

MAINSTREAMING DISASTER RISK REDUCTION - CLIMATE CHANGE ADAPTATION (DRR-CCA) IN THE NEW MAKATI COMPREHENSIVE LAND USE PLAN (2013 – 2023) : A GUIDELINE

1.0 Introduction

It has been acknowledged that natural disasters throughout the world have occurred with more frequency and severity in the last twenty years, resulting in the loss of economic, humanitarian, and ecological resources in the areas struck by them. Many areas in the Philippines, whether urban or rural, are known to be vulnerable to natural hazards such as typhoons, floods, landslides, volcanoes, earthquakes, and tsunamis.

In 2010, it was estimated that about 66.40 % of the total population in the Philippines was living in urban areas.¹ Many of the old cities in the Philippines developed with little consideration for the geo-physical and hydro-meteorological hazards of their settlement sites and therefore were not able to avoid or mitigate the potential risks brought about by earthquakes and floods. The difficult tasks of disaster management and response in cities have been made all the more challenging by rapid urbanization and the increase in the number of densely populated informal settlements. The marginalized sector is often the most severely affected by natural disasters largely because of the poor location and lack of physical planning of their communities.

More recent and comprehensive studies of the geology in the Philippines have provided more precise geophysical information such as the presence of fault lines (the causal location of earthquakes) and the location of areas prone to liquefaction. In the mega-city of metro manila for example, there are three geological fault lines that cross the component Local Government Units (LGUs) of Taguig City, Makati City, Pateros, Pasig City, Marikina City, and Quezon City.²

Climate change is another recent concern that refers to significant and lasting changes in the statistical distribution of [weather](#) patterns in the world that is currently being experienced and is expected to further occur in the succeeding decades. In recent years, more frequent typhoons and unprecedented rainfall have resulted in destructive floods throughout the Philippines. In September 2009, Metro Manila was hit by typhoon Ketsana (PAGASA name: Ondoy), considered the most devastating typhoon since 1970. The flooding caused by the typhoon, however, yielded valuable information that could be used to mitigate potential floods in Metro Manila in

¹ www.indexmundi.com, accessed in April 5, 2012

² ncr.denr.gov.ph

the future. Such actual experiences and projected weather conditions in the future that are attributed to climate change have to be considered in the formulation of all development plans including the Comprehensive Land Use Plan. It is imperative that cities make use of the latest geophysical and hydro-meteorological data to identify areas that have to be redeveloped taking into consideration *disaster risk reduction*³ and *climate change adaptation*⁴.

2.0 Legal Bases

Based on the Local Government Code of the Philippines (Republic Act 7160), all cities and municipalities are mandated to formulate a Comprehensive Land Use Plan (CLUP) that will designate the type (e.g., residential, commercial) and intensity of land uses throughout the city or municipality. The Zoning Ordinance is the legal instrument that enforces the Land Use Plan of the city or municipality.

In 2005, the Hyogo Framework for Action (HFA) called for worldwide implementation of DRR initiatives to substantially reduce by 2015 the loss of lives as well as socio-economic and environmental resources brought about by disasters. In response to HFA's call, the National Economic and Development Authority (NEDA) Regional Development Office prepared a set of guidelines in 2008 to mainstream risk reduction within development and land use planning.

As a party to the United Nations Framework Convention on Climate Change, the Philippines passed Republic Act No. 9279 - the Climate Change Act of 2009. It is a law mainstreaming climate change into government policy formulations, establishing the framework strategy and program on climate change, creating for this purpose the Climate Change Commission, and for other purposes. The Climate Change Act adopts the ultimate objective of the Convention which is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system which should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

Recognizing the vulnerability of the Philippine archipelago and its local communities, particularly the poor, women, and children, to potential dangerous consequences of climate change such as rising seas, changing

³ "disaster risk reduction (DRR)" – is a term used for techniques that focus on preventing or minimizing the effects of disasters. The term has been adopted by the United Nations, which has developed an "International Strategy for Disaster Reduction".

⁴ Climate change adaptation is a response to climate change that seeks to reduce the vulnerability of biological systems to its effects.

landscapes, increasing frequency and/or severity of droughts, fires, floods and storms, climate-related illnesses and diseases, damage to ecosystems, biodiversity loss that affect the country's environment, culture, and economy, the State shall cooperate with the global community in the resolution of climate change issues, including disaster risk reduction. It shall be the policy of the State to enjoin the participation of national and local governments, businesses, non-government organizations, local communities and the public to prevent and reduce the adverse impacts of climate change and, at the same time, maximize the benefits of climate change.

