development Project (Kaunlaran Village), receiving drainage outflow from DDDP peripheral canal.
Tanigue Lateral Canal	953	14°38'52"N / 120°57'56"E	14, 18, 20, 22 (Kaunlaran Village)	0.95 km lateral canal cutting across Kaunlaran Village, receiving drainage outflow from DDDP Peripheral Canal.
Torsillo Lateral Canal	582	14°38'33"N / 120°58'68"E	28 (Kaunlaran Village)	0.58 km lateral canal cutting across Kaunlaran Village, receiving drainage outflow from DDDP peripheral canal.

⁶ Electronic Survey –CAD Data (dwg format), MMDA Caloocan City District Map, _____

River System	Approx. Length (l.m.)	Midline Coordinate (Latitude / Longitude)	Covered Barangays (Old Districts)	Description
Maligaya Creek Main Segment 2 nd Avenue / West Cemetery Wall (Main Segment)	882	14°38'28"N / 120°59'65"E	118, 120 (La Loma, Grace Park - East)	0.88 km creek located along the west wall of La Loma Cemetery and runs across Rizal Avenue Extension to City of Manila. It receives drainage outflow from eastern portion of Grace Park via underground main drainages along 2 nd Street.
Maligaya Creek Branch La Loma Cemetery	496	14°38'51"N / 120°59'11"E	118 (La Loma)	0.50 km small creek running across La Loma Cemetery receiving drainage outflow from Barrio San Jose via underground main drainages along Tagaytay Street towards Maligaya Creek Main
Casili Creek	3440	14°38'51"N / 120°58'29"E	19, 17, 21, 29, 32, 33, 34, 43, 46, 49, 59, 63, 65, 66, 70, 72, 75, 76 (Maypajo, Grace Park (West), Poblacion, Calaanan (West), & Bonifacio)	3.44 km small creek running across old districts of Bonifacio, Calaanan (West), Grace Park (West), Sampalukan, Maypajo and terminates at Estero de Maypajo. A total of 1.92 km is already covered by culverts found at different segments of the creek.
Cantarilla / Panaca Creek	1099	14°39'39"N / 120°58'14"E	1, 2, 3 (Sangandaan)	1.1 km (length along boundary lines) small creek, divides Malabon City and South Caloocan City with main outflow going to Longos River.
NORTH CALOOCAN				
Meycauayan-Marilao River	17037	14°46'57"N / 121°02'53"E	176, 181, 185, 186, 188 (Bagong Silang, Tala, Malaria-Barracks, Pangarap)	17 km (length along boundary lines) River, divides Bulacan Province from North Caloocan City, with main outflow crossing Bulacan Province towards Manila Bay. A total of 3.1 km of small tributaries or branches connects to this river system from Bagong Silang Resettlement Area
Tala Creek	2118	14°46'02"N / 121°04'43"E	180, 183, 184, 185 (Tala, Malaria – Barracks)	2.1 km (within City boundary) small creek crossing Mountain Heights Subdivision, Bankers Village 2 Subdivision, Soldiers Hills Subdivision, and Malaria-Barracks, westward to Meycauayan - Marilao River
Bagong Silang River	8869	14°45'56"N / 121°03'11"E	176, 179, 180, 187 (Tala, Bagong Silang)	8.9 km (within City boundary) creek crossing Amparo Subdivision, Miramonte Heights Subdivision, Tala, Bagong Silang Resettlement Project (Matarik), and Shelter Ville Subd. westward to Meycauayan – Marilao River
Camarin Creek	8152	14°45'15"N / 121°02'38"E	175, 177, 178 (Bagumbong,	8.2 km creek receiving drainage outflow from Sacred Heart Village VI, Capitol Parkland Subdivision, Camarin II (Area D), Lilies

River System	Approx. Length (l.m.)	Midline Coordinate (Latitude / Longitude)	Covered Barangays (Old Districts)	Description
			Camarin)	Subd., Castle Spring Subd., Ma. Luisa Subd., North Matrix Village I, Almar Subd., Villa Amor 2 Subd., Palmera Springs II Subd., Senate Village, Congressional Model Subd., Union Village, Kalikasan Hills, Bankers Village, and Forest Park westward to Meycauayan – Marilao River.
Pasong Malapad Creek	2780	14°44'50"N / 121°02'32"E	172, 173, 177 (Camarin)	2.8 km small tributary creek receiving drainage outflow from Constellation Homes, Merry Homes II Subd., Franville V, MC Homes and Villa Angelica Subd. Northward to Camarin Creek.
Bagumbong Creek (Main Segment & Branches)	7718	14°44'40"N / 121°00'42"E	168, 171 (Bagumbong, Deparo)	7.7 km creek with tributaries receiving drainage outflow from Villa Maria Subd., Northcrest Subd., Evergreen Executive Village, Villa Sarah, Tierra Nova Royale, Saint Dominic I, Sto. Thomas Village 7 westward to Meycauayan River
Bignay-Llano Creek (Main Segment & Branches)	3631	14°44'02"N / 121°00'52"E	167 (Llano)	3.6 km creek with tributaries receiving drainage outflow from Silangan Village, Del Mundo Subd., and Sanchez Subd., westward to Bignay Punturin Creek in Valenzuela City.
Sapang Bakaw	2389	14°43'33"N / 121°00'31"E	165, 166, 167 (Llano, Kaybiga)	2.4 km small creek receiving drainage outflow from Sunriser Village, Pleasant View Subd. II, and Vista Verde North, westward to Lingunan Creek in Valenzuela City.

CLIMATE

Just like the rest of the towns and cities of Metro Manila, Caloocan City falls under type 1 of the Philippine Climate Classification which has two distinct seasons. First is the Dry High Pressure season, which comes in the months of November till April. The dry season corresponds with the northeast monsoon (October to January). The Wet season which starts from May and lasts up to October is consistent with the southwest monsoon (June to September). Between these two well-defined monsoon periods, the southeast trade winds blow from February to May.

Table 1-07: Average climatological normals, 1981-2010 North Caloocan City (Science Garden, Diliman, Quezon City)

Month	Rainfall (mm)	Rainy Days	Temperature (°C)			Mean Sea Level Pressure	Prevailing Wind	
			Maximum	Minimum	Mean		Direction	Speed (mps)
NORTH CALOOCAN (SCIENCE GARDEN, DILIMAN, QUEZON CITY)								
January	18.5	4	30.6	20.8	25.7	1012.3	N	1
February	14.6	3	31.7	20.9	26.3	1012.0	NE	1
March	24.8	4	33.4	22.1	27.8	1011.3	SE	1
April	40.4	5	35.0	23.7	29.4	1009.7	SE	1
May	186.7	12	34.7	24.7	29.7	1008.5	S	1

Month	Rainfall (mm)	Rainy Days	Temperature (°C)			Mean Sea Level Pressure	Prevailing Wind	
			Maximum	Minimum	Mean		Direction	Speed (mps)
June	316.5	18	33.1	24.6	28.8	1008.1	SW	1
July	493.3	22	31.9	24.1	28.0	1007.7	SW	2
August	504.2	23	31.3	24.2	27.8	1007.4	SW	2
September	451.2	22	31.6	24.0	27.8	1010.6	SW	1
October	296.6	18	31.6	23.5	27.6	1008.8	N	1
November	148.8	14	31.4	22.7	27.1	1010.1	N	1
December	78.7	8	30.5	21.6	26.0	1011.5	N	1
Annual	2574.4	153	32.2	23.1	27.7	1009.8	N	1

Rainfall

Since Caloocan is divided into two separate geographical location, two recording stations were considered in the study of the city's annual rainfall, the Port Area Station in Manila was considered for South Caloocan and the Science Garden Station in Diliman, Quezon City was for North Caloocan respectively:

Maximum Occurrence

In 1994, maximum rainfall in North and South Caloocan occurred in the months of July, August and September. The annual rainfall was recorded to be 2,115.90 mm with a maximum of 761.70 mm in July and a minimum of 1.60 mm in February for the South Caloocan. North Caloocan recorded 2,588.70 mm annual rainfall with a maximum of 518.30 mm.

Table 1-08: Average Climatological Normals, 1981-2010, South Caloocan City (Port Area Station, Manila)

Month	Rainfall (mm)	Rainy days	Temperature (°C)			Mean sea level pressure	Prevailing wind	
			Maximum	Minimum	Mean		Direction	Speed (mps)
SOUTH CALOOCAN (PORT AREA STATION, MANILA)								
January	17.3	4	29.6	23.8	26.7	1012.6	N	2
February	14.2	3	30.6	24.2	27.4	1012.4	E	3
March	15.8	3	32.1	25.3	28.7	1011.7	SE	3
April	23.7	4	33.5	26.6	30.1	1010.2	SE	3
May	147.2	10	33.2	26.9	30.0	1008.6	SW	3
June	253.5	17	32.2	26.4	29.3	1008.1	SW	3
July	420.5	21	31.2	25.9	28.5	1007.7	SW	3
August	432.4	21	30.8	25.8	28.3	1007.3	SW	4
September	355.1	20	31.0	25.7	28.4	1008.2	SW	3
October	234.8	17	31.1	25.7	28.4	1009.0	SW	3
November	121.7	12	30.9	25.1	28.0	1010.1	N	3
December	67.4	7	29.8	24.2	27.0	1011.8	N	2
Annual	2103.6	139	31.3	25.5	28.4	1009.8	SW	3

Figure 1-11: 10-Year Average Monthly Temperature 1981-2010, Caloocan City

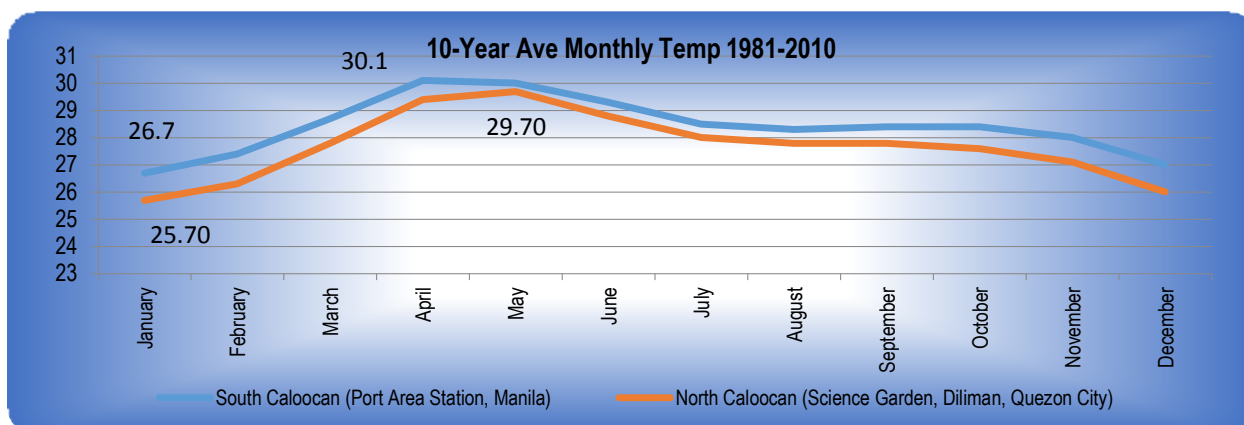
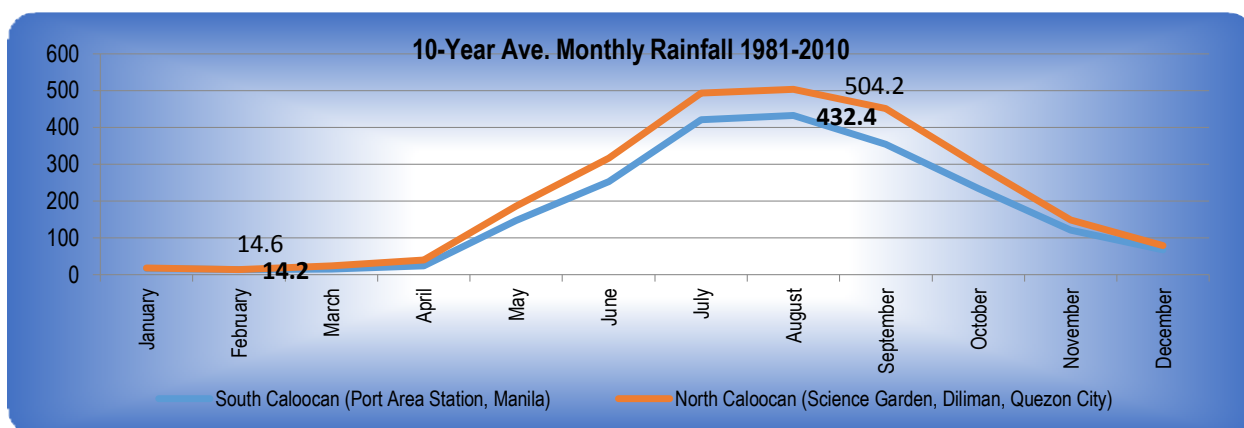


Figure 1-12: 10-Year Average Monthly Rainfall (in mm.)1981 – 2010, Caloocan City



WIND DIRECTION

South Caloocan

The northeast winds prevail during the months of November and December. The west wind is predominant in February, March and April. The southwest monsoon blows From May to October, this procures the heavy rain experienced during that period. Maximum wind speed recorded was 28 miles per second, which occurs in October.

North Caloocan

The north winds prevail during the months of January, March, October, November and December. The southwest monsoon prevails From April till July, this explains the heavy rains experienced during these months.

POPULATION

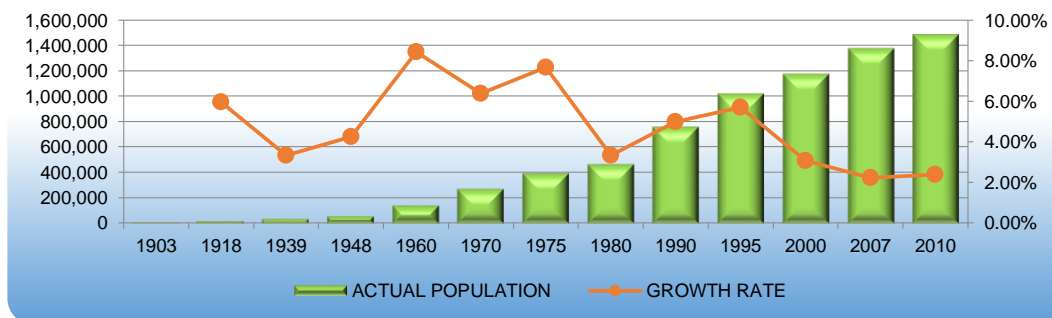
Historical Growth

- 1903 - Census of Population and Housing (CPH) reported a population of 7,847 for Caloocan City.
- 1918 - Significantly doubled the 1903 figures.
- 1960 - population zoomed to 145,523
- 1980 - population was on the threshold of the half million mark at 467,816
- 2007 - total population surpassed the one million mark at 1,381,610, 15.09% higher from the census of 2000
- 2010 - Population accounted for 12.56% of the National Capital Region total of 11,855,975 and 1.61% of the Philippines' total population of 92,337,852. By population size, Caloocan ranks third among the cities and municipalities in NCR.
- The average annual growth rate based on 2000 and 2010 actual census is 2.37%, which is higher compared to the National Capital Region's (NCR) 1.78%.
- It is projected that by year 2020 the population of the city will reach 1,680,013

Table 1-09. Historical Growth of Population (1903 – 2015)⁷

Date	Actual Population	Growth Rate
March 2, 1903	7,847	
December 31, 1918	19,551	5.9674
January 1, 1939	38,320	3.3202
October 1, 1948	58,208	4.2423
February 15, 1960	145,523	8.4209
May 6, 1970	274,453	6.3853
May 1, 1975	397,201	7.6734
May 1, 1980	467,816	3.3268
May 1, 1990	761,824	4.9973
September 1, 1995	1,023,159	5.6858
May 1, 2000	1,177,604	3.0584
August 1, 2007	1,381,610	2.2282
May 1, 2010	1,489,040	2.3714
August 1, 2015	1,583,978	1.1842

Figure 1-13. Historical Growth of Population (1903-2010)⁷

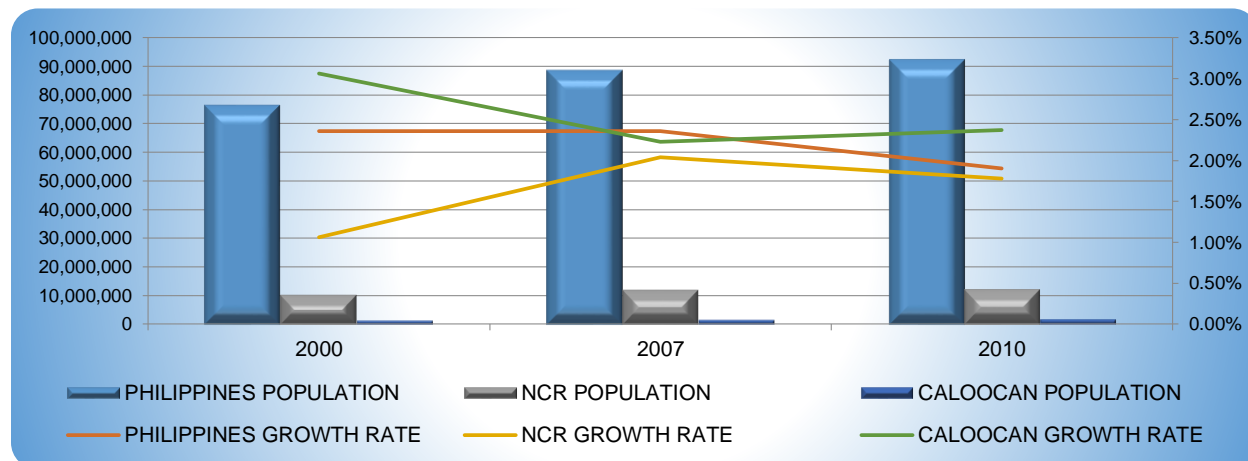


⁷ Various Census Years, National Statistics Office (Philippine Statistics Authority)

Table 1-10. Comparative Population Result⁸

	2000		2007		2010	
	POPULATION	GROWTH RATE	POPULATION	GROWTH RATE	POPULATION	GROWTH RATE
PHILIPPINES	76,504,077	2.36%	88,564,453	2.36%	92,337,852	1.90%
NATIONAL CAPITAL REGION	9,932,560	1.06%	11,566,325	2.04%	11,855,975	1.78%
CALOOCAN CITY	1,177,604	3.06%	1,381,610	2.23%	1,489,040	2.37%

Figure 1-14. Comparative Population Result⁸



Population Distribution

The 1995 Census of Population and Housing conducted by the NSO established that the population of South Caloocan exceeds that of North. In the succeeding census years beginning 2000, the statistics started to show otherwise, that of North surpassing its Southern counterpart in terms of populace.