Further recognizing that climate change and disaster risk reduction are closely interrelated and effective disaster risk reduction will enhance climate change adaptive capacity, the State shall integrate disaster risk reduction into climate change programs and initiatives.

Cognizant of the need to ensure that national and sub-national government policies, plans, programs and projects are founded upon sound environmental considerations and the principle of sustainable development, Republic Act No. 9279 declared that it is a state policy to **systematically integrate the concept of climate change in various phases of policy formulation, development plans, poverty reduction strategies and other development tools** and techniques by all agencies and instrumentalities of the government. Also in keeping with the HFA, the Philippine Congress passed Republic Act No. 10121 (RA 10121) or the "Philippine Disaster Risk Reduction and Management Act of 2010" to strengthen the Philippines' Disaster Risk Reduction and Management System, provide for the National Disaster Risk Reduction and Management Framework, institutionalize the National Disaster Risk Reduction and Management Plan, and appropriate funds therefore and for other purposes. Section 2 (g) of RA 10121 asserts that it is a policy of the State to "mainstream disaster risk reduction and climate change in development processes such as policy formulation, socio-economic development planning, budgeting, and governance particularly in the area of environment, agriculture, water, energy, health, education, poverty reduction, **land use and urban planning**, and public infrastructure and housing, among others.

3.0 Conceptual Framework

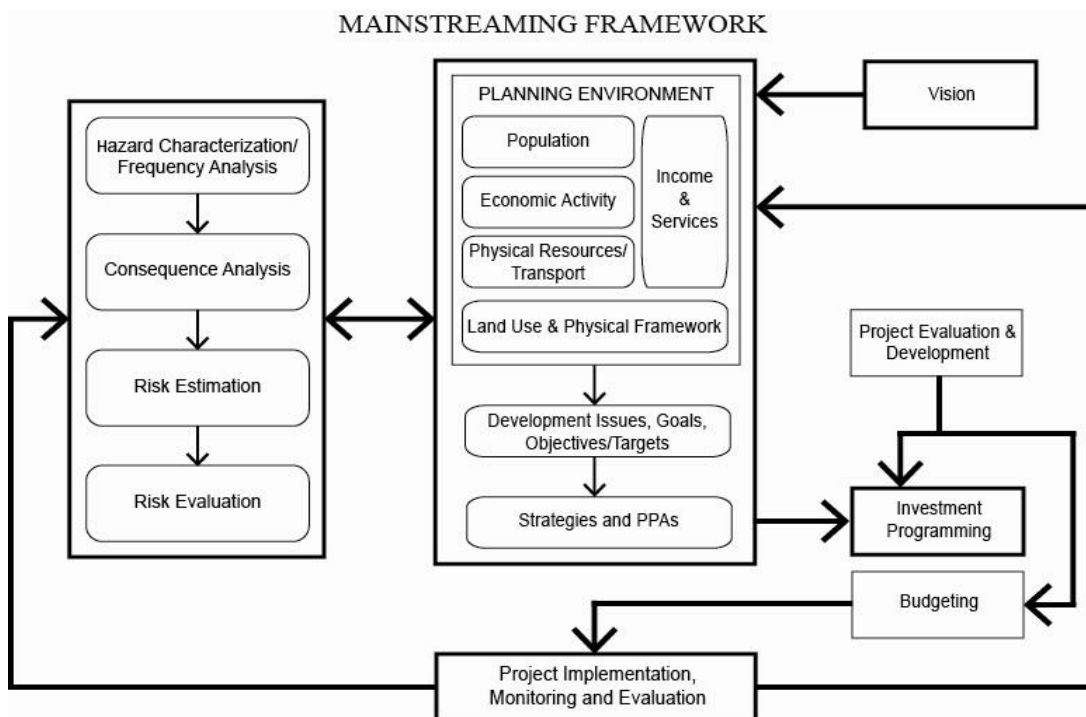


Figure 1. Framework for Mainstreaming DRR in Land Use Planning
 Source: *Mainstreaming Disaster Risk Reduction in Sub-national Development and Land Use/Physical Planning in the Philippines, NEDA, 2008*

The Climate Change Act of 2009 (RA 9279) defines **“Climate Change”** as a change in climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period typically decades or longer, whether due to natural variability or as a result of human activity.⁵ “Climate Change Adaptation” is the response to climate change that aims to reduce the vulnerability of biological systems to its effects. Adapting to climate change is particularly important in developing countries like the Philippines where the severe effects of climate change are expected to occur. Adaptive Capacity⁶ is closely linked to social and economic development as the economic costs of climate change adaptability will cost billions of dollars in the next few decades. The most common and widespread climate change-related disaster in Metro Manila will be floods. For the cities adjacent to Manila Bay, they will also experience sea level rise and storm surges. Other

⁵ Republic Act No. 9279 – Climate Change Act of 2009.

⁶ Adaptive Capacity – is the capacity and potential for humans to adapt to Climate Change.

problems that may arise that is related to climate change are typhoons, climate-related illnesses and diseases, and hot and humid summers. It should be realized that the adaptation challenge grows with the magnitude and the rate of climate change.

According to the Mainstreaming Disaster Risk Reduction (National Economic Development Authority, 2008), Disaster Risk Assessment (DRA) is the process of studying risks caused by natural hazards and their effects on elements at risk (e.g. people, buildings and structures, infrastructure, economic activities, and public services).⁷ Risk assessment is the process of quantifying and evaluating risk. The quantification of risks may be presented as the number of elements lost (e.g. loss of lives), proportion of elements affected (e.g., 30% of buildings), and monetary value of damaged property. DRA involves:

- a. Hazard characterization/ frequency analysis;
- b. Consequence analysis;
- c. Risk estimation; and
- d. risk prioritization.

In the process of formulating the New Makati Comprehensive Land Use Plan (2013-2023), hazard characterization/frequency analysis was completed. The other steps (i.e. consequence analysis, risk estimation, and risk prioritization) have to be completed in a more detailed undertaking involving more experts and consultation with the communities in all the barangays in Makati. Such a consultative process will require more time and resources to complete.

Through characterization/frequency analysis and analysis of available information, however, several critical areas that require immediate intervention can be identified. DRA was incorporated in the land use planning process in the:

- a) analysis of the planning environment;
- b) identification of issues and problems;
- c) formulation of goals, objectives and targets;
- d) formulation of development strategies; and
- e) identification of programs, projects and activities.

4.0 Planning for Disaster Risk Reduction and Climate-Change Adaptation (DRR-CCA) in Metro Manila

Disasters can disrupt social, economic, and physical development and even set back gains. Deaths, injuries, community dislocation, damage to infrastructure, destruction of industries, and disruption of economic activities

⁷ Mainstreaming Disaster Risk Reduction, National Economic Development Authority (NEDA), United Nations Development Program (UNDP), European Commission Humanitarian Aid, VJ Graphics Arts, Inc. (2008)

as a result of disasters can increase poverty. Because of the limited resources of both national and local governments and the unpredictability of disasters, some of the resources that would otherwise be used for development will have to be diverted for emergency response and relief when such calamities do occur. It should be pointed out that disaster risks may also result from wrong development policies and poor land use planning. The siting of settlements, production areas, and infrastructure, urban growth and development, and the use of resources all have to be carefully planned and managed to prevent disasters.

Sustainable development policies reduce disaster risks. A city or barangay with a thriving economy is expected to have more employment and livelihood opportunities, better social services, and good infrastructure. The existence of such conditions in a community will make it more disaster-resilient or more capable of overcoming natural hazards. The opposite of disaster-resiliency is disaster-vulnerability. Communities that are exposed to natural hazards and are in a poor economic, social and physical state are considered highly vulnerable.

Mainstreaming Disaster Risk Reduction and Climate Change Adaptation (DRR-CCA) in the land use planning process in Metro Manila is particularly difficult because of the highly built-up nature of the metropolis. For example, the 2002 Metro Manila Earthquake Impact Reduction Study (MMEIRS) provided geophysical information that should be considered in the planning of Metro Manila. However, it was not surprising to discover that urban developments have already occupied areas where geological hazards are present. The layouts and land uses in the component LGUs of Metro Manila would have been very different in the areas where geological and hydro-meteorological hazards exist had the information been available in the beginning. To reduce loss of life, injuries, and more serious infrastructure damage brought about by disasters, areas that have been identified as “high-risk” may be planned for redevelopment or urban renewal based on the information that is available today.