Barangay 176 in North Caloocan was registered as the most populated barangay in the Philippines, tallied as having 243,878 individuals, accounting for 16% of the city's total population. On the other hand, Barangay 76 in South Caloocan registered the least number of inhabitants at 106. Barangays 167 and 171 had the fastest growing population in the city with an annual growth rate of 9.77% and 9.78%, respectively.

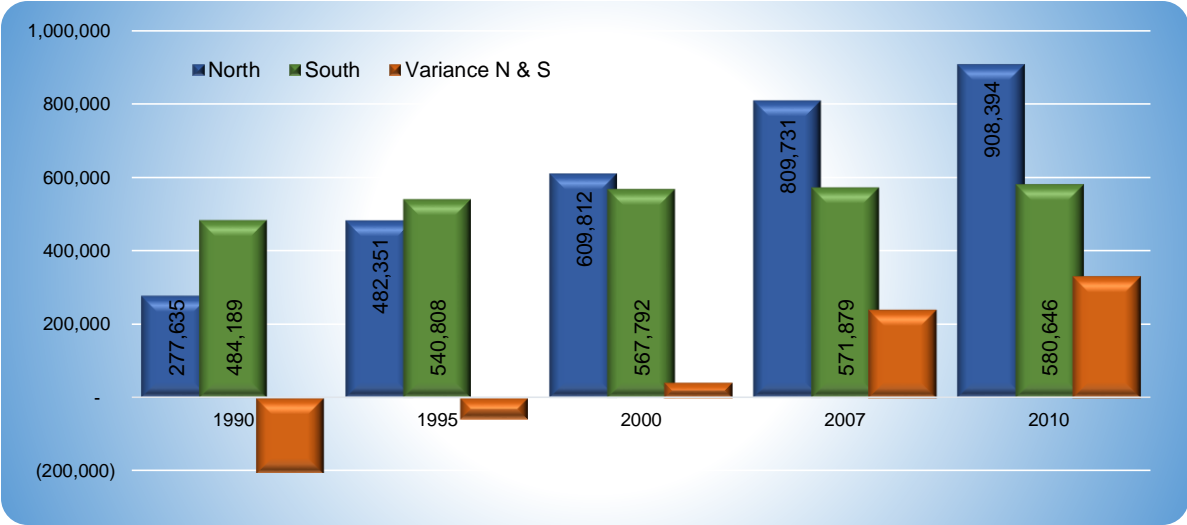
Table 1-11. Actual and Projected Population (1990-2025)

Year		Total	Based on Geographical Location		Based on Political District	
			North	South	District I	District II
ACTUAL POPULATION	1990	781,824	277,635	484,189	421,517	340,307
	1995	1,023,159	482,351	540,808	653,704	369,455
	2000	1,177,604	609,812	567,792	789,129	388,475

⁸ Various NSO Census of Population

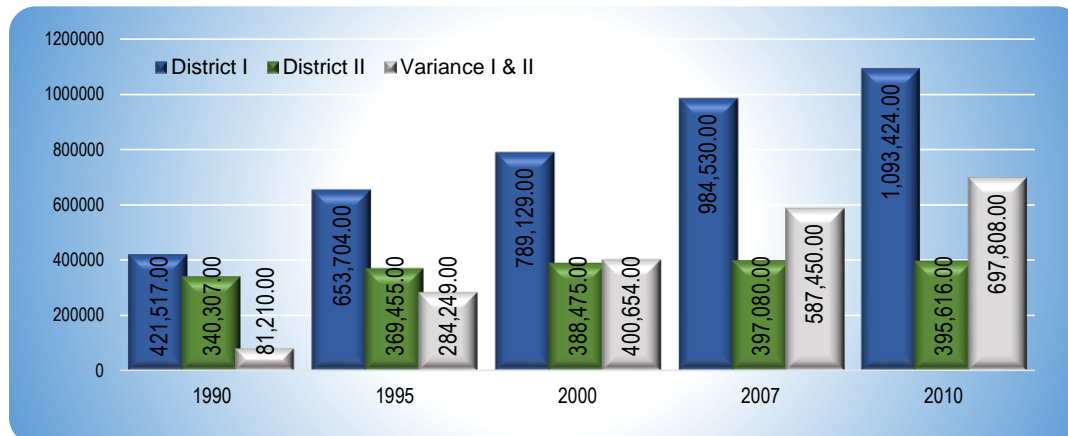
Year	Total	Based on Geographical Location		Based on Political District	
		North	South	District I	District II
2007	1,381,610	809,731	571,879	984,530	397,080
	1,489,040	908,394	580,646	1,093,424	395,616
	1,538,978	998,887	585,091	1,193,419	309,559
PROJECTED POPULATION ⁹	1,524,393	926,961	594,432	1,119,385	405,009
	1,560,586	952,041	608,545	1,145,961	414,625
	1,597,638	974,645	622,994	1,173,169	424,469
	1,635,570	997,785	637,785	1,201,023	434,547
PROJECTED POPULATION ¹⁰	1,602,735	1,010,715	592,020	1,207,551	395,184
	1,621,715	1,022,685	599,030	1,221,851	399,864
	1,640,919	1,034,795	606,124	1,236,320	404,599
	1,660,351	1,047,049	613,302	1,250,961	409,390
	1,680,016	1,059,449	620,564	1,265,775	414,238
	1,699,908	1,071,995	627,913	1,280,764	419,144
	1,720,038	1,084,689	635,349	1,129,931	424,107
	1,740,407	1,097,534	642,873	1,311,278	429,129
	1,761,017	1,110,531	650,486	1,326,806	434,211
	1,781,871	1,123,682	658,189	1,342,518	439,353

Figure 1-15. Population Growth by Geographic Location



⁹ Projected Population based on the 2000 and 2010 Actual Population
¹⁰ Projected Population based on the 2010 and 2015 Actual Population

Figure 1-16. Population Growth by Political District



Household Population, Household Size And Population Density

The city's population represented 13% (1,487,245) of the National Capital Region's (NCR) total household population of 11,796,873 based on the statistics of the 2010 NSO Census. It has a total of 345,444 households (establishing an increase of 38.42 percent from 249,567 in 2000) with an average size of 4.37 occupants respectively. The household size considerably decreased from the 4.71 documented in 2000. Bagong Silang (Barangay 176) holds the most number of households at 53,425 while Barangay 76 has only a single domiciliary.

In terms of population density, South Caloocan's compacity is placed at 426 persons per hectare and is highly expected to reach the 600 mark in 2025. On the other hand, North Caloocan registered an average of 229 persons per hectare and is projected to reach 325 by 2025. In general, population density was placed at 279 person per hectare in entirety (citywide), manifesting an increase of 26.45 percent since 2000 or 58 persons per hectare for the last 10 years.

Age, Sex Composition

Of the total household population in 2010, 49.80 percent were males and 50.20 percent were females. These figures equate to a ratio of 99 males for every 100 females. The census results likewise affirmed that the sex ratio for the age groups 15 to 64 had more females than males while those below the 15 year age group is contrasting in terms of proportion. Senior citizens (aged 60 and over) represent 5.17 per cent of the total household population while the school age group occupies about 41.45 per cent as per the 2010 NSO Census of Population.

The dependency age covers about 34.57 percent of the population (14 and below age group at 32 percent). This reflected a dependency ratio of 53 dependents for every 100 persons of the working populace.

Figure 1-17: Population Age, Sex Composition

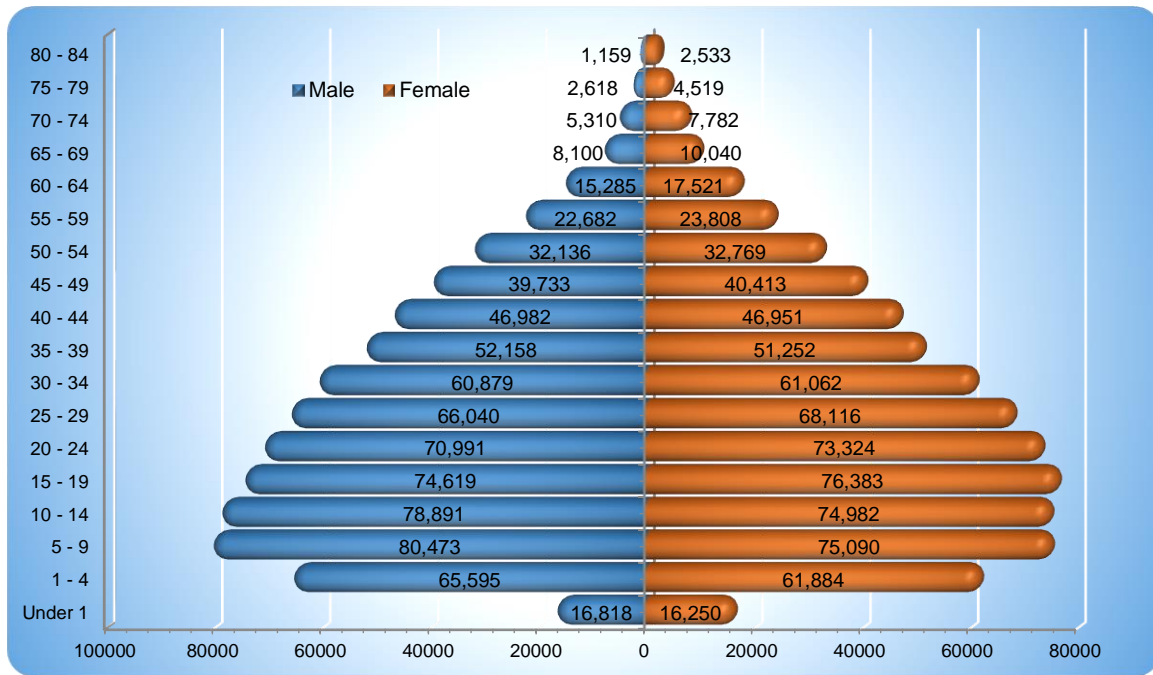


Table 1-12: Age Sex Composition, Caloocan City, 2010¹¹

Age Group	Both Sexes	Male	Female	Ratio
Under 1	33,068	16,818	16,250	103.495
1 to 4	127,479	65,595	61,884	105.996
5 to 9	155,563	80,473	75,090	107.169
10 to 14	153,873	78,891	74,982	105.213
15 to 19	151,002	74,619	76,383	97.691
20 to 24	144,315	70,991	73,324	96.818
25 to 29	134,156	66,040	68,116	96.952
30 to 34	121,941	60,879	61,062	99.700
35 to 39	103,410	52,158	51,252	101.768
40 to 44	93,933	46,982	46,951	100.066
45 to 49	80,146	39,733	40,413	98.317
50 to 54	64,905	32,136	32,769	98.068
55 to 59	46,490	22,682	23,808	95.270
60 to 64	32,806	15,285	17,521	87.238
65 to 69	18,140	8,100	10,040	80.677
70 to 74	13,092	5,310	7,782	68.234
75 to 79	7,137	2,618	4,519	57.933
80 to 84	3,692	1,159	2,533	45.756
85 and over	2,097	,561	1,536	36.523
Caloocan City	1,487,245	741,030	746,215	99.305

¹¹ National Statistics Office, 2010 Census of Population and Housing

Household Population, Household Size and Population Density

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HOUSING

Based on the 2010 Census of Population and Housing (CPH), a total of 331,345 occupied housing units were recorded in Caloocan City. This translates to a ratio of 100 occupied housing units for 4.5 persons per occupied housing unit. However, almost 20% of the total occupied housing units are rent-free with and without consent of the lot owners. With an annual growth of 3.30% households (2000-2010), there is an estimated housing needs of 10,000 units annually to meet the standard of 1 household per housing unit.

Urban blight and slum areas remain to be a major concern in the housing programs of the city government. The lack of access to affordable housing results to the proliferation of informal settlers and professional squatting.

These resulted to urban congestion and deterioration of environmental conditions. The problems arising from urban blights such as worsening of structural conditions, poor health and sanitation, increase in crime and decline of public order continuous to pose as a challenge to the city government.

Table 1-13, Actual and Projected Number of Housing Units by Tenure Status of Lot 2000, 2010, 2016-2025

Particulars	No. of HH (Actual)				Projected No. of HH							
	2000	2010	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Owned/Being Amortized	119,970	176,534	215,747	223,081	230,666	238,508	246,616	255,000	263,670	272,634	281,903	291,487
Rented	63,673	88,330	108,012	111,683	115,480	119,407	123,466	127,663	132,004	136,492	141,132	145,930
Sub-Total	183,643	264,864	323,759	334,764	346,146	357,915	370,082	382,663	395,674	409,126	423,035	437,417
% Share (A+B/ Total)	80.42	80.52	80.53	80.53	80.53	80.53	80.53	80.53	80.53	80.53	80.53	80.53
Rent-free with consent of owner	28,875	42,713	52,201	53,975	55,810	57,708	59,670	61,698	63,796	65,965	68,207	70,256
Rent free without consent of owner	15,824	16,806	20,539	21,237	21,959	22,706	23,478	24,276	25,101	25,955	26,837	27,749
Sub-Total	44,699	59,519	72,740	75,212	77,769	80,414	83,148	85,974	88,897	91,920	95,044	98,002
% share (C+D/Total)	19.58	18.09	18.09	18.09	18.09	18.09	18.09	18.09	18.09	18.09	18.09	18.04
Grand Total	228,342	328,948	402,016	415,683	429,815	444,428	459,537	475,160	491,314	508,018	525,289	543,147

ECONOMIC DEVELOPMENT

With Caloocan City's growing population and the rising demand for economic activities, there is a need to develop more strategies to address the issues of poverty and unemployment, provide opportunities for investments, and encourage the growth of commercial and other business establishments in the city. Those would serve as primary catalysts for a more balanced development of Caloocan. The city's advantage is the presence of vacant land or open areas in the North which remain untapped and are highly suitable for further development. Considering that the current trends in both property and commercial development is the movement towards the north of Metropolitan Manila, Caloocan City is rightfully the gateway towards Northern Luzon and its peripheries such as Malabon, Navotas, Valenzuela, Quezon City, including Novaliches and Fairview and the Province of Bulacan.

DEVELOPMENT TREND

Development Growth

Growth of Commercial and Business Centers along Major Transit Points and Corridors

City's several business center brought by various land using activities, have grown rapidly in number and density for the past ten (10) years. The changes eventually resulted to more economic opportunities and challenges as well.

Commercial areas in South Caloocan City grew in land area from 152.6 to 168.41 hectares. On the average, properties being use for commercial purposes increased in area about 1% annually. These businesses were mostly small and large retail stores, supermarkets, especially service shops, wet and dry markets, food service outlets, commercial and industrial product distributors, transport vehicle trading (heavy equipment, trucks, cars and motorcycle), hospitality services (hotels and ins), and shopping malls.

One can observe major commercial activities in North Caloocan City at vicinities surrounding the following locations:

Whole stretch and some junctions along

- Epifanio de los Santos Avenue
- Rizal Avenue Extension
- General San Miguel Streets and Samson Road
- Mabini Street
- C-3 (5th Avenue)
- 10th Avenue
- Tullahan-Santa Quiteria Road
- Baesa Road
- Along several roads within vicinities of Grace Park (east and west) and Bagong Barrio (Balintawak Estate)

Major infrastructure projects that are recently been completed or being proposed, forms the direction of business growth in South Caloocan City, particularly those surrounding A. Bonifacio Monument Circle and General San Miguel – A. Mabini Junction (Sangandaan). The said projects were generally proposed or implemented to improve mobility of people between major business centers in northern Metro Manila and northern suburbs of Bulacan. These significant transportation projects are the proposed North-South Commuter Railway from Tutuban to Malolos, the completed LRT Line 1 extension as part of "Closing the Loop" of various LRT lines, and Stage 10 (Segment 10) of NLEX Harbor Link Project. The North-South Commuter Line would have one (1) boarding station within South Caloocan City.

Other factors causing rapid business growth within the CBD of South Caloocan City are on-going operation of several transit terminals that eventually rendered Bonifacio Monument Area as major transit point of northern Metropolitan Manila.

In North Caloocan City, commercial areas are growing annually at an average of 33.2% from 2003 to 2013. Total commercial land area in 2003 was 39.44 hectares and rose to 52.47 hectares in 2013. Businesses in these zones were mostly small and large retail stores, supermarkets, specialty service shops, wet and dry markets, and food service outlets.

Location of commercial activities in North Caloocan City can be found at vicinities surrounding the following locations:

- Junctions of Camarin-Susano Road and Camarin-Zabarte Road;
- Major junctions within Phases II, IV and X of Bagong Silang Resettlement Project;
- Kiko Road up to junction of Sampaloc Road;
- Malaria-Barracks Road up to junction of Quirino Highway;
- Whole stretch and junctions along Camarin –Susano Road;
- Junction of Deparo Road and T. Samson Street; and
- Junction of Quirino Highway and Apitong Road (Pangarap Village).

Expansion of Industrial Areas within Existing Industrial Zones

The long-established zones for industrial activities are expanding in number and land area. These industries are engaged generally in product (food and non-food) manufacturing, processing, packaging and warehousing activities.