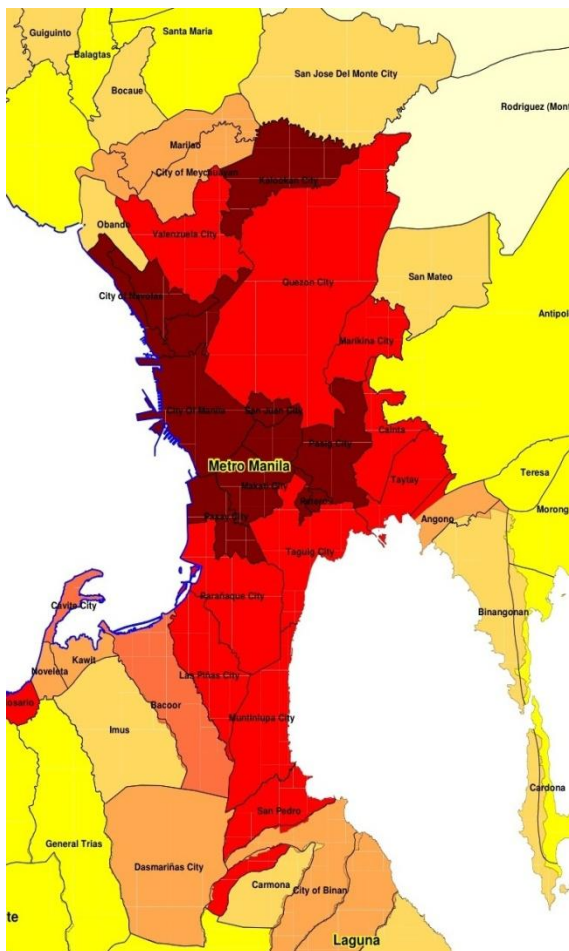


Figure 2. Population Density Map of Metro Manila

The most densely populated cities in the Philippines are in Metro Manila and its periphery. (Areas that are colored

Figure 3. Location Map of Makati City

Makati City is southeast of Metro Manila's core city Manila.

- **Photo 1. Makati City as the Financial Capital**

Makati City is one of the richest cities in the Philippines. It has the Central Business District (foreground) and the new Bonifacio Global City business district (background).



Makati City and Metro Manila

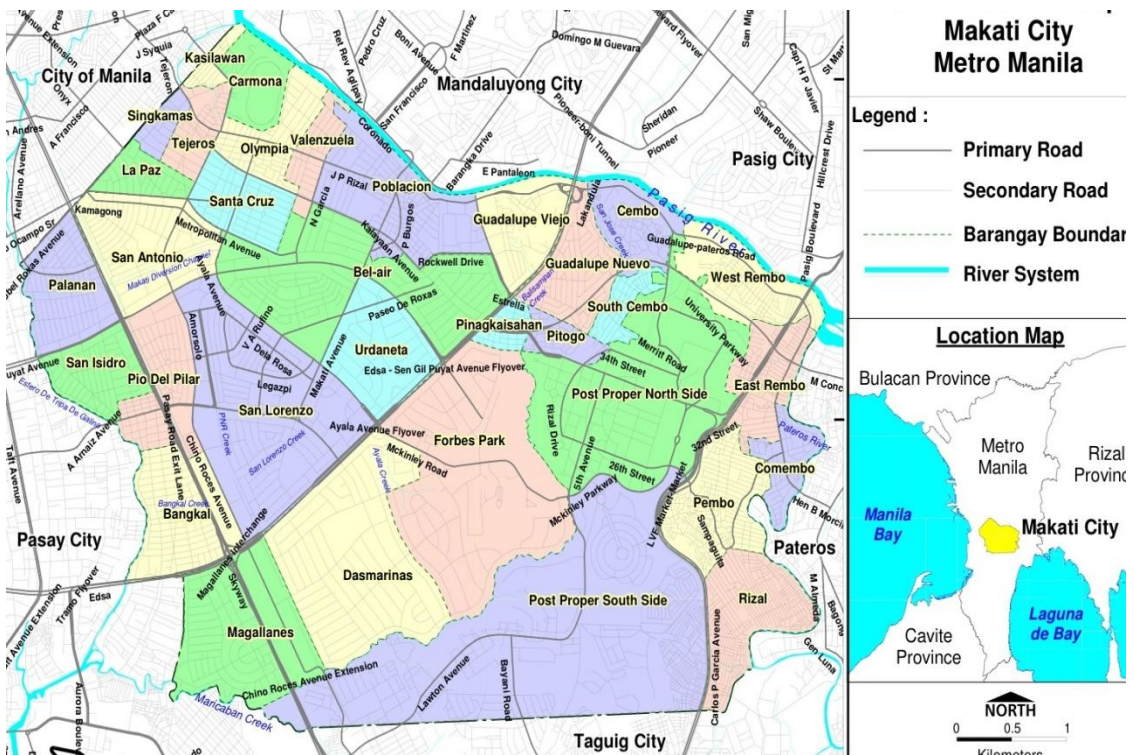
With a total land area of only 638.55 square kilometers (0.2% of the Philippines' total land area), Metropolitan Manila accounts for about 13% of the national population and 33% of the National Gross Domestic Product. Makati is one of 17 Local Government Units (LGUs) that comprise Metro Manila. In spite of Makati City's limited land area of 27.36 square kilometers, it has consistently been in the list of top five richest cities in the country. As the financial capital of the Philippines, Makati hosts the biggest banks and