In the last 10 years Industrial land area in North Caloocan City grew from 177.74 to 197.49 hectares or an added 19.76 hectares of land uses, with average increases of 1.10% annually. Industrial establishments generally thrive in Industrial Zones of Kaybiga, Bagbaguin, Llano, Bagumbong, Camarin, and Tala. However there are still few existing industrial plant and warehouse that could be found inside residential subdivisions particularly Amparo Subdivision that apparently infringes against the provisions of subdivision's zoning classification. Similarly, cluster of industries can be seen in some parts of Bagumbong that is originally designated as Residential Zone under Zoning Ordinance 0369 S. 2003, but existed before the enactment of the said Ordinance.

In South Caloocan City, lands having industrial activities are larger than those lands being utilized for commercial businesses. The said areas increased in size by 3.2% in the last ten (10) years but still cover a significant 14.5% part of South Caloocan City. Parcels that are being used for industrial purposes largely cover Dagat-Dagatan Area, old districts of Grace Park (East and West), Bonifacio, Morning Breeze, Bagong Barrio (Balintawak Estate), and Baesa.

Rapid increase of Residential Land Area in North Caloocan City

In the past 10 years about 344.65 hectares of residential land area are added within several vacant properties in North Caloocan City. The total land cover with existing residential uses increased in average of 1.73% per year or 19.0% in 10 years. The said large sum of residential lands are generally located within new residential subdivisions, existing government relocation areas, CMP Projects, government and private low-rise residences, informal settlements, and newly occupied vacant residential lots. There are also low-rise private condominium and socialized housing complexes, currently being developed in Camarin area that may well alter the overall character of residential districts from typical landed housing to multi-level housing units.

Table 1-14. 10-Year Major Land Use Growth Trend – South and North Caloocan City

Land Use Classification	Land Area (Ha.) 2003	Land Area (Ha.) 2013	10-Year Land Area Increase / Decrease	10-Year Increase	Annual Rate of Increase 2003-2013
North Caloocan City					
Residential	1,837.18	2,186.35	349.17	19.0%	1.8%
Commercial	39.44	52.47	13.03	33.0%	2.9%
Industrial	177.74	197.49	19.76	11.1%	1.1%
South Caloocan City					
Residential	545.62	561.07	15.45	2.8%	0.3%
Commercial	152.62	168.41	15.79	10.3%	1.0%
Industrial	191.44	197.61	6.17	3.2%	0.3%

Development Potentials

Availability of Areas Suitable for New Development

North Caloocan City has a total of 867.22 hectares or 21.84% of vacant land area that generally with moderate or no susceptibility to any natural hazard. These areas are vacant large parcels of land and unoccupied subdivision lots. Around 72.24% or total of 626.50 hectares of these vacant lands on different parts of North Caloocan City are found to be moderately to highly suitable for future development given the type of slope, type of soil and susceptibility to natural hazards of each parcel. Similar measures, 27.76% of vacant spaces or a total of 240.72 hectares are learnt to have poor to very poor suitability rating. Improving these vacant properties requires using more sustainable type of soil surface grading, cutting and filling without altering extensively the natural land form and surface drainages within and surrounding its environment. Most of the open grounds available for improvements are spread out in Llano, Deparo, Bagumbong and Camarin. Those areas not suitable for urban development (CRITICAL AREAS) are parcels near river ways and creeks and vacant subdivided lots with steeply rolling and undulating terrain -- stretching in some portions of Bagumbong, Camarin, Tala, Amparo and Pangarap.

South Caloocan City, yet being considered as 95.10% built-up in terms of land area still have a total of 66.77 hectares or 4.90% vacant land that is available for future development. Roughly 86.16% of the said total is Moderately to Highly Suitable for future development based on each parcels slope classification and exposure to natural hazards. The developable spaces are generally located along North Luzon Expressway and in some portion of the old district of Baesa. Around major business center in Bonifacio district, a 2.5 hectare estate was included in the total developable plot which is formerly a shopping mall area that was raged in fire. However, there is a sum of 9.24 hectares of parcels with different sizes and location that can be considered as not suitable for land development, which locations are traced along Tullahan River within Baesa District. About 5.3 hectare contiguous property lying near Tullahan Bridge was included in this total.

Table[C1] 1-15: Suitability Analysis for Future Development Areas – Caloocan City 2013

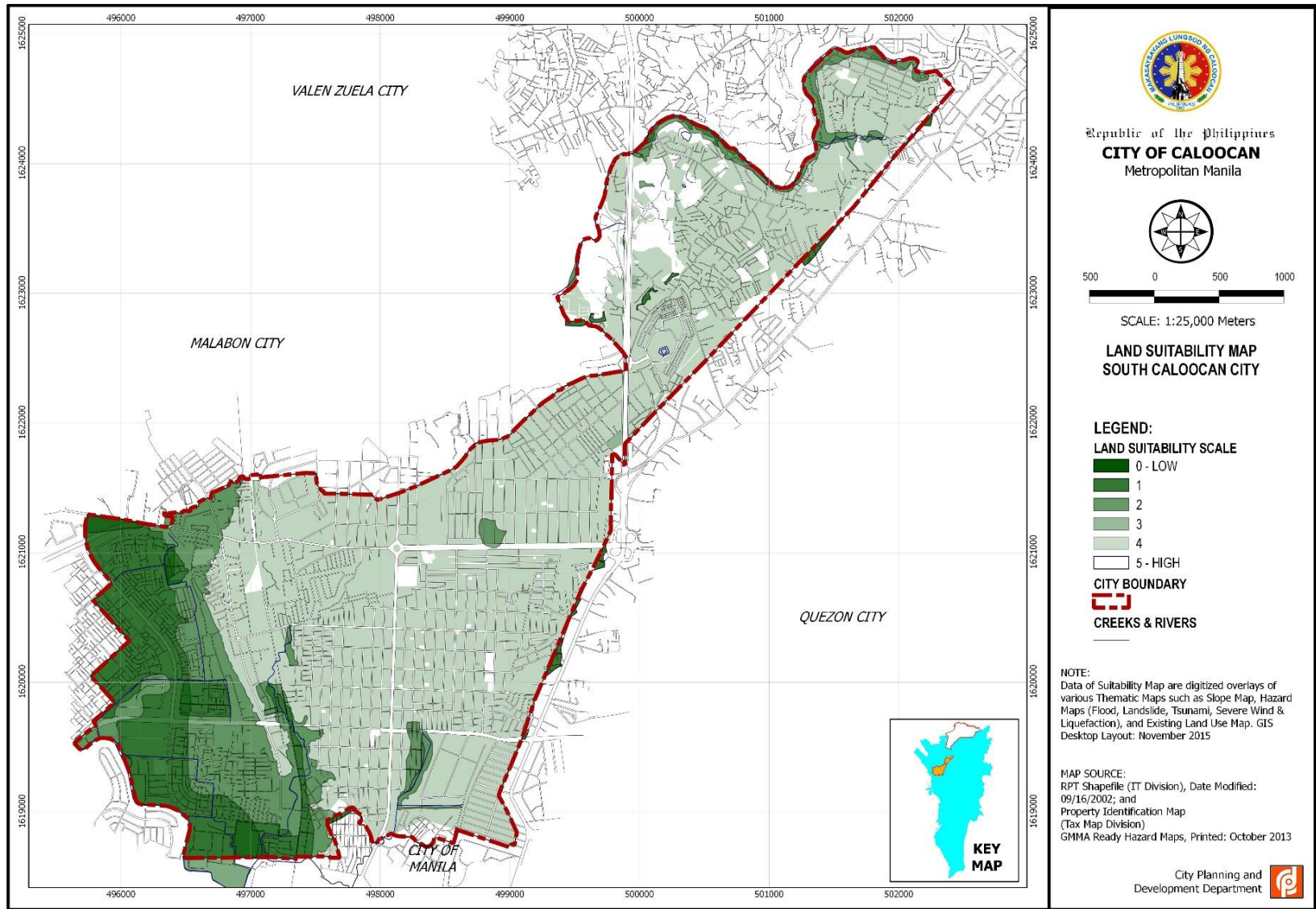
Suitability Rating for Future Development Areas	South Caloocan City		North Caloocan City	
	Area (Ha.)	% Distribution	Area (Ha.)	% Distribution
Highly Suitable (0 - 3% Slope)	33.34	49.93%	220.86	25.47%
Moderately Suitable (3 - 8% Slope)	24.19	36.23%	405.64	46.77%

Suitability Rating for Future Development Areas	South Caloocan City		North Caloocan City	
	Area (Ha.)	% Distribution	Area (Ha.)	% Distribution
Not Suitable (8 - 18% Slope)	9.24	13.84%	133.12	15.35%
Not Suitable (18 - 30% Slope)	-	-	107.60	12.41%
TOTAL	66.77	100.00%	867.22	100.00%
General Land Use 2013				
Vacant Land	66.77	4.90%	867.22	21.84%
Built-Up Area	1,295.73	95.10%	3,103.68	78.16%
Total Land Area	1,362.50	100.00%	3,970.90	100.00%

Future[C2] Development of New Road and Transportation Services

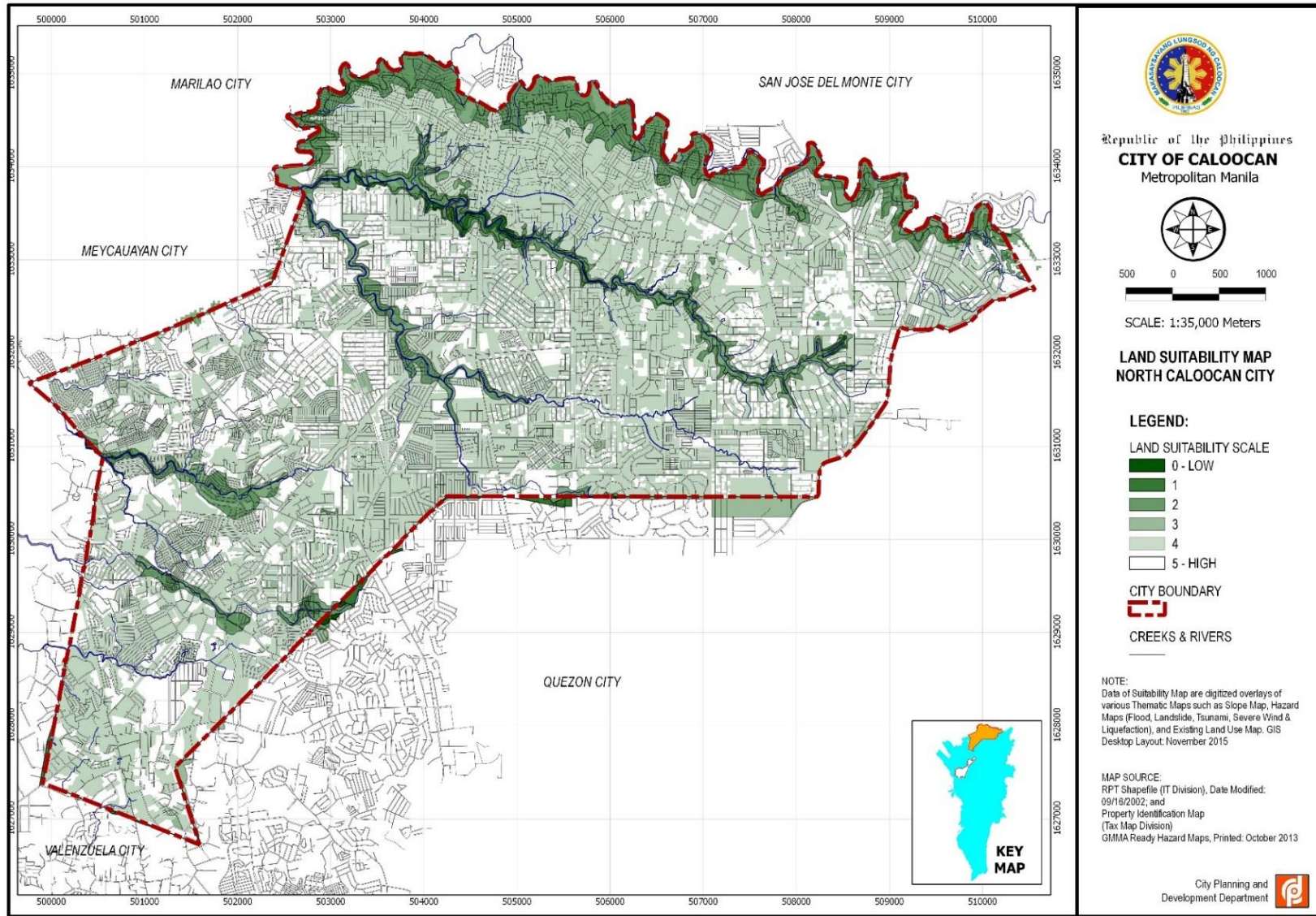
For the next ten (10) years, new roads and transportation projects that would cut across areas of Caloocan City, shall be implemented in Metropolitan Manila. These major projects in due course shall cause large changes in the City's land use pattern particularly on those areas surrounding each project's immediate location. Efficiency of traveling through the City's future road network system using modern transport facilities would achieve one of the basic land use planning goals of the Caloocan City CLUP -- that is to shorten travel time and distances between journeys.

Figure 1-18 Land Suitability Map, South Caloocan City



DISCLAIMER: This map was prepared for planning purposes only and cannot be used for legal engineering survey, for settling or reconciling discrepancies involving political, territorial and geographical boundaries or to be used on any other legal purpose. The Caloocan City Government make no warranty or guarantee and assumes no legal responsibility as to the map's content, accuracy, timeline records or completeness of any data drawn therein or otherwise represented.

Figure 1-19. Land Suitability Map, North Caloocan City



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THE LOCAL CLIMATE CHANGE ACTION PLANNING FRAMEWORK

PLANNING CONTEXT AND APPROACH

The City hereby promotes the following Vision and Goal for Climate Change, the achievement of which is operationalized in the succeeding Framework Diagram:

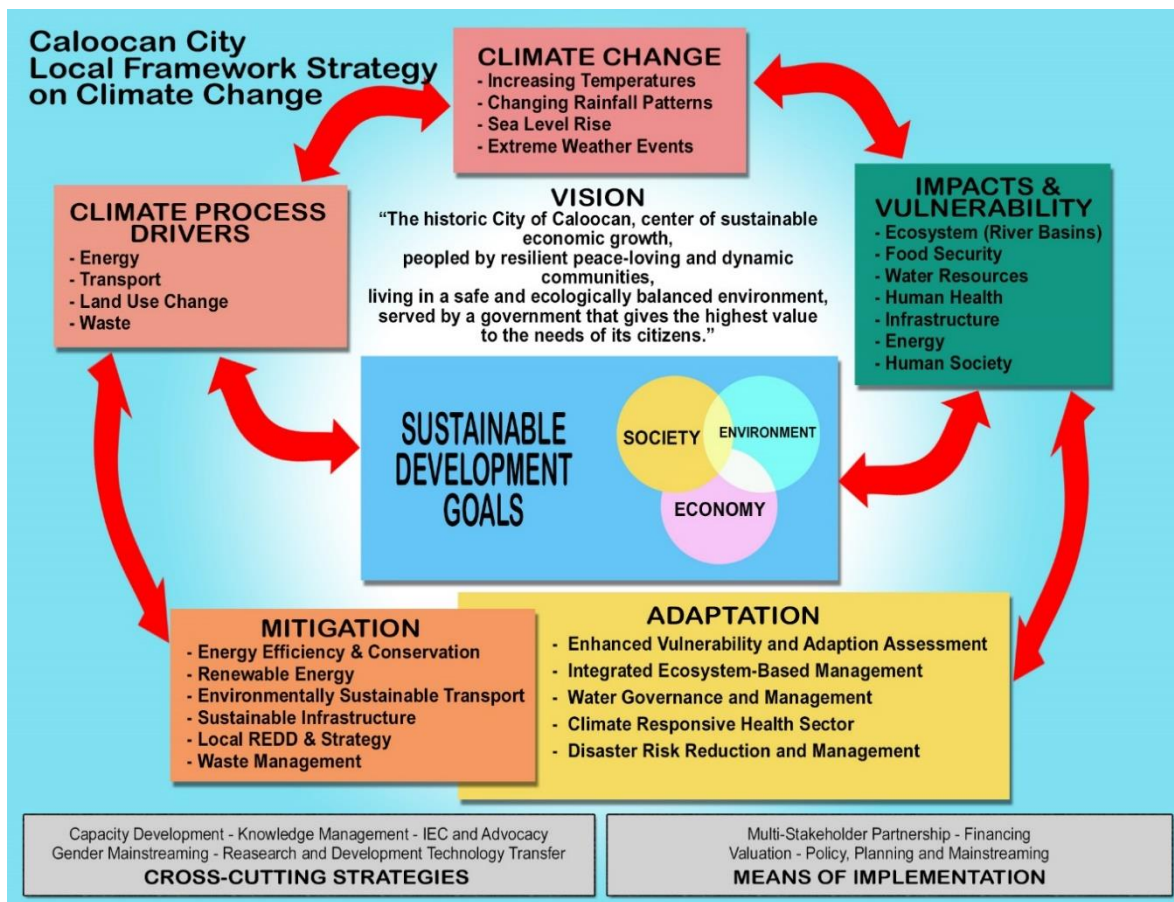
Vision

“A City peopled by resilient, peace-loving and dynamic communities, living in a safe and ecologically balanced environment”.

Goals

1. A progressive City that provides excellent urban services and amenities;
2. A harmonious community with utmost capacity to deter the effect of natural and human-made hazards and other calamities that threatens the general welfare, health and safety of the population particularly woman, children and the differently-abled city residents.
3. A City that efficiently use, acquire and manage land as a limited resource.
4. Governance that advances acceptable and orderly development of growth and progress.
5. A vibrant Local Economy that promotes key investment opportunities and balances physical development with sustainable use of local resources.
6. A City that promotes sustainable development, preservation of the natural environment and the conservation of historical and cultural heritage.

Figure 1-20. Climate Change Framework



The Caloocan City Local Climate Change Action Plan was a local adaptation of the National Framework Strategy on Climate Change. As such it is formulated within the context of the City's sustainable development goals and governance that affects the City's ability to respond to climate change as laid out in the 2017-2019 City Comprehensive Development Plan and the 2016-2025 Disaster Risk and Climate Change Adaptive City Comprehensive Land Use Plan (CLUP).

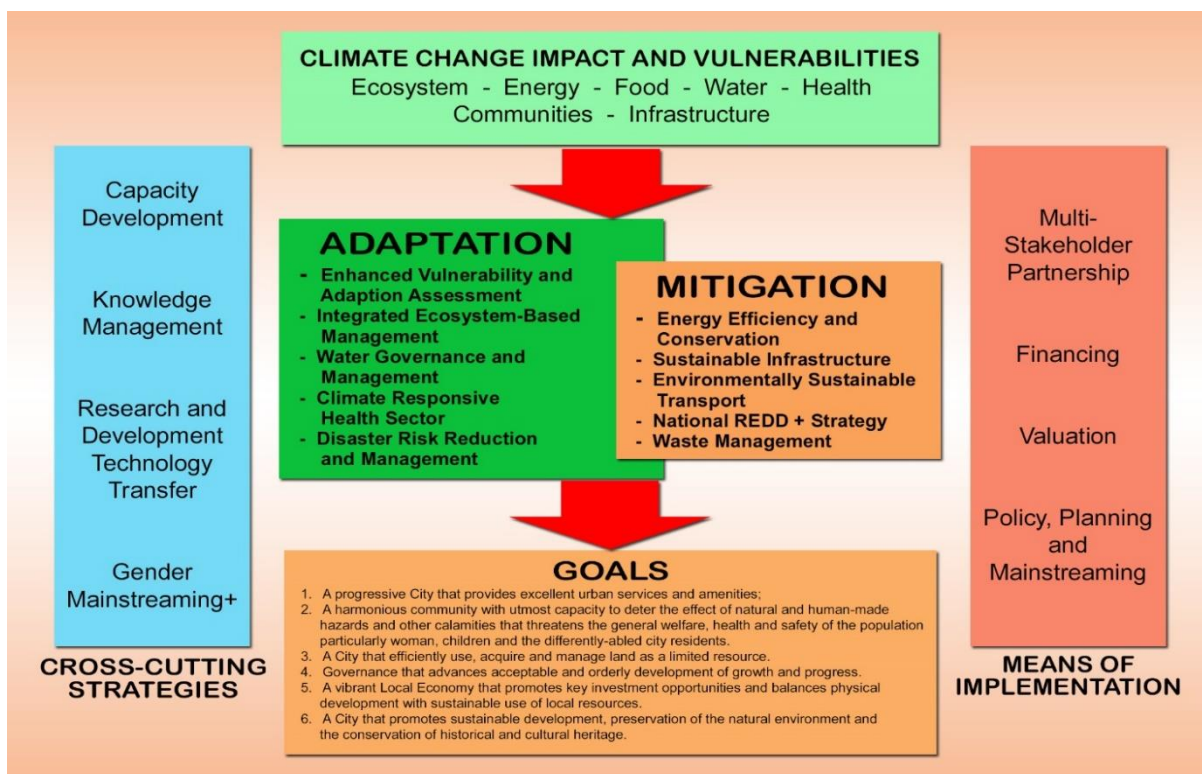
The changing climate conditions caused by global warming will have a myriad of impacts and underscore the vulnerabilities in all sectors of society and economy. The LCCAP will require resources and the cooperation of all the sectors. Strategies geared towards climate change, therefore, moved beyond the environmental challenges and was closely linked with economic targets and social sustainability.

Increasing temperatures, changing rainfall patterns, sea level rise, and extreme weather events form the backdrop upon which the City endeavors to pursue its development goals. These factors affects the food, water, health infrastructure, energy and the society. The ability of the City to address such impacts and vulnerabilities of the sectors affect the facility by which the sustainable development is pursued.

The LCCAP identified Key Result Areas (KRAs) to be pursued I key climate-sensitive sectors in addressing he adverse effects of climate change both under adaptation and mitigation. In order to achieve the Key Result Areas (KRAs), cross-cutting strategies were likewise given attention. As means of implementation, the framework puts forward multi-stakeholder partnerships, financing, valuation and policy planning and mainstreaming.

The following diagram specifically illustrates the City's climate change framework, taking into account how climate change impacts and vulnerabilities shall be addressed by adaptation, mitigation and cross-cutting strategies and supported by the means of implementation- which would eventually lead to achievement of the goal.

Figure 1-21. Climate Change Framework



VULNERABILITY AND ADAPTATION ASSESSMENT RESULTS

GEOLOGIC HAZARD ASSESSMENT

Climate change, involving both natural climate variability and anthropogenic global warming, has been a major worldwide concern, particularly with the publication of the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change. Considering the archipelagic nature of the Philippines and despite its being a very minor emitter of greenhouse gases, adaptation to climate change has been the Government's national policy. The importance of expediting these climate change-related adaptation measures was highlighted by a string of geo-meteorological-related disasters, specifically triggered by landslides and floods consequent to unusual weather conditions. Recognition of the pertinent issues and the extant challenges point to the urgent need for mainstreaming both geo-meteorological-related disaster risk management and climate change adaptation measures in the light of changing climate conditions.

GEOHAZARDS

The GMMA Ready Project that started in 2011 identified at least six major natural hazards that could eventually affect the Greater Metropolitan Manila Area in the future. The Project, a multi-lateral aid granted to CSAND agencies, conducted the Hazard Profiling and Risk Assessments within the Project boundaries and provided related technical assistance to local government units (LGUs), concerned national government agencies, academic institutions and civil society organizations. The Project aims to decrease the vulnerability of the Greater Metro Manila Area (GMMA) to natural hazards and increase the resilience of concerned agencies, by strengthening their institutional capacities in managing disaster and climate change risks (UNDP, 2011). Hazards identified can be classified into climate and geologic hazard. Geologic hazards are ground shaking, liquefaction and tsunamis. Meanwhile the climate related hazards are flooding, rain-induced landslide and severe winds.

Flooding

Flooding due to monsoon rains and typhoon is anticipated to intensify due to climate change. Recurrent problems of flood and destruction of properties and loss of lives due to typhoons is expected to aggravate this coming rainy season.

Severe flood problems in the city are mostly due to river overflow, excessive rainfall and inadequate channel capacity. In some areas within higher elevation, accidents from flooding hazards (such as flash floods) are caused by erosion and landslides. These flood problems gave rise to the loss of property and some lives (on isolated cases) as well. Those areas identified at risk on this action plan report are classified as potential disaster areas; taking into account its physical condition and/or limitation, and known case of disaster or accident occurred within because of flood.

Based on the study conducted under the GMMA Ready Project, 15 barangays in the South Caloocan will be susceptible to high flooding and 5 barangays will have a very high flooding. Meanwhile, 20 barangays in the North Caloocan will be vulnerable to high flooding and 18 barangays to a very high flooding.

Table No. 2-01: Barangays and Estimated Population to be Affected by Flood

Bgy. No.	Susceptibility Levels	Land Area (hectares)	Population (2015)	Barangay No.	Susceptibility Levels	Land Area (hectares)	Population (2015)
SOUTH CALOOCAN							
16	High	6.25	1,450	70	High	5.64	4,318
18	High	10.34	3,376	75	Moderate to High	4.98	3,806
20	High	11.28	2,771	76	Moderate to High	3.04	4
22	High	5.71	901	95	High to very High	5.82	2,549
33	High	5.45	10,296	113	High	0.38	22
34	High	5.36	2,090	114	High	0.62	569
36	High	2.44	2,675	117	High	1.04	369
37	High	2.54	1,254	118	High	0.16	281
37	Very High	2.69	1,326	118	Very High	4.79	8,447
43	High	2.00	2,123	119	High	1.49	285
46	Very High	1.06	365	120	High	1.51	2,182
49	High	1.23	1,535	120	Very High	0.60	873
49	Very High	1.23	1,535	128	Moderate to High	1.19	946
52	High	0.35	272	159	High	69.29	21,855
59	Very High	1.81	1,946	160	Moderate to High	47.32	10,357
63	High	0.92	753	162	Very High	0.01	2
69	High	3.19	3,395	163	Very High	0.02	8
				164	Very High	0.93	227
Total			38,066				57,101
NORTH CALOOCAN							
166	Moderate to High	189.96	19,864	177	Very High	3.95	1,672
167	High	29.00	8,713	178	High	3.73	1,282
168	High	35.55	3,750	178	Very High	7.46	2,564
169	High	12.95	1,054	179	High	13.42	2,630
169	Very High	0.13	10	179	Very High	19.17	3,757
169	Very High	1.29	105	180	High	3.75	1,191
170	High	2.42	643	180	Very High	6.26	1,986
170	High	-	-	181	High	6.70	1,873
170	Very High	1.45	386	181	Very High	9.57	2,675
171	High	34.52	6,305	182	High	4.34	315
172	Very High	8.26	1,311	182	Very High	6.20	449
173	Very High	7.60	1,236	185	High	4.15	1,705
174	High	3.53	518	185	Very High	6.92	2,842
174	Very High	2.65	389	186	High	8.22	1,176
175	High	26.78	6,438	186	Very High	5.14	735
175	Very High	40.17	9,658	187	High	1.53	415
176	High	50.92	23,926	187	Very High	0.77	207
176	Very High	76.39	35,889	188	High	4.23	1,915
177	High	5.92	2,508	188	Very High	3.02	1,368
Total			122,703				30,759
Grand Total			160,769				87,860

Figure No. 2-01: Flood Map- North Caloocan (PAG-ASA-DOST, October 2013)

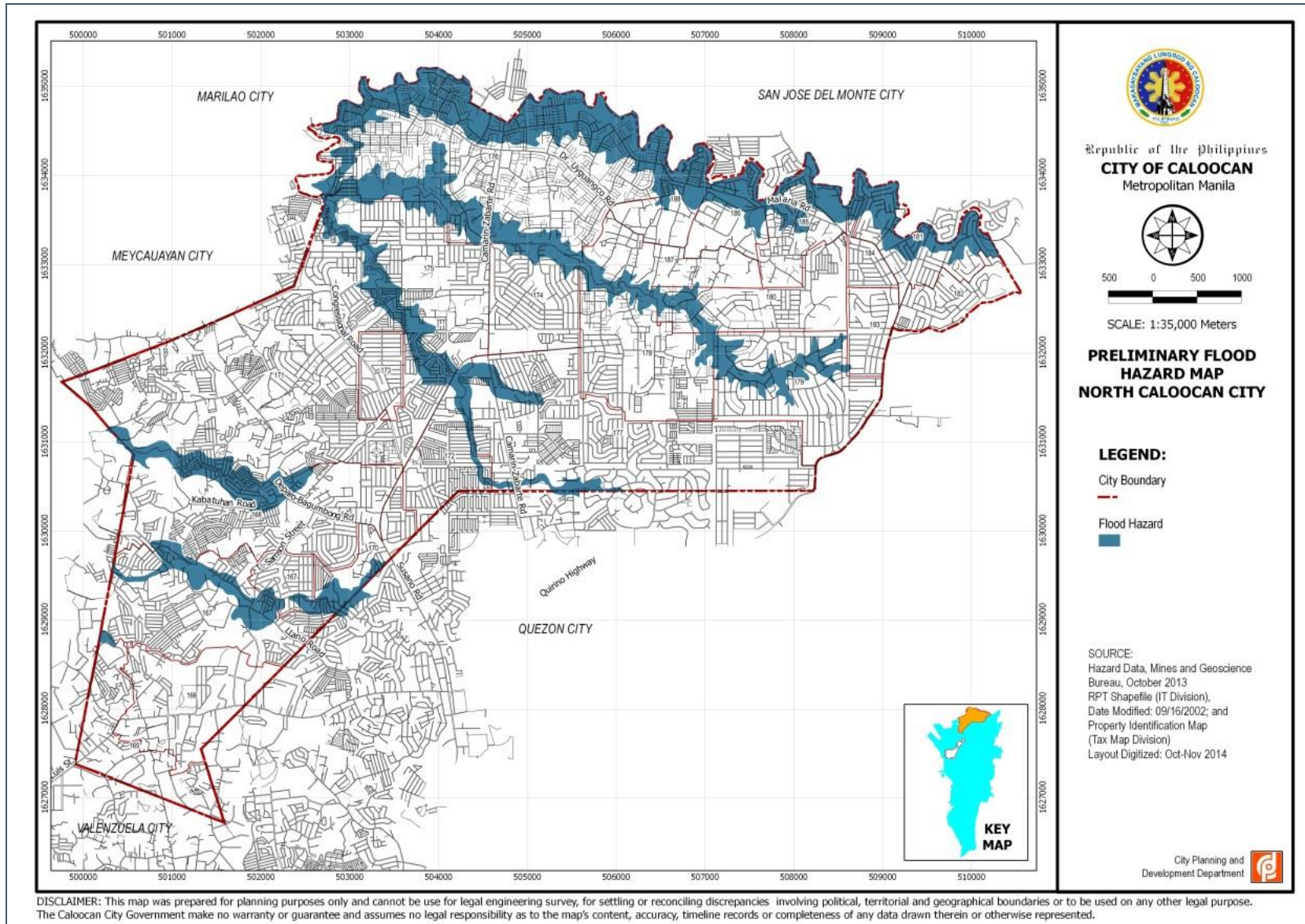
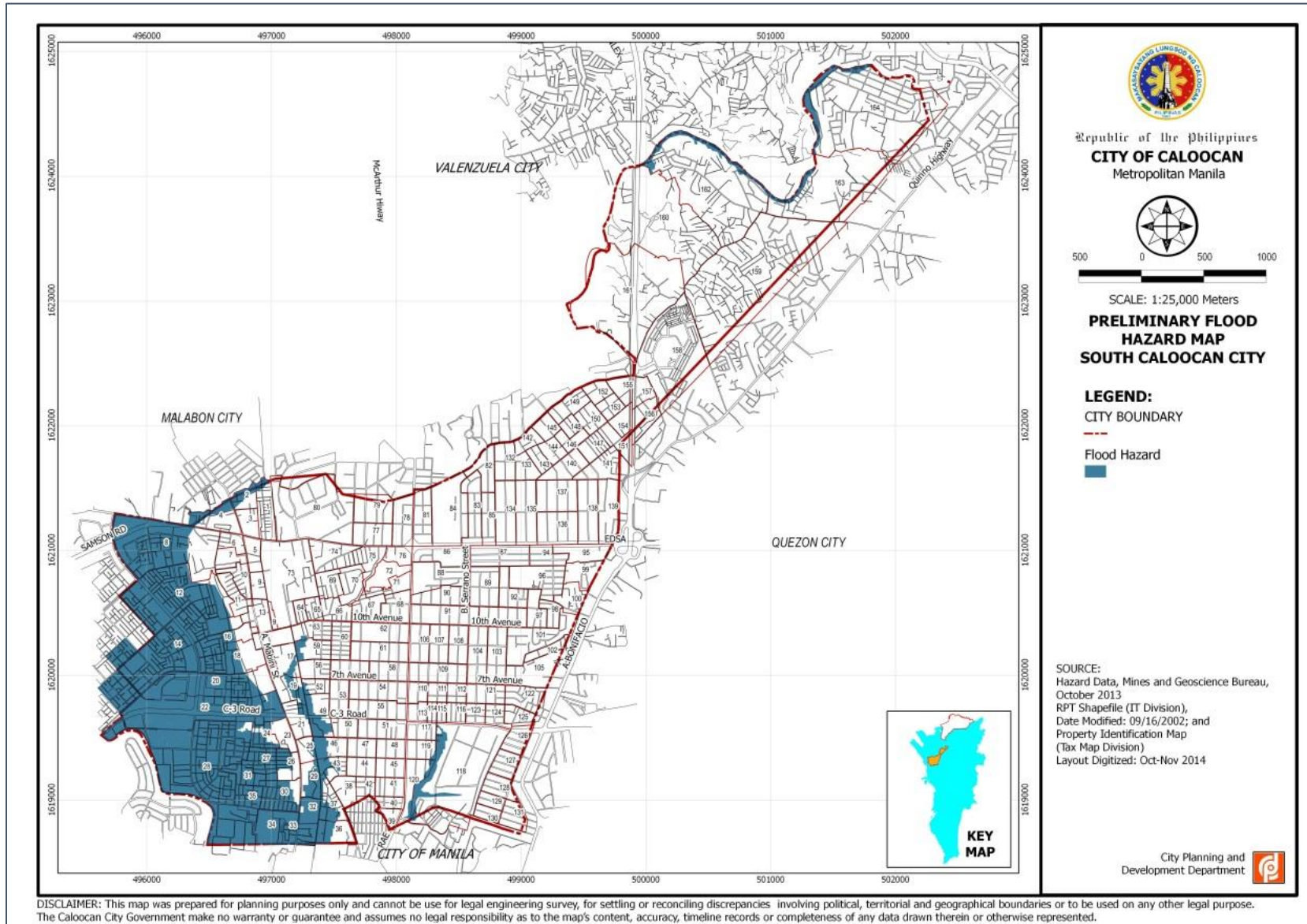


Figure No. 2-02: Flood Map- South Caloocan (PAG-ASA-DOST, October 2013)



Rain-Induced Landslide

From the study conducted by Metro Manila Earthquake impact Reduction Study, (MMEIRS), GMMA RAP and MGB, two barangays in South Caloocan City are high susceptible to rain-induced landslide. These barangays were formerly a garbage dumpsite. Meanwhile in North Caloocan portions of Barangays 178 and 179 are moderately susceptible while part of Barangays 168 and 175 are highly susceptible, this is in NW of Deparo Subdivision and Sitio Matarik respectively.