corporations, highest number of embassies, and the most affluent residential enclaves. Ironically, the city also has its share of high-density residential areas that are highly vulnerable to disasters.

For the New Makati Comprehensive Land Use Plan (2013-2023), the City will have the opportunity to utilize more scientific data (hazard maps) and integrating Disaster Risk Reduction in the land use planning process. It is with much expectation that the updated CLUP will effectively improve the disaster resiliency of its communities.

5.0 Assessment of Disaster Risks in Makati City

The poor and informal settlers are considered the most vulnerable to disasters as they have the least resources and are often given the least attention by local governments.⁸ Urban low-cost housing are often located in areas with narrow roads and congested conditions, while informal settlements are situated in the most hazardous locations close to where there are livelihood opportunities (e.g., along railroad tracks, creeks and rivers, underneath bridges)



- **Figure 4. Barangay Map of Makati City**
- Makati City has a total land area of 27.36 square kilometers and consists of 33 barangays.

⁸ Christine Wamsler, Managing Urban Disaster Risk, Chapter 1, 2007

The West Valley Fault

The Japan International Cooperation Agency (JICA), Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the Metropolitan Manila Development Authority (MMDA) conducted the Metro Manila Impact Reduction Study (MMEIRS) from August 2002 to March 2004 to formulate a master plan for earthquake impact reduction in Metro Manila. The MMEIRS Study (2004) identified 18 possible earthquake scenarios that may heavily affect Metro Manila. The three scenarios considered for damage estimation are as follows:

- Model 13 which is a huge subduction type magnitude 7.9 earthquake along the Manila Trench that generates a tsunami;
- Model 18 which is a magnitude 6.5 strike slip earthquake reminiscent of the 1863 earthquake in Manila Bay; and
- Model 8 which is a magnitude 7.2 strike slip type earthquake occurring along the 67 kilometer segment of the West Valley Fault.

Among the eighteen scenarios, Model 8, which is expected to produce high ground shaking levels, is considered the worst-case scenario for cities traversed by the West Valley Fault.⁹ The West Valley Fault System consists of two faults, the East and West Valley Fault Systems. The scenarios presented in the study illustrate the vulnerability of highly urbanized cities like Metro Manila to earthquakes.

All 16 cities and 1 municipality in Metro Manila are vulnerable to earthquakes but the areas traversed by the West Valley Fault are regarded as “high risk” for the Model 8 scenario. The West Valley Fault cuts across Marikina City, Quezon City, Pasig City, Pateros, Makati City, and Taguig City. However, the higher density and more inadequately planned residential areas that it traverses are located in the cities of Makati and Taguig. The West Valley Fault cuts across the eastern portion of Makati City through Barangays East Rembo, Pembo, Comembo, and Rizal.¹⁰ Horizontal or vertical shifting of the ground or a combination of both may result from surface rupture or the breaking and movement of the ground along the active fault trace. Buildings or structures that are sitting on faults are at risk of structural damage when an earthquake occurs.