Table No. 2-02: Barangays and Estimated Population to be Affected by Rain-Induced Landslide

Barangay No.	Susceptibility Levels	Land Area (hectares)	Estimated Population (2015)
SOUTH CALOOCAN			
8	HIGH	1.47	1,149
12	HIGH	1.97	1,567
Total		3.44	2,716
NORTH CALOOCAN			
168	HIGH	0.44	47
175	HIGH	7.58	1,823
Total		8.02	1,870
Grand Total		11.46	4,586

Sea-level Rise and Land Subsidence

Land subsidence resulting from excessive extraction of groundwater is particularly acute in East Asian countries. Some Philippine government sectors have been to recognize that the sea-level rise of one to three millimeters per year due to global warming is a cause of worsening floods around Manila Bay.¹² Enhance flooding and tidal incursion are not only deleterious effects of subsidence. It can trigger minor seismicity. Based on the study conducted on 2003, 5-9 cm/per year of subsidence were observed in Metro Manila during 1991-2003.

¹² "Global sea-level rise is recognized, but flooding from anthropogenic land subsidence is ignored around northern Manila Bay, Philippines by Kevin S. Rodolfo and Fernando P. Siringan

Figure No. 2-03: Rain-Induced Landslide – North Caloocan (MGB, DENR, October 2013)

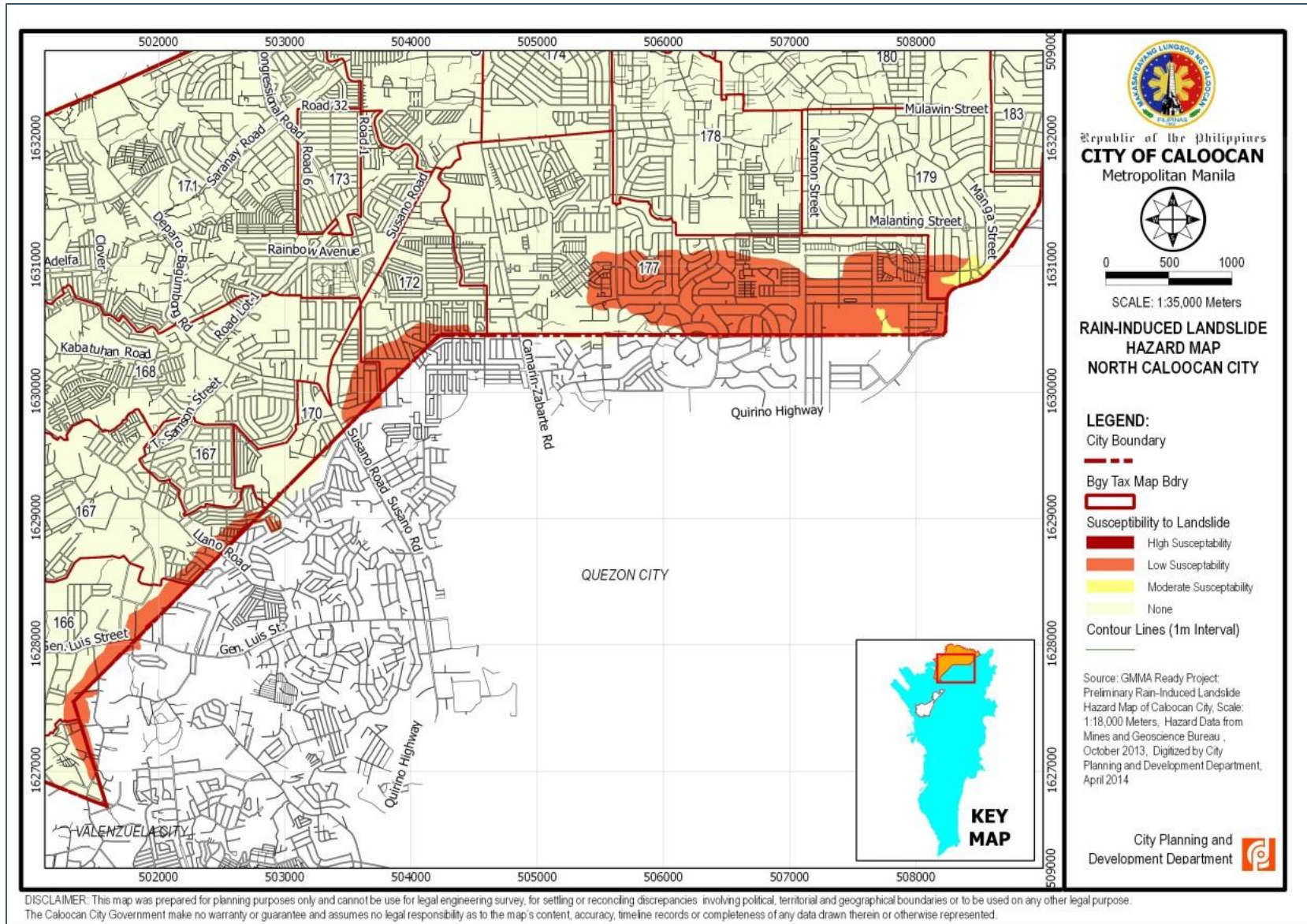
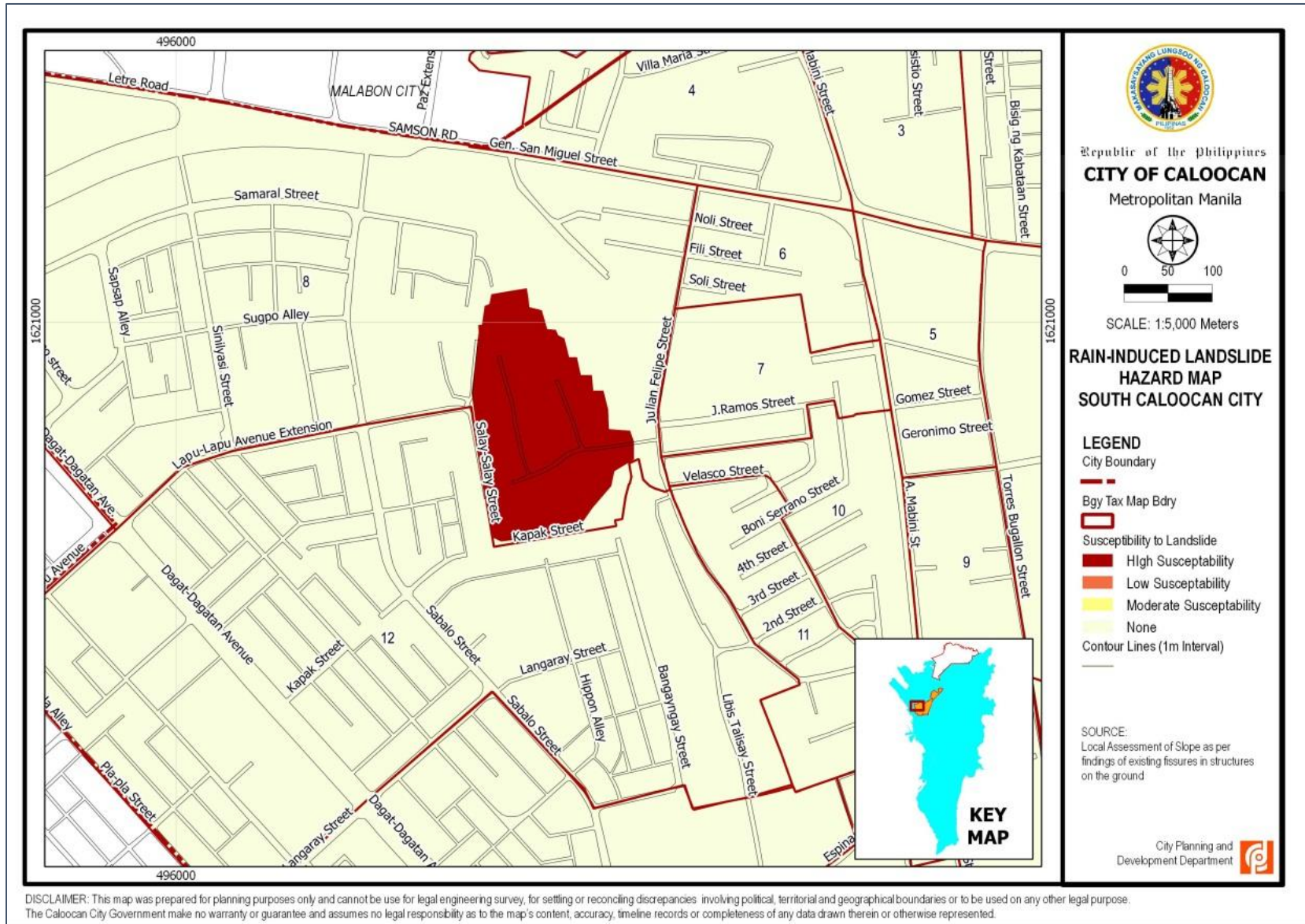


Figure No. 2-04: Rain-Induced Landslide – South Caloocan (MGB, DENR, October 2013)

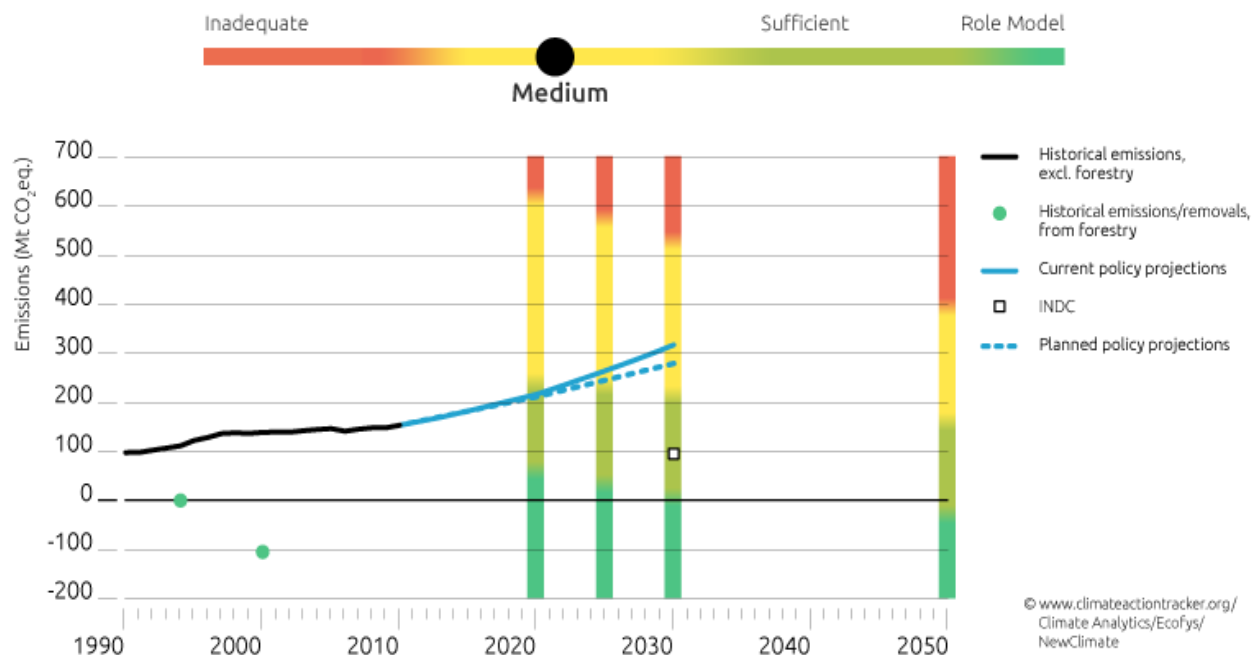


PHILIPPINE GREENHOUSE GAS EMISSION

Source: Climate Action Tracker (Page last updated: 2nd November 2016)

Rating

Figure No. 2-05



Note: More information [here](#) on the fair emissions range per effort sharing category.

Assessment

The Philippines' emissions pathway towards 2030, as proposed in its Intended Nationally Determined Contribution (INDC), could be rated "sufficient," however the high uncertainty in its envisioned emissions pathway leads to a "medium" rating. The Philippines' reference—or business as usual (BAU)—scenario, against which the target is measured, has not yet been published and the government has shared no details explaining how the NDC target relates to the LULUCF sector, nor how this will be quantified. Recent statements from the President of the Philippines regarding his country's position on the Paris Agreement (King, 2016b), as well as previous announcements on increasing coal-fired power capacity, add significantly to the uncertainty as to whether the government intends to take substantial action in adopting the policy changes required to meet its INDC target. This lack of details on how the target will be achieved and the role that the LULUCF sector will play in it, leaves the option open for achieving the target by increasing carbon sinks (LULUCF) which is not compatible with what is needed—or fair—to keep global warming below 2°C. Current policies indicate a rapid and ongoing increase in greenhouse gas emissions, which appear inconsistent with meeting the INDC goals

In its INDC, submitted on 1 October 2015, the Philippines included a conditional greenhouse gas reduction target of 70% below business as usual (BAU) levels by 2030. The INDC states that the target is conditional on "the extent of financial resources, including technology development & transfer, and capacity building, that will be made available to the Philippines." The target covers all emissions from all sectors, including land use, land use change and forestry (LULUCF) (Government of the Philippines, 2015).

Green House Gas (GHG) Inventory

Greenhouse gases trap heat in the atmosphere, which makes the earth warmer, thus resulting to climate change. Carbon dioxide is the most important greenhouse gas emitted by humans. Greenhouse gases come from all sorts of everyday activities, such as using electricity, heating our homes and driving around town. The three top most gases that contributes to the global warming are carbon dioxide (CO₂) which is 77% of the global anthropogenic emissions, methane (CH₄), 14% and nitrous oxide (N₂O).

Greenhouse emissions are classified into 3 main sources or scopes. Scope 1 refers to direct emissions from fuel that vehicles consume, Scope 2 is the indirect emissions that come mostly from electricity consumption and Scope 3 refers to other emissions not falling under Scopes 1 and 2.

Caloocan City Green House Gas (GHG) Inventory

Table No. 4-06: Estimated GHG Emission due to mobile fuel combustion¹³

Year	Motor Vehicle Registered Per Type of fuel used/ ¹	Estimated Gross Sale of Fuels (PhP)/ ²	Estimated Price Per Liter/ ³	Estimated Liters sold	kgCO ₂ (li x 2.30)	kgCH ₄ (li x emission factor/4 x GWP/5)	kgN ₂ O (li x emission factor/6 x GWP/7)	TOTAL GHG Emission (kgCO ₂)
2013	Gas	165,340,417.95	31.52	5,245,571.64	16,064,814.76	120,071.13	172,369.48	12,357,255.38
	Diesel	89,104,231.61	33.78	2,637,780.69	7,148,385.66	7,755.08	86,677.47	7,242,818.21
2014	Gas	66,856,696.68	60.62	2,183,432.29	5,021,894.26	49,978.77	71,747.59	5,143,620.61
	Diesel	25,054,662.19	32.89	761,771.43	2,064,400.56	2,239.61	25,031.81	2,091,671.98
2015	Gas	72,365,216.36	19.33	3,743,673.89	8,610,449.95	85,692.70	123,017.12	8,819,159.77
	Diesel	30,352,924.34	19.92	1,523,741.18	4,129,338.60	4,479.80	50,070.14	4,183,888.54

Table No. 4-07: Estimated GHG Emission due to Purchased Electricity¹⁴

Year	kWh used per Type of Use/ ¹					GHG Emission kgCO ₂ /2 (kWh used x emission factor for Luzon grid)				
	Residential	Commercial	Industrial	Streetlights	Total	Residential	Commercial	Industrial	Streetlights	Total
2013	478,557,000	209,503,000	241,261,000	4,579,000	933,900,000	48,371,083	08,732,057	25,214,459	2,376,501	484,694,100
2014	482,433,000	211,259,000	243,674,000	4,638,000	942,004,000	250,382,727	09,643,421	26,466,806	2,407,122	88,900,076
2015	510,093,000	221,480,000	249,974,000	4,640,000	986,187,000	264,738,267	114,948,120	129,736,506	2,408,160	511,831,053
TOTAL	1,471,083,000	642,242,000	734,909,000	13,857,000	2,862,091,000	763,492,077	333,323,598	381,417,771	7,191,783	1,485,425,229

¹³ Source:

- /1 – Number of Registered Vehicles Per Type of Fuel Used, Land Transportation Office-Caloocan City District Office, August 2011
- /2 – Gross Sale of Registered Gasoline Station in Caloocan City, Business Permits and Licensing Office, April 2015
- /3 – Gasoline and Diesel Price – Philippine Peso per Liter, Webpage, Index Mundi, November 2016
- /4 – emission factor for gas – 0.001090 kg/CH₄/li
- /5 – Global Warming Potential for gas – 21
- /6 – emission factor for diesel – 0.000140 kg/li
- /7 – Global Warming Potential for diesel – 310

¹⁴ Source:

- /1 – kWh Sales Per Type of Use, MECO, March, 2016
- /2 – emission factor for Luzon Grid – 0.519 kg CO₂/kWh

Table 4-08: Estimated GHG Emission from waste generated in operations¹⁵

Waste Generated/1		Waste Treatment	Proportion (percent)	Average emission factor of waste treatment method (kg CO ₂ /ton)	GHG emission ((kg CO ₂)
kg	ton				
566,408.88	566.408	Landfill	77.6	300	131,859.78
187,156.88	187.157	Recycled	22.0	10	411.745
TOTAL					132,271.525

ELEMENTS, SECTORS AND INSTITUTIONS EXPOSED TO CLIMATE CHANGE HAZARDS

Table 2-03. Critical Economic Facilities by Barangay Location

BGY. NO	NUMBER OF ECONOMIC FACILITIES	FLOOD	RAIN INDUCED LANDSLIDE
ZONE 1			
008	7	MODERATE (Flood Level = 0.5m)	HIGH
012	9	MODERATE (Flood Level = 0.5m)	HIGH
ZONE 2			
014	10	MODERATE (Flood Level = 1m)	–
016	3	HIGH (Flood Level = 1.1.5m)	–
020	2	MODERATE to HIGH	–
021	3	LOW to MODERATE	–
022	8	MODERATE to HIGH (Flood Level = 0to1m)	–
023	2	MODERATE	–
ZONE 3			
025	5	MODERATE (Flood Level = 1m)	–
028	5	MODERATE (Flood Level = 1m)	–
029	1	MODERATE (Flood Level = 1m)	–
030		MODERATE (Flood Level = 1m)	–
030	10	MODERATE (Flood Level = 1m)	–
032	4	MODERATE (Flood Level = 1m)	–
033	7	MODERATE to HIGH	–
034		HIGH PEIS 8.5	INUNDATED
035		HIGH PEIS 8.5	NONE

¹⁵ Source:

/1 – Summary Showing the Quantity and Composition of Waste Disposal from all sources, WACS, ESS, 2015

BGY. NO	NUMBER OF ECONOMIC FACILITIES	FLOOD	RAIN INDUCED LANDSLIDE
ZONE 4			
036		MODERATE to HIGH (Flood Level = 1.5m)	–
037		VERY HIGH	–
039	1	LOW to MODERATE (Flood Level = 0.1m)	–
043	1	LOW to HIGH (Flood Level = 1m to 1.5m)	–
ZONE 5			
056		MODERATE	–
057	1	LOW to MODERATE (Flood Level = 0.5m)	–
ZONE 6			
059	1	LOW to VERY HIGH (Flood Level = 2m)	–
060	4	MODERATE (Flood Level = 0.5-1.0m)	–
063	3	LOW to HIGH (Flood Level = 1.0m)	–
066	1	MODERATE (Flood Level = 1.0m)	–
067		MODERATE (Flood Level = 0.3m)	–
070	3	HIGH (Flood Level = 1.0m)	–
ZONE 7			
075	3	MODERATE to HIGH (Flood Level = 0.3 TO 0.5m)	–
076	7	MODERATE to HIGH (Flood Level = 1m)	–
ZONE 9			
095	2	HIGH to VERY HIGH (Flood Level = 1m)	–
102	1	LOW to MODERATE (Flood Level = 0 to 1m)	–
ZONE 10			
106	8	MODERATE	–
107	1	LOW to MODERATE (Flood Level = 1m)	–
108	1	LOW to MODERATE	–

BGY. NO	NUMBER OF ECONOMIC FACILITIES	FLOOD	RAIN INDUCED LANDSLIDE
109	3	LOW to MODERATE (Flood Level = 1m)	–
110	6	LOW to MODERATE (Flood Level = 1m)	–
111	2	LOW to MODERATE (Flood Level = 0.5 to 1m)	–
112	5	LOW	–
113	3	LOW to MODERATE (Flood Level = 0.5 to 1m)	–
119	3	LOW to VERY HIGH (Flood Level = 1.5m to 2m)	–
ZONE 11			
120	3	LOW to VERY HIGH (Flood Level = knee-deep/1.5m)	–
ZONE 14			
159	1	High (Flood Level = 1.5m)	–
160	1	MODERATE to HIGH (Flood Level = 1.5m)	–
162	5	LOW to VERY HIGH (Flood Level 3 to 6m)	–
163	4	LOW to VERY HIGH (Flood Level = 0.4m)	–
164	1	LOW to VERY HIGH	–
ZONE 15			
165	4	LOW to MODERATE (Flood Level = up to 1.5m)	–
166	12	MODERATE to HIGH	LOW
167	10	MODERATE to HIGH	LOW
168	22	LOW to MODERATE	HIGH
169	3	LOW to MODERATE	–
170	3	LOW to VERY HIGH (Overflow of Creek, Flood Level = 12 to 1.5m)	LOW

BGY. NO	NUMBER OF ECONOMIC FACILITIES	FLOOD	RAIN INDUCED LANDSLIDE
171	13	LOW to HIGH	–
172	5	LOW to VERY HIGH	–
173	3	LOW to VERY HIGH (Flood Level 1m)	–
174	5	LOW to VERY HIGH (Overflow of Creek)	–
175	22	LOW to VERY HIGH	HIGH
176	52	LOW to VERY HIGH	–
177	16	HIGH to Very HIGH (Flood Level = 1.5 to 3m)	–
178	19	HIGH to Very HIGH (Flood Level = >1.5m)	LOW to MODERATE
ZONE 16			
179	16	LOW to VERY HIGH (Flood Level 1 to 1.5m)	LOW to MODERATE
180	2	HIGH to VERY HIGH	–
181		LOW to VERY HIGH	–
182	1	LOW to VERY HIGH	–
183		MODERATE (Flood Level = 0.5m)	–
184	3	MODERATE (Flood Level = 1m)	–
185	8	LOW (Flood Level=6 inches) to VERY HIGH (Flood Level = 0.5m,1.0-1.5m)	–
186	2	LOW to VERY HIGH	–
187	3	LOW to VERY HIGH	–
188	4	LOW to VERY HIGH	–

Table No. 2-04. School Facilities' Risk Assessment and Hazard Vulnerability

	SCHOOL	BARANGAY	HAZARDS SUSCEPTIBILITY	
			FLOOD	RAIN-INDUCED LANDSLIDE
Elementary				
Aromar District				
1	Grace Park	52	M to High	-
2	Grace Park Unit I	56	Moderate	-
3	Kasarinlan	28	Moderate	-
4	Kaunlaran	20	High	-
5	Lerma	31	Moderate	-
7	Marulas	36	High	-
8	Maypajo	35	Moderate	-
Pobcaran District				
9	Bagong Silang	114	Low to High	-
10	Cecilio Apostol	109	Moderate	-
Tanque District				
11	Baesa -Libis Baesa Annex	160	M to High	-
12	Sta. Quiteria	163	Low to M	-
13	Talipapa	164	Low to VH	-
Caloocan North District I				
14	Amparo	179	Low to VH	-
15	Camarin	175	Low to VH	High
16	Camarin D	178	Low to VH	Low to M
17	Camarin D - Unit II Annex	178	Low to VH	Low to M
18	Caloocan North	178	Low to VH	Low to M
19	Cielito Zamora Memorial School	177	Low to VH	-
20	Congress	173	Low to VH	-
22	Horacio dela Costa	179	Low to VH	Low to M
23	Urduja	172	M to VH	-
Caloocan North District II				
24	Bagong Silang	176	Low to VH	-
25	Gabriela Silang	176	Low to VH	-
26	Rene Cayetano (Annex)	176	Low to VH	-
27	Sto. Niño	176	Low to VH	-
28	Kalayaan	176	Low to VH	-
29	Kalayaan - Unit Annex	176	Low to VH	-
30	Silanganan	176	Low to VH	-
31	Star - Unit I Annex	176	Low to VH	-
Caloocan North District III				
32	A. Mabini	187	Low to VH	-
33	MLQ	185	Low to VH	-
34	Marcelo H. del Pilar	185	Low to VH	-

	SCHOOL	BARANGAY	HAZARDS SUSCEPTIBILITY	
			FLOOD	RAIN-INDUCED LANDSLIDE
35	NHC	186	Low to VH	-
36	Pag-asa	176	Low to VH	-
37	Pangarap	181	Low to VH	-
38	Tala	186	Low to VH	-
Caloocan North District IV				
39	Bagbaguin	165	Low to M	-
40	Bagumbong	171	Low to High	-
41	Bagumbong - Annex	171	Low to High	-
42	Caybiga	166	M to High	-
43	Deparo	168	Low to High	-
44	Llano	167	Low to High	-
45	Sampaguita	175	Low to VH	-
Secondary				
1	Ma. Clara High School	109	Moderate	-
2	M. B. Asistio, Sr. High School	14	Moderate	-
3	M. B. Asistio, Sr. - Unit I	14	High	High 8
4	Maypajo High School	35	Moderate	-
5	Kasarinlan High School	28	Moderate	-
6	Talipapa High School	164	Low to Very High	-
7	Caybiga High School	165	Low to Moderate Low	-
8	Deparo High School	168	Low to High Low	High
9	Llano High School	167	Low to High Low	Low
10	Sampaguita High Schl.	175	Low	High
11	Cielito Zamora	172	Moderate	Low 8
12	Urduja Business High School	172	Moderate	-
13	Amparo High School	179	High to Very High	Low to Moderate
14	AHS-H. Dela Costa -Annex	179	Moderate	Low to Moderate
15	Pangarap High School	182	Moderate	-
16	Mountain Heights High School	183	Moderate	-
17	NHC High School	186	Moderate	-
18	Manuel L. Quezon High School	185	Moderate	-
19	Tala High school	188	Moderate	-
20	Bagong Silang High School	176	Low to Very High	-
21	Benigno Aquino, Jr.	176	Low to Very High	-
22	Kalayaan National HS	176	Moderate	-
23	Caloocan National Science & Tech.	173	Moderate	-

Table No. 2-05. Hospitals and Health Centers by Hazards Susceptibility

HEALTH FACILITIES		BARANGAY	HAZARD SUSCEPTIBILITY	
			FLOOD	RAIN-INDUCED LANDSLIDE
Hospitals				
1	Martinez Memorial Hospital	32	Moderate	
2	Our Lady of Grace Hospital	61	Low	
3	Our Lady of Lourdes Hospital of Caybiga, Inc.	166	M to H	
4	Markvim Hospital	177	Low to VH	
5	Nodado General Hospital	175	L to M	
6	North Caloocan Doctor's Hospital	185	Low to VH	
7	Caloocan City Medical Center	15	Low	
8	Dr. Jose Rodriguez Memorial Hospital	186	Low to VH	
Health Centers				
1	Julian Felipe Health Center	8	Moderate	High
2	Barangay 12 Health Center	12	Moderate	High
3	Barangay 14 Health Center	14	Moderate	
4	Barangay 18 Health Center	18	High	
5	Ana Health Center	28	Moderate	
6	A. A. Zapa Puericulture Center	34	High	
7	Marulas Puericulture Center	36	M to H	
8	Barangay 118/120 Health Center	120	L to VH	
9	Calaanan Puericulture Center	53	L to M	
10	Francisco Health Center	75	M to H	
11	Grace Park Health Center	108	L to M	
12	Barrio San Jose Health Center	128	M to H	
13	Baesa Health Center	161	High	
14	Sta. Quiteria Health Center	162	L to VH	
15	Talipapa Health Center	164	Very High	
16	Bagbaguin Health Center	165	L to M	
17	Llano Health Center	167	Low to high	Low
18	Deparo Health Center	168	L to M	High
25	Urduja Health Center	172	Very High	
26	Bagumbong Health Center	171	Low to high	
27	Bagumbong Dulo	173	L to VH	
28	Camarin Lying-in	174	L to VH	
29	Camarin Health Center	175	L to VH	High
30	Brixton Health Center	175	L to VH	High
31	Bagong Silang Health Center Ph. 1	176	L to VH	
32	Bagong Silang Health Center Ph. 2	176	L to VH	
33	Bagong Silang Health Center Ph. 7	176	L to VH	
34	Bagong Silang Health Center Ph. 8	176	L to VH	
35	Bagong Silang H. C. Ph. 9	176	L to VH	
36	Bagong Silang Health Center Ph. 10	176	L to VH	

	HEALTH FACILITIES	BARANGAY	HAZARD SUSCEPTIBILITY	
			FLOOD	RAIN-INDUCED LANDSLIDE
37	Parkland Health Center	177	L to VH	
38	Cielito Health Center	177	L to VH	
39	Barangay 178 A Health Center	178	L to VH	Low to Moderate
40	Barangay 178 B	178	L to VH	Low to Moderate
41	Amparo Health Center	179	L to VH	Low to Moderate
42	Pangarap Health Center	181	Very High	
43	Malaria Health Center	185	L to VH	
44	Tala Health Center	188	L to VH	

Table No. 2-06. Location of Informal Settler Families (ISFs) By Hazard Susceptibility

	DANGER AREAS (Creek, Riverside, Canals, Esteros and Under the Bridge)	BARANGAY	HAZARD SUSCEPTIBILITY	
			FLOOD	RAIN-INDUCED LANDSLIDE
1	Cantarilla Creek - 212 families	1	Low	Low
		2	Low	Low
		4	Low	Low
2	Caloocan Navotas River - 689 families	8	Low to Moderate	High
		12	Moderate	High
		14	Moderate	Low
		16	High	Low
		18	High	Low
		20	High	Low
		28	Moderate	Low
3	Casili Creek - 1,402 families	17	Moderate	Low
		19	Moderate	Low
		21	Low to Moderate	Low
		29	Moderate	Low
		31	Moderate	Low
		32	Moderate	Low
		33	Moderate to High	Low
		34	High	Low
		35	Moderate	Low
		43	High	Low
		46	Low	Low
		49	Very High	Low
		59	Very High	Low
63	Moderate	Low		
65	Low	Low		
66	Moderate	Low		
67	Moderate	Low		
		70	High	Low

DANGER AREAS (Creek, Riverside, Canals, Esteros and Under the Bridge)		BARANGAY	HAZARD SUSCEPTIBILITY	
			FLOOD	RAIN-INDUCED LANDSLIDE
		72	Low	Low
		75	Moderate to High	Low
		76	Moderate to High	Low
4	Estero de Maypajo - 374 families	35	Moderate	Low
5	Maligaya Creek - 555 families	118	Low to Very High	Low
		120	Low to Very High	Low
6	Tullahan River - 341 families	160	Moderate to High	Low
		161	Low	Low
		162	Low to Very High	Low
		163	Low	Low
		164	Low	Low
7	Bisalaw Creek - 202 families	166	Moderate to High	Low
8	Bignay Llano Creek - 104 families	167	Low to High	Low
9	Camarin Creek (Pasong Palad) - 398 families	171	Low to High	Low
		172	None to Very High	Low
		173	Low to Very High	Low
		175	Low to Very High	High
		177	None to Very High	Low
10	Bagong Silang Creek - 174 families	176		
		Ph. 7	Low to Very High	Low
		8	Low to Very High	Low
		9	Low to Very High	Low
		10	Low to Very High	Low
11	Matarik Creek (B. Silang Creek) - 725 families	174	Low to Very High	Low
		175	Low to Very High	High
		178	Low to Very High	Low to Moderate
		179	Low to Very High	Low to Moderate
		180	Low to Very High	Low
		187	Low to Very High	Low
12	Sapang Alat River (Marilao Creek) - 1,665 fam.	181	Low to Very High	Low
		182	Low to Very High	Low
		184	Moderate	Low
		185	Moderate to VH	Low
		186	Low to Very High	Low

Table No. 2-07. Police Stations by Hazards Susceptibility

POLICE STATION/ SUBSTATION		BARANGAY	HAZARD SUSCEPTIBILITY	
			FLOOD	RAIN-INDUCED LANDSLIDE
1	PCP 4	124	Low to Very High	-
2	PCP 3	118	Low to High	-
3	PCP 7	23	High	-
4	PCP 9	31	High	-
5	PSB 36	36	Moderate to High	-
6	PCP 8	16	High	-
7	North Extension PCP 13	175	Very High	High
8	North Extension PCP 14	176	Very High	High
9	Sub-Station 4	175	Very High	High
10	PCP 6	162	Very High	-
11	PCP 16	179	Very High	-
12	PCP 17	180	Very High	-
13	PCP 18	181	Very High	-
14	PCP 19	182	Very High	-
15	PCP 20	185	Very High	-
16	PCP 21	186	Very High	-
17	PCP 23	177	Very High	-
18	Sub-Station 5	176	Very High	-
19	PCP 22	166	Moderate to High	-

Table 2-08. Fire Stations by Hazards Susceptibility

FIRE STATION/ SUBSTATION		BARANGAY	HAZARD SUSCEPTIBILITY	
			FLOOD	RAIN-INDUCED LANDSLIDE
1	Central Fire Sub-Station	80	Low	-
2	Bagong Barrio Fire Sub Station	146	Low	-
3	Barrio San Jose Fire Sub station	128	M to H	-
4	4th Ave. Fire Sub Station	51	Low	-
5	Maypajo Fire Sub Station	34	High	-
6	B.F. Homes Fire Sub Station	169	M to VH	-
7	Talipapa Fire Sub Station	164	Very High	-
8	Kaybiga Fire Sub Station	166	M to H	-

Table No. 2-09. Critical Institutional Facilities as of 2014¹⁶

BARANGAY	CRITICAL FACILITIES	FLOOD	RAIN-INDUCED LANDSLIDE
8	Barangay Hall	Moderate (Flood level = 0.5m)	High

¹⁶ Evaluated base on GMMA Ready Risk Assessment Project's Hazard Mapping

BARANGAY	CRITICAL FACILITIES	FLOOD	RAIN-INDUCED LANDSLIDE
12	Barangay Hall	Moderate (Flood level = 0.5m)	-
14	Barangay Hall	Moderate (Flood level = 1m)	-
20	Barangay Hall	Moderate to High	
34	Barangay Hall	High	-
37	Barangay Hall	Very High	-
16	Barangay Hall	High (Flood level = 1.1.5m)	-
22	Barangay Hall	Moderate to High (Flood level = 0to1m)	-
25	Barangay Hall	Moderate (Flood level = 1m)	-
30	Barangay Hall	Moderate (Flood level = 1m)	-
33	Barangay Hall	Moderate to High	-
35	Barangay Hall	Moderate (Flood level = 1m)	-
18	Barangay Hall	High (Flood level = 1.1.5m)	-
23	Barangay Hall	Moderate	-
28	Barangay Hall	Moderate (Flood level = 1m)	-
31	Barangay Hall	Moderate (Flood level = 1m)	-
32	Barangay Hall	Moderate (Flood level = 1m)	-
36	Barangay Hall	Moderate to High (Flood level = 1.5m)	-
119	Barangay Hall	Low to Very High (Flood level = 1.5m to 2m)	-
21	Barangay Hall	Low to Moderate	-
29	Barangay Hall	Moderate (Flood level = 1m)	-
43	Barangay Hall	Low to High (Flood level = 1m to 1.5m)	-
109	Barangay Hall	Low to Moderate (Flood level = 1m)	-
113	Barangay Hall	Low to Moderate (Flood level = 0.5 to 1m)	-
49	Barangay Hall	Low to Very High (Flood level = 0.5m)	-
60	Barangay Hall	Moderate (Flood level = 0.5-1.0m)	-
76	Barangay Hall	Moderate to High (Flood level = 1m)	-
110	Barangay Hall	Low to Moderate (Flood level = 1m)	-

BARANGAY	CRITICAL FACILITIES	FLOOD	RAIN-INDUCED LANDSLIDE
116	Barangay Hall	Low	–
118	Barangay Hall	Low to High (Flood level = 2m)	–
120	Barangay Hall	Low to Very High (Flood level = knee deep/1.5m)	–
122	Barangay Hall	Moderate (Flood level = 0.5 to 1m)	–
125	Barangay Hall	Moderate (Flood level = 0.5 to 1m)	–
128	Barangay Hall	Moderate to High (Flood level - 1.5 to 2m)	–
53	Barangay Hall	Low to Moderate (Flood level = 0.5m)	–
57	Barangay Hall	Low to Moderate (Flood level = 0.5m)	–
59	Barangay Hall	Low to Very High (Flood level = 2m)	–
66	Barangay Hall	Moderate (Flood level = 1.0m)	–
67	Barangay Hall	Moderate (Flood level = 0.3m)	–
106	Barangay Hall	Moderate	–
107	Barangay Hall	Low to Moderate (Flood level = 1m)	–
108	Barangay Hall	Low to Moderate	–

VULNERABILITY AND CROSS-SECTORAL ANALYSIS

The expected effects of climate change such as warmer temperature, increased rainfall variability, sea level rise and more intense typhoons.