Areas Prone to Liquefaction

Liquefaction refers to instances when soil loses strength due to an increase in pore water pressures on the saturated subsurface caused by ground shaking during a high magnitude earthquake. A subsurface made-up of loose sand with the static water level near the ground level is generally considered

⁹ Metro Manila Earthquake Impact Reduction Study (MMEIRS), 2004

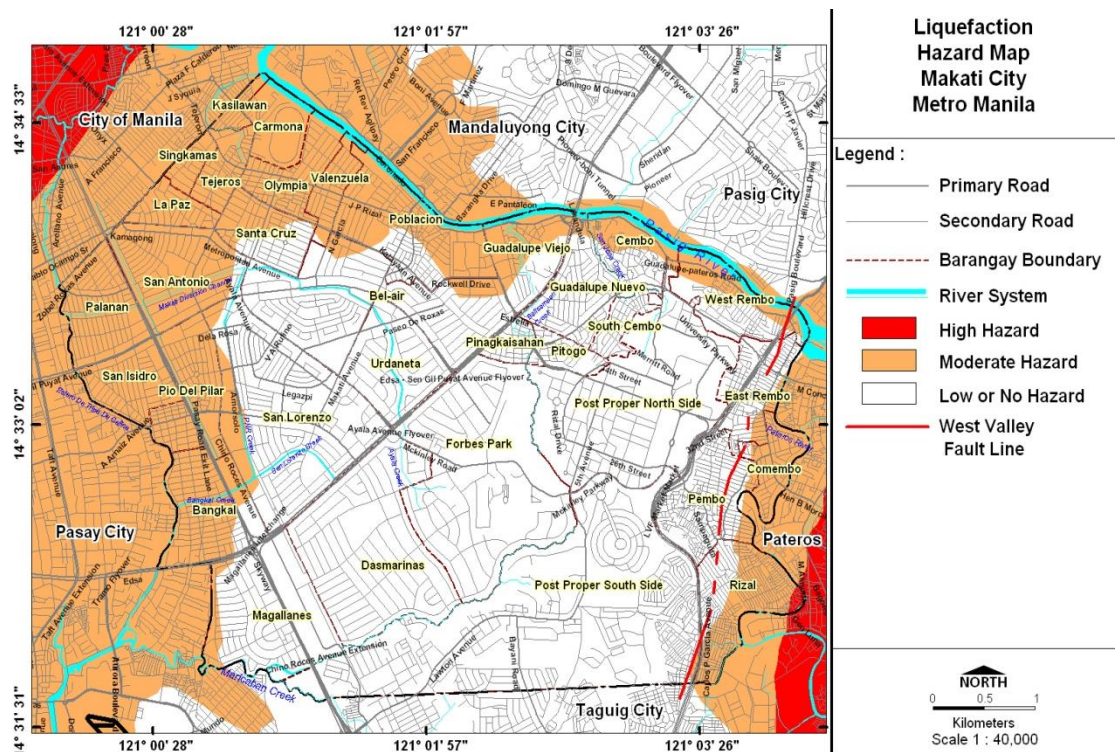
¹⁰ Alfredo Mahar A. Lagmay, Geohazard Assessment Report for Makati City (Preliminary Report), 2012

susceptible to liquefaction. Ground shaking will cause the sand to behave like a liquid with an upward flow towards the surface which would consequently lead to differential settlement. The potential for liquefaction in Makati City ranges from low to none in areas that have Guadalupe Tuff as subsurface and moderate in areas that have Quaternary Alluvium underneath.

Forthcoming Planned Unit Developments (PUD) and urban renewal projects have to contend with this limitation.

Earthquakes' Impact on Lifelines

Lifelines are infrastructures that are essential for a community to function (e.g. roads, water supply lines, sewage lines, power lines and telecommunication systems). The MMEIRS report (2004) presented estimates of impacts of an M7.2 earthquake originating from the West Valley Fault (WVF) on Makati City's lifelines. Earthquakes can just as easily damage underground systems (water supply, sewage, power, communication) as much as surface infrastructure. Based on the report, most of Makati City will experience very minimal damage to underground pipe systems in the event of an M7.2 tremor originating from the West Valley Fault. The pipe systems in Barangays Comembo, San Lorenzo, San Antonio, Santa Cruz, Tejeros, La Paz, Palanan, San Isidro, Bangkal, and Dasmariñas are slightly more at risk of damage, although considered manageable in a post-disaster scenario.