According to the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) the country's average annual mean temperature is expected to increase up to 1.2°C by 2020 and up to 3°C by 2050.

Meanwhile, rainfall is expected to become more variable with changes ranging from -0.5 – 17.4% in 2020 and -2.4 – 16.4% in 2050. Luzon and Visayas are projected to have increased rainfall while Mindanao is projected to dry up.

Associated with increase in temperature will be sea level rise, which have the potential to inundate coastal settlements and low-lying areas, and more intense typhoons, which pack more devastating winds.

The impacts of climate variability on different sectors would likely to differ from one place to another due to differences in local conditions.

Table No. 2-10: Sector Impacts

SECTOR	SUB-SECTOR	IMPACTS
SOCIAL	Public health and health services	<ul style="list-style-type: none"> • Increase levels of heat stress, respiratory illness, chronic disease, human displacement, infectious disease and premature death • The populations at greater risk are those with the least ability to adapt • The number of people at risk for flooding increases • Health facilities on the low-lying and areas near waterways areas will be severely affected by flood
	Human Settlement	<ul style="list-style-type: none"> • Destruction due to landslides, flooding and sea level rise causing climate induced environmental refugees • Communities near coastal/waterways are at high risk
	Education	<ul style="list-style-type: none"> • 12 public schools near Casili Creek and Dagat-Dagatan in South Caloocan and 30 public schools lying near Tullahan, Marilao and other tributary rivers in North Caloocan will be affected by flooding
INFRASTRUCTURE	Transportation and Infrastructure	<ul style="list-style-type: none"> • Damage from sea-level rise, erosion, flooding, landslides, and temperature extremes • Flooding and heavy rainfall may overwhelm local water infrastructure and increase the level of sediment and contaminants in the water supply • Delays on the respond to disasters and delivery of basic services due to damage to some transportation infrastructure
	Drainage and Flood Control	<ul style="list-style-type: none"> • Frequent flooding at low-lying areas • Obstruction of illegal structures and massive volume of dumped solid wastes at existing natural surface drainage system due to ISFs
ECONOMIC	Tourism and recreation	<ul style="list-style-type: none"> • Shorter recreation season due to severe typhoons
	Land Use	<ul style="list-style-type: none"> • Rate of conversion of land areas for urban uses • Conflicting/competing land uses
ENVIRONMENT	Solid Waste Management	<ul style="list-style-type: none"> • Increase pollution level along easements of waterways • Disposal of domestic sewage
INSTITUTIONAL	Administrative Governance	<ul style="list-style-type: none"> • Interruption in government service and delays of delivery of basic services • 33 barangay halls located in the Dagata-Dagatan were identified as critical areas

LCCAP OBJECTIVES

PROPOSED CLUP OUTPUT AND OUTCOME INDICATORS

Table[C3] 3-01. Vision, Goals and Objectives with Output / Outcome Indicators, CLUP 2016-2025

VISION	GOALS / OBJECTIVES	OUTPUT INDICATORS	OUTCOME INDICATORS
<p><i>"Peopled by resilient, peace-loving and dynamic communities, living in a safe and ecologically balanced environment"</i></p>	<p>GOAL 1. A progressive City that provides excellent urban services and amenities;</p>		
	<ul style="list-style-type: none"> Encourage development of new sustainable residential communities that would accommodate locally displaced informal settlers. 	<ul style="list-style-type: none"> Increased in number of housing projects and housing units for local informal settlers as beneficiaries Decrease in number of local informal settlers 	<ul style="list-style-type: none"> Reduced housing backlog Secured tenurial status of informal settlers
	<ul style="list-style-type: none"> Maximize public investments on critical facilities delivering health, education and protective services in partnership with local and international organizations; 	<ul style="list-style-type: none"> Increase in the new development or improvement of facilities that provides health, educational, and protective services to marginalize communities, in partnership with local and international organization Compliance to social development indicators and standards such as student – classroom ratio, hospital bed – population ratio, police-population ratio, fireman-population ratio, etc. 	<ul style="list-style-type: none"> Improved effectiveness and efficiency of the City Government in providing basic economic and social services Reduced crime-rate, increased completion rate of basic education, reduced threat to lives and properties from fire hazards, decreased total morbidity and mortality rates, etc.
	<p>GOAL 2. A harmonious community with utmost capacity to deter the effect of natural and human-made hazards and other calamities that threatens the general welfare, health and safety of the population particularly woman, children and the differently-abled city residents;</p>		
	<ul style="list-style-type: none"> Protect and manage critical areas such as major watercourses and its 	<ul style="list-style-type: none"> Increase length of waterways protected from all types of illegal 	<ul style="list-style-type: none"> Improved water quality of natural surface drainages Reduced risks on life and

VISION	GOALS / OBJECTIVES	OUTPUT INDICATORS	OUTCOME INDICATORS
	<p>embankments together with communities exposed to natural hazards, against human encroachments and other unsustainable human activities.</p>	<p>encroachment through clearing of illegal structures and improvement of all embankments</p>	<p>property of residents brought by perennial flood hazards</p> <ul style="list-style-type: none"> Protects health and safety welfare of marginalized member of communities particularly woman, children and person with disabilities
	<ul style="list-style-type: none"> Implement sustainable system of infrastructure development that would avert impact of eminent hazards and protect natural resources (e.g. ground water, natural surface drainages) 	<ul style="list-style-type: none"> Increased number and scale of road and utility infrastructure that adopted sustainable form of development 	<ul style="list-style-type: none"> Lowered risks on damages to life and property brought about by natural and man-made hazards.
	<ul style="list-style-type: none"> Promote and sustain redevelopment of communities potentially exposed to various type of natural and human-made hazards. 	<ul style="list-style-type: none"> Increased land area of communities redeveloped to adapt with the effect of Natural and Human-Made Hazards 	<ul style="list-style-type: none"> Reduced risks on life and property of residents brought about by multiple natural hazards (e.g. flood, severe wind, ground shake, etc.) and human-made hazards (e.g. crime, civil disorder, fire, industrial accidents, etc.)
	<ul style="list-style-type: none"> Strictly enforce accessibility and gender laws, regulations and standards to all habitable buildings, transportation facilities, and public spaces; and mainstream said legal measures to local development policies, standards, programs, projects and activities 	<ul style="list-style-type: none"> Increase in percentage and number of habitable buildings, transportation facilities, and public spaces that complies with accessibility and gender laws, regulations and standards 	<ul style="list-style-type: none"> Increased accessibility and usability of public facilities and infrastructure by women and children, and persons with disabilities.
	<p>GOAL 3. A City that efficiently use, acquire and manage land as a limited resource;</p>		
	<ul style="list-style-type: none"> Facilitate the renewal and revitalization of blighted areas, and informal settlements 	<ul style="list-style-type: none"> Increased in area of upgraded blighted communities 	<ul style="list-style-type: none"> Improved general living condition of settlers on upgraded blighted areas
	<ul style="list-style-type: none"> Direct the protection, preservation and conservation of sites and structures that has ecological, aesthetic, 	<ul style="list-style-type: none"> Identified, assessed, restored and improved sites and structures that has ecological, aesthetic, historical and cultural 	<ul style="list-style-type: none"> Protection, preservation, conservation and promotion of the City's historical and cultural heritage;

VISION	GOALS / OBJECTIVES	OUTPUT INDICATORS	OUTCOME INDICATORS
	historical and cultural significance;	significance	<ul style="list-style-type: none"> Established growth of local historical and cultural tourism
	GOAL 4. Governance that advances acceptable and orderly development of growth and progress.		
	<ul style="list-style-type: none"> Direct all implementation and management of various local infrastructure programs and projects in coordination with on-going and proposed major projects of NGA's and PPP proponents; 	<ul style="list-style-type: none"> Coordinated implementation of government projects and projects implemented by utility concessionaires (e.g. water supply, power services, and telecommunication projects) Increased number of development programs and projects implemented through Public-Private Partnerships. 	<ul style="list-style-type: none"> Incurred financial and economic savings from wasteful uncoordinated series of projects implemented by various government agencies and utility concessionaires
	<ul style="list-style-type: none"> Maximize partnership with the business sector and civil society groups in pursuing progress through participatory development 	<ul style="list-style-type: none"> Increased number of programs and projects implemented with coordination or direct participation of business sector and civil society groups using Bottom-Up Approach (BUB) in Planning 	<ul style="list-style-type: none"> Increased participation of the private sector in local development planning
	<ul style="list-style-type: none"> Support and sustain a desirable local land use pattern that would prevent wasteful development of resources and minimize the cost of establishing public infrastructure, utilities and institutional amenities; 	<ul style="list-style-type: none"> Increased number of public infrastructure, community facilities, utilities and institutional amenities; developed in remote areas located apart from major urban centers and primary arterial roads. 	<ul style="list-style-type: none"> Incurred economic savings from shortened journeys between residential neighborhoods Added business revenues from new commercial and institutional services and amenities
	<ul style="list-style-type: none"> Improve travel efficiency, mobility and accessibility of local residents and enterprises to essentially needed goods, services and facilities, 	<ul style="list-style-type: none"> Increased completion and success rates in the research, planning and development of proposed and existing road infrastructure, traffic management and traffic engineering system Increase rate of compliance of existing and proposed economic and 	<ul style="list-style-type: none"> Reduced volume of motor vehicles Decreases travel time and use of motor vehicle mode in all journeys Reduced emission and concentration of gaseous pollutants (e.g. CO, HC, NO_x, PM) from motor vehicles at traffic congested areas

VISION	GOALS / OBJECTIVES	OUTPUT INDICATORS	OUTCOME INDICATORS
		<p>social infrastructures, institutions, and business establishments to the provisions of accessibility law (B.P.344)</p> <ul style="list-style-type: none"> • Increase in modal share of public transit system (e.g. 'jeepneys' and buses) and decreased use of private vehicles • Increase level of service of main arterial roads during peak hour traffic (decreases in actual volume-capacity ratio) 	
<p><i>"The historic city of Caloocan, center of sustainable economic growth"</i></p>	<p>GOAL 5. A vibrant Local Economy that promotes key investment opportunities and balances physical development with sustainable use of local resources;</p>		
	<ul style="list-style-type: none"> • Regulate and guide various urban activities and land use changes according to national, local and regional development goals, objectives and policies 	<ul style="list-style-type: none"> • Increased in numbers and extents of economic and social infrastructure programs and projects that promote and support national, local and regional development goals, objectives and policies • Increase in number of land development projects and building constructions that complies with the provisions of City Zoning Ordinance, P.D. 957, BP 220, and other relevant national and local legislations, guidelines, rules and regulations. 	<ul style="list-style-type: none"> • Increased in number of business investments / establishments at targeted growth areas • Incremental increased of local revenues from local permit fees, taxes, and other charges • Increased number of additional from new entrepreneurial activities • Increased assessed values of real estate properties
	<ul style="list-style-type: none"> • Promote strong business investments engaged in labor intensive industries, trading and commercial services 	<ul style="list-style-type: none"> • Increase in number and scale of approved business permits for businesses that has capacity to generate employment (e.g. product manufacturing, processing, and assembly, retail shops, and BPO's) • Promote Investments on new commercial amenities and services (e.g. markets, shopping areas, schools, 	<ul style="list-style-type: none"> • Reduced rate of unemployment and underemployment • Reduced rate of poverty incidence / Increased number of household living above poverty threshold level

VISION	GOALS / OBJECTIVES	OUTPUT INDICATORS	OUTCOME INDICATORS
		groceries, etc.) near sub-urban neighborhood communities	
<p><i>“Living in a safe and ecologically-balanced environment, served by a government that gives the highest value to the needs of its citizens”</i></p>	<p>GOAL 6. A City that promotes sustainable development, preservation of the natural environment and the conservation of historical and cultural heritage</p>		
	<ul style="list-style-type: none"> • Implement the development of all existing subdivision parks and playgrounds into urban greenery area and new public spaces 	<ul style="list-style-type: none"> • Increase in area of new and existing public spaces, parks, playgrounds, recreation and similar community facilities developed or improved with landscapes, hardscapes, outdoor amenities and utilities • Compliance with current and future land area requirement for parks and playground at 500 square meters per 1,000 population 	<ul style="list-style-type: none"> • Increased number of individuals and household engaging in active and passive recreations • Improved living standard and health of communities
<p>-do-</p>	<ul style="list-style-type: none"> • Promote improvement of air and water quality 	<ul style="list-style-type: none"> • Increased rate of compliance of industries and motor vehicle owners on water quality standards and ambient air quality standards 	<ul style="list-style-type: none"> • Decreased emission level of air / gaseous pollutants (PM₁₀, PM_{2.5} level, NO_x, Sox) from various sources • Decreased total load of water pollutants (BOD, COD, TSP) disposed to natural surface drainages
	<ul style="list-style-type: none"> • Control disposal of solid waste and promote waste recovery 	<ul style="list-style-type: none"> • Improved solid waste management collection, handling, treatment and disposal • Increased number of improved material recovery system per Barangay 	<ul style="list-style-type: none"> • Decreased disposal of uncollected solid waste to natural surface drainage • Decreased volume of residual waste disposed to landfill
	<ul style="list-style-type: none"> • A community that supports conservation of historical and cultural heritage 	<ul style="list-style-type: none"> • Increased number of restored / conserved sites and structures that has historical, cultural and aesthetic significance / relevance 	<ul style="list-style-type: none"> • Enhanced awareness on significance of local sites, structures, relics and records to national and City’s history and culture • Increased number of tourists and development of tourism-related activities.

CLIMATE CHANGE ADATATION AND MITIGATION MEASURES

The greenhouse gas emissions that are causing global warming come from a wide range of sources including cars and trucks, power plants and others. Because of these sources there are many options for reducing emissions.

The manifestations of climate change in the form of temperature increase, flooding, land subsidence and others have impacts on the city's economy, infrastructure, and use and on the city's 188 barangays.

In response to all of these and in consonance with the Climate Change Act which provides the policy framework with which to systematically address the growing threats on community life and its impact on the environment.

ADAPTATION/ MITIGATION ACTIONS

Table 4-01: Impacts of Climate Change on Different Infrastructures, Mitigation and Adaptation Measures¹⁷

Infrastructure	Description	Impacts	Mitigation	Adaptation
Buildings	Refers to residential dwellings, commercial, industrial and institutional buildings	<ul style="list-style-type: none"> • Increased residential, commercial and industrial property damage • Increased maintenance, repair and replacement of residential, commercial and industrial buildings • Reduction in capacity of businesses to operate due to property damage • Reduction in use of buildings and facilities due to inundation, flooding, ground movement and structural integrity 	<ul style="list-style-type: none"> • Promotion of green buildings such as building with energy efficient designs (natural lighting and ventilation) • Adopt alternative and more efficient construction methods (pre-fabrication and off-site construction) • Increase density of homes and mixing uses to minimize transportation 	<ul style="list-style-type: none"> • Locate settlements away from vulnerable areas (waterways, powerlines, road-right-of ways, etc.) • Improve building design (e.g. use of climate change resilient materials, stronger roof fixing connections, installation of essential vulnerable equipment on higher elevations)
Transportation	Refers to roads, highways and bridges	<ul style="list-style-type: none"> • Increased roads, highways and bridges damage and deterioration • Increased maintenance, repair and replacement of roads, highways and bridges • Reduction in use of transport infrastructure due to inundation, flooding, ground movement and structural integrity 	<ul style="list-style-type: none"> • Promotion of electric vehicles • Planning for efficient transport system to minimized trip generation • Anti-smoke belching campaign • Encourage non-motorized transport (i.e. cycling and walking) 	<ul style="list-style-type: none"> • Locating major transport infrastructure away from vulnerable areas • Improve transport infrastructure design such as higher road embankment elevation, use of elevated roads, walkways, pathways and thicker pavement • Ensure new settlements are accessible by all-weather roads • Improve traffic management
Water Supply	Water supply includes sources of water, reservoirs, treatment facilities, and transmission and distribution lines. As water is crucial to man's existence, climate-proofing this infrastructure is of utmost importance	<ul style="list-style-type: none"> • Reduction in available water for consumptive use-potable, commercial and industrial • Declining water quality leading to higher treatment costs • Accelerated degradation and increased failure of water distribution infrastructure 	<ul style="list-style-type: none"> • One way to mitigate the impact of climate change in the field of water supply is through the use of water supply systems with minimal contribution to climate change, e.g. gravity over pumped systems, which does not require power. 	<ul style="list-style-type: none"> • Encourage water use efficiency and conservation (technology, behavioral and pricing solutions and incentives) • Develop and implement rainwater harvesting systems • Promote water reuse and/or recycling