• **Figure 5. The West Valley Fault and Areas Prone to Liquefaction in Makati City**

- Four barangays on the east side of Makati City straddle the West Valley Fault Line. There are also large sections on the west and north sides of Makati City that are “moderately” prone to liquefaction (areas in brown).
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The lack or inadequacy of disaster response may result in more deaths and injuries after an earthquake rather than during the occurrence of the event itself. Emergency response is crucial in the saving of lives and property. Apart from the quality of equipment and trained personnel, accessibility is also a consideration in reducing loss of lives and property damage. Areas have to be permeable (can be accessed through several routes) which means there should be no dead-ends and roads have to be wide enough for emergency response teams to get through.

Areas Prone to Flooding

In Makati City, most of the flooding occurs in areas adjacent to rivers and creeks especially if they are low-lying (downstream) and have gentle slopes. Based on the flood hazard map of the Mines and Geosciences Bureau (MGB) of the Department of Environment and Natural Resources (DENR), areas that are prone to 2-to-10-year flood cycles are the areas along creeks, along Pasig River and with low elevations. The 50 and 100-year flood cycles, on the other hand, affect areas along Pateros River and in areas where it joins Pasig River. The volume of rainfall during Typhoon Ondoy (Typhoon Ketsana) in 2009 was considered a 150-year extreme rainfall event.

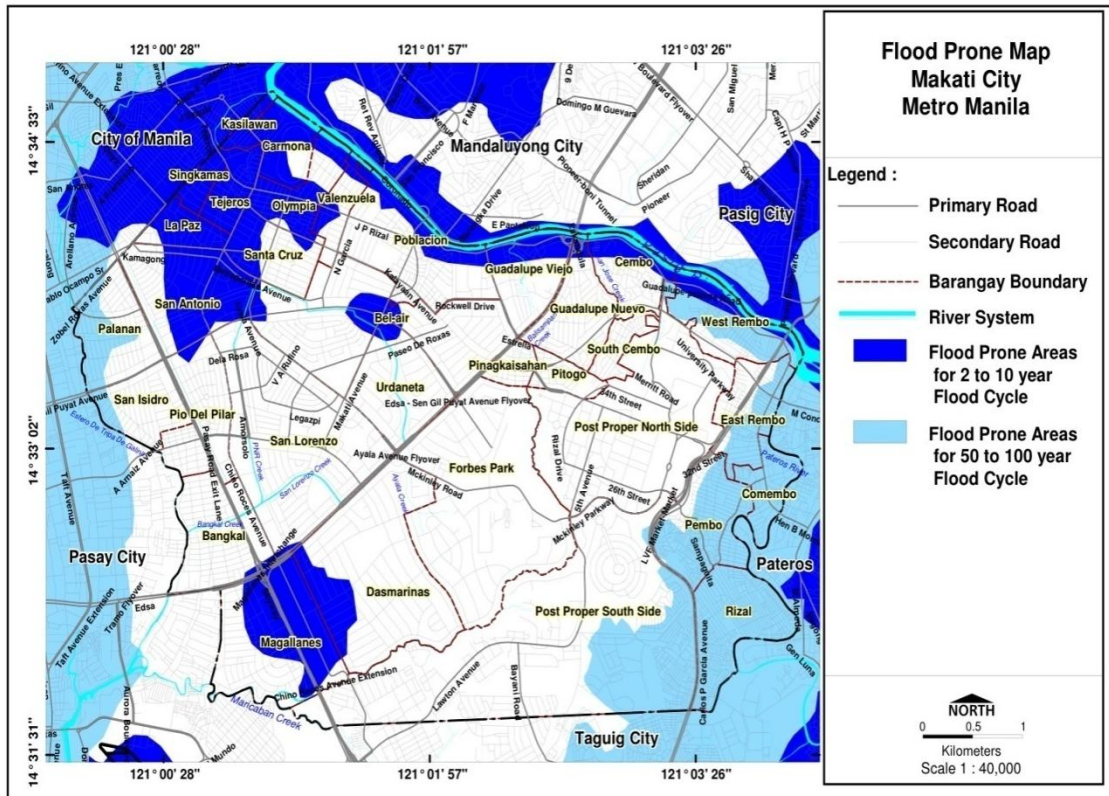
Floods in the city by and large occur in areas surrounding rivers