¹⁷ LGU Guidebook in LCCAP Formulation-Book 2

Infrastructure	Description	Impacts	Mitigation	Adaptation
		<p>(i.e. pipe breakage due to increased ground movement)</p> <ul style="list-style-type: none"> • Increase in water cost per unit of production 		
Stormwater and Drainage	<p>Stormwater and drainage infrastructures are very important in conveying flood water from settlements and thereby preventing flooding. It is thus crucial that these facilities are strengthened in the face of climate change.</p>	<ul style="list-style-type: none"> • Increased stormwater flows <ul style="list-style-type: none"> ▪ Increased flood occurrence • Wider areas of inundation 	<ul style="list-style-type: none"> • Prioritize drainage system options with mini 	<ul style="list-style-type: none"> • Develop and implement flood plain zones • Improving natural and artificial drainage system • Improve drainage infrastructure design such as accounting for increased rainfall intensities in design flow calculations • Create and develop flood and storm shelters • Develop locally specific flood protection programs • Water river management by avoiding bank erosion and creating buffer zones
Waste Water System	<p>Wastewater systems are those infrastructures that deal with the collection, conveyance and treatment of wastewater or sewage generated from households, commercial and industrial establishments and including institutional establishments.</p>	<ul style="list-style-type: none"> • Increased wastewater flows due to inflow/infiltration, which would require larger sewer lines and treatment facilities, thus more expensive facilities • Increased damage to pipes and appurtenances due to flooding, ground movement and structural integrity, which would require higher maintenance costs 	<ul style="list-style-type: none"> • Prioritize wastewater system options with minimal contribution to climate change such as conveying wastewater by gravity as opposed to pumped systems • Construction and operation of energy-neutral wastewater treatment facilities 	<ul style="list-style-type: none"> • Locating major wastewater infrastructure away from vulnerable areas. Example of this is situating certain components such as electrical and electronic equipment in higher elevations to avoid damage by flooding • Improve wastewater infrastructure design to account for climate change e.g. increase design flows • Adopt formal asset management approach that can effectively consider climate inputs to

Infrastructure	Description	Impacts	Mitigation	Adaptation
				maintain wastewater infrastructures
Solid Waste Systems	Refers to solid waste disposal facilities	<ul style="list-style-type: none"> • Higher generation rate of methane due to increasing temperature • Increased leachate production due to increased rainfall intensities 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Full implementation of proper solid waste management program • Reserve local sites to accommodate waste sorting, recycling and re-use; locate sites away from climate change vulnerable areas
Power Systems	Largely refers to transmission and distribution systems	<ul style="list-style-type: none"> • Damage to transmission and distribution lines resulting in increased blackouts • Reduced network capacity • Accelerated deterioration and depreciation of assets due to highly variable climate • Potential blackout due to increased demand especially in areas where temperature is increasing thus increased air-condition units use 	<ul style="list-style-type: none"> • Promote alternative energy sources that will minimize need for transmission and distribution infrastructure. 	<ul style="list-style-type: none"> • Improve power infrastructure design such as us of climate change resilient materials, changes of design parameters • Use of locally sources energy to minimize transmission infrastructure • Adopt formal asset management approach that can effectively consider climate inputs to maintain power infrastructures

IDENTIFIED ADAPTATION/ MITIGATION OPTIONS

Table No. 4-02 Mitigation/ Adaptation Initiatives for Temperature Increase

Programs/ Projects and Activities	NCCAP Priority Responded to	Responsible Office	Implementation Period
Median and sidewalk landscaping, greening, installation of bike lanes	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security 	DPSTM, CED	2017-2025
Reduction of Greenhouse Gas through:			
Procurement of Energy Efficient lightings on different offices on the government	<ul style="list-style-type: none"> • Ecological and environmental stability 	All government offices and departments	2017-2025
Landscaping and greening	<ul style="list-style-type: none"> • Ecological and environmental stability 	Parks Administration Services	
Installation of Traffic Road sign and engineering devices (i.e. smoke belching)	<ul style="list-style-type: none"> • Ecological and environmental stability 	DPSTM	2017-2019
Strict implementation of traffic rules	<ul style="list-style-type: none"> • Ecological and environmental stability 	DPSTM	2017-2025
Regular maintenance of vehicles	<ul style="list-style-type: none"> • Ecological and environmental stability 	All offices/departments of city government	2017-2025
Anti-Smoke belching operation (installation of equipment)	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security 	DPSTM	2017-2025
Urban Greening	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security 	Parks and Recreation Services	2017-2025
Promotion of waste composting	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security 	ESS	2017-2025
Installation of energy efficient streetlights (LED) to various streets, pathwalks and alleys	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security 	City Engineering Department	2017-2025
Promotion and Purchase of e-bicycles and tricycles	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security 	DPSTM	2017-2025
Site acquisition/ preparation of additional 3 air quality monitoring station	<ul style="list-style-type: none"> • Ecological and environmental stability 	ESS	2017-2019
Acquisition of air quality monitoring equipment/ analyzer, with data logger and data acquisition system	<ul style="list-style-type: none"> • Ecological and environmental stability 	ESS, EMB	2017-2019

Programs/ Projects and Activities	NCCAP Priority Responded to	Responsible Office	Implementation Period
Conduct monitoring of water quality of natural surface drainage based on parameters prescribed by ESS on Water Quality Criteria for Freeh Waters	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security • Water sufficiency 	ESS, EMB	2017-2019
IEC campaign on the strict implementation of "NO SEGREGATION NO COLLECTION POLICY" at BARANGAY LEVEL	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security 	ESS,	2017-2025
Massive information campaign on cleanliness, tree planting and adaptability to climate change – "KALINISAN AT KALUSUGAN PARA SA KAUNLARAN"(Henson, 2016)	<ul style="list-style-type: none"> • Ecological and environmental stability • Human security 	ESS	2017-2025
Conduct massive Information, Education, & Communication (IEC) campaign activities to all schools, institutions, and selected communities to promote waste reduction and bio-composting and printing of campaign materials	<ul style="list-style-type: none"> • Ecological and environmental stability 	ESS, DepEd, CRO, PIO	2017-2025
Integrating increased temperature and urban heat concerns in the city's development plans, programs and policies such as: <ul style="list-style-type: none"> • Comprehensive Land Use Plan • Comprehensive Development Plan • Annual Investment Plan • City Disaster Risk Reduction and Management Plan • Traffic Code • Executive Legislative Agenda • Ten Year Solid Waste Management Plan 	<ul style="list-style-type: none"> • Ecological and environment stability • Human security • Knowledge and capacity development 	All departments/offices of the city government	2017-2025
Food Security			
Vegetable seed distribution	<ul style="list-style-type: none"> • Food security 	Parks	2017-2019

Table No 4-03: Mitigation/ Adaptation Initiatives for flooding due to increase precipitation

Programs/ Projects and Activities	NCCAP Priority Responded to	Responsible Office	Implementation Period
Flooding brought on by typhoon			
Relocating flood prone/danger area communities and commercial centers like public market/s to safer place	<ul style="list-style-type: none"> • Human security 	UPAO	2017-2025
Develop and implement a CCA Plan for settlement and resettlement in consultation with affected communities, private sector and civil society organizations	<ul style="list-style-type: none"> • Human security 	UPAO	2017-2025

Programs/ Projects and Activities	NCCAP Priority Responded to	Responsible Office	Implementation Period
Finalization and Approval of Caloocan City Comprehensive Shelter Plan	<ul style="list-style-type: none"> Human security 	UPAO, CSWD, CED, CHD, Caloocan City Local Housing Board	2017-2019
Capacity Building			
Conduct seminars, trainings workshop on climate change and climate variability	<ul style="list-style-type: none"> Knowledge and capacity development 	All offices and departments of the city government	2017-2019
Improving city flood management	<ul style="list-style-type: none"> 		
Construction, rehabilitation and improvement of pathwalks and drainage system	<ul style="list-style-type: none"> Ecological and environmental stability Human security 	City Engineering Department	2017-2025
Concreting/ asphaltting/ improvement of various roads, alleys, bridges, highways and pathwalks	<ul style="list-style-type: none"> Ecological and environmental stability 	City Engineering Department	2107-2025
Construction of creek Rip-rap	<ul style="list-style-type: none"> Ecological and environmental stability Human security 	City Engineering Department	2017-2019
Clearing of illegal structures along easement of creeks and rivers and peripheral / lateral canals	<ul style="list-style-type: none"> Ecological and environmental stability Human security 	City Engineering Department	2017-2019
Annual dredging of creeks and rivers and peripheral / lateral canals	<ul style="list-style-type: none"> Ecological and environmental stability Human security 	City Engineering Department	2017-2025
Infrastructure and Structures	<ul style="list-style-type: none"> 		
Construction, repair, rehabilitation and maintenance of school buildings, multi-purpose and other government building	<ul style="list-style-type: none"> Ecological and environmental stability Human security 	City Engineering Department	2017-2019
Maintenance of existing city-own parks and other similar facilities	<ul style="list-style-type: none"> Ecological and environmental stability 	CATO, PAS. GSO. Sports Development Services, ESS, Barangays	2017-2019

Table No 4-04: Mitigation/ Adaptation Initiatives for flooding due sea level rise

Programs/ Projects and Activities	NCCAP Priority Responded to	Responsible Office	Implementation Period
Installation of CCTV especially on hazard prone areas	<ul style="list-style-type: none"> Ecological and environmental stability Human security 	DPSTM, CCDRRMO	2017-2025

CROSS-CUTTING STRATEGIES

The city government espoused several cross-cutting areas that were identified by the National Framework as crucial to the achievement of the local goals: Capacity Development, Knowledge Management, Information, Education and Communication (IEC), Research and Development (R&D), and Technology Transfer. The succeeding sections outline the priority strategies that would be undertaken under these critical areas of concern.

CAPACITY DEVELOPMENT

Capacity development objectives in the area of policy formulation, organizational development and systems improvement shall be pursued by the local government congruent to the programs of national government agencies and stakeholders group involved. At the city level, specialized capacity (training) needs in the areas of adaptation and mitigation have to be addressed to enable the full, effective and sustained implementation of the Local Framework and Action Plan. Overall, these strategies are aimed at strengthening the capacity of local institutions and individual stakeholders for undertaking climate change initiatives.

Strategic Priorities

- a. Review and develop policy instruments at all levels to facilitate the implementation of the Local Frameworks Strategy on Climate Change.
- b. Enhance the Capacity to plan, prepare, implement , monitor and report on climate change actions, including the integration of such actions into relevant local strategies and plans;
- c. Coordinate with concerned national agencies for enhancement of systematic observation, research and knowledge management, which includes strengthening and using data for systematic observation, early warning, local downscaling and modeling, disaster preparedness, vulnerability assessment and other climate services.
- d. Strengthen climate change communication, education, training and public awareness at all levels, including grassroots levels, taking into account gender issues;
- e. Encourage and strengthen participatory and integrated approaches taking climate change considerations into account to the extent feasible in relevant social, economic and environmental policies and actions.
- f. Enhance systems and procedures to strengthen institutional arrangements in addressing climate change mitigation and adaptation.
- g. Harmonize the development of appropriate assessment tools such as carrying capacity assessment incorporating an appropriate environmental valuation methodology in the area of decision-making, policy development, research and development (R&D), payment and incentive mechanisms, and other climate change-related endeavors with other NGAs, LGUs and stakeholders concern.

KNOWLEDGE MANAGEMENT AND INFORMATION, EDUCATION AND COMMUNICATION (IEC)

Under knowledge management, mechanisms and protocols shall be installed for a well-coordinated climate change information and data management and reporting system. The information management system includes the adoption and sharing of experiences and lessons with other local government units along with their best practices and innovative measures in addressing climate change adaptation and mitigation with the inclusion of assessments/evaluations. This knowledge management mechanism shall then be translated into IEC materials and tools in advancing the public approach towards awareness on Climate Change.

Strategic Priorities

- a. Educate the public and private sectors to secure broad public awareness, support and cooperation in disaster risk reduction, mitigation and adaptation programs.
- b. Mainstream climate change into all levels of formal education.
- c. Provide socio-economic and cross-sectoral climate change impacts and vulnerability assessment and decision-making tools in all levels of development.
- d. Maximize utility of forecast, research and climate change knowledge through coordination with all concerned NGAs to capacitate local agencies in the oversight of citywide behavior change communication (BCC) and IEC campaigns.
- e. Establish an operational network in partnership with other NGAs, NGO institutions and professionals to provide the city with necessary tools, observation and information in dealing with climate change.

RESEARCH DEVELOPMENT AND TECHNOLOGY TRANSFER

The local government shall coordinate with the Department of Science and Technology to avail of the agency's Research and Development as well as Technology Transfer of data on the current trends in climate change approach. This shall ensure the success of mainstreaming climate change adaptability in all the cities various programs and plans.

BUDGETARY REQUIREMENTS

Programs, Projects and activities identified the Caloocan City Local Climate Change Action Plan shall be funded through the following funding sources:

1. National Government Funding

The required funding for programs, projects and activities in the city comes from the national government agencies implementing it. It comes as an assistance to the local government infrastructure projects from the Office of the Congressional representative under the General Appropriations Act.

2. Caloocan City Government Funding

Funding requirements from the Local Government of Caloocan may come from its regular annual City Executive Budget which might include the following:

- 20% Internal Revenue Allotment (IRA) Development Fund which is annual appropriation that are earmarked for development Projects as defined by the Joint Memorandum Circular No. 2011-1
- Local Disaster Risk Reduction Management Fund or the 5% of the estimated revenue from regular sources shall be set aside to support disaster risk management activities as per Joint Memorandum Circular No. 2013-1 s. 2013
- Special Education Fund
- Incentivized Awards Program such as the Seal of Good Local Governance

3. *Other Sources of Funding*

Other sources of local funding comes through external sources that include but do not limit to the locally-based private corporations and enterprises, NGOs/POs, academe and private volunteer group or individuals.

MONITORING AND EVALUATION

MEANS OF IMPLEMENTATION

The following Strategies in the areas of governance, coordination, financing, valuation and partnerships are adopted to facilitate the implementation of the Framework. Other mechanism that may be appropriately during the formulation of the Action Plan shall be included.

- Establish appropriate management and institutional arrangements and coordination mechanisms for climate change at the national, sub-national and local levels.
- Maximize government financing instruments and local levels as source of funds for the National Framework Strategy.
- Install policy and incentive mechanism to facilitate and leverage private sector investments in climate change.
- Provide and access scaled-up, new and additional financial resources to support the requirements of the National Framework, including sectoral and local financing requirements.
- Development of appropriate assessment tool such as carrying capacity assessment incorporating an appropriate environmental valuation methodology to inform decision-making, policy development, research and development (R&D), payment and incentive mechanism, and other climate change-related endeavors.
- Establish partnerships among national and local government agencies, business, professional and other private groups, community-based organizations, academic and scientific organizations, and civil society organizations.

MONITORING AND EVALUATION OF THE FRAMEWORK

The Climate Change Commission, in coordination with concerned agencies and stakeholder groups, shall install a monitoring and evaluation (M&E) system to tack the implementation progress of the provisions of this Framework and resulting National Climate Change Action Plan and Local Climate Change Action Plan.

As per Rule VIII, Sec.1 of the Implementing Rules and Regulations of the Climate Change Act of 2009, review the provisions of this Framework every three (3) years using a participatory evaluation process.

REFERENCES AND ANNEXES

ABBREVIATIONS AND ACRONYMS

ABC – Association of Barangay Captains

BDRRMC – Barangay Disaster Risk Reduction Management Committee

Brgy. – Barangay

BP – Batas Pambansa

BPO – Business Process Outsourcing

CAO – City Assessor’s Office

CATO – Cultural Affairs and Tourism Office

CCDRRMC – Caloocan City Risk Reduction and Management Council

CCDRRMO – Caloocan City Disaster Risk Reduction and Management Office

CCDRRMP – Caloocan City Disaster Risk Reduction and Management Plan

CC – Climate Change

CCA – Climate Change Adaptation

CCATWG – Climate Change Adaptation Technical Working Group

CCC – Climate Change Commission

CCSWDD – Caloocan City Social Welfare Department

CCVI – Climate Change Vulnerability Index

CDP – Comprehensive Development Plan

CED – City Engineering Department

CEMO – City Environmental Management Office

CHD – City Health Department

CLUP – Comprehensive Land Use Plan

CMO – City Mayor’s Office

CRO – Community Relations Office

CPDD – City Planning and Development Department

DA – Department of Agriculture

DENR – Department of Environment and Natural Resources

DepEd – Department of Education

DILG – Department of Interior and Local Government

DOST – Department of Science and Technology

DPWH – Department of Public Works and Highways
DPSTM – Department of Public Safety and Traffic Management
DRR – Disaster Risk Reduction
DRRM – Disaster Risk Reduction and Management
EMB – Environmental Management Bureau
ESS – Environmental and Sanitation Services
GG – Greenhouse Gases
GSO – General Services Office
HUDCC – Housing and Urban Development Coordinating Council
LEIPO – Local Economic and Investment Promotion Office
IEC – Information and Education Campaign
IRA – Internal Revenue Allotment
IWRM - Integrated Water Resources Management
LDC – Local Development Council
LCCAP – Local Climate Change Action Plan
LCE – Local Chief Executive
LEIPO – Local Economic and Investment Promotion Office
NCCAP – National Climate Change Action Plan
NDRRMC – National Disaster Risk Reduction and Management Council
NGA – National Government Agency
NGO – Non-Government Organization
NWRB – National Water Resources Board
PAS – Parks Administration Services
PhiVolcs – Philippine Institute of Volcanology and Seismology
PIO – Public Information Office
PNP – Philippine National Police
POs – People’s Organization
PPP – Public-Private Partnership
RA – Republic Act
SP – Sangguniang Panlungsod
TMO – Traffic Management Office
UPAO – Urban Poor Affairs Office

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GLOBAL SEA LEVEL RISE IS RECOGNIZED

By Kevin S. Rodolfo and Fernando V. Siringan

METHOD OF COMPUTATION:

<http://climateactiontracker.org/methodology/85/Comparability-of-effort.html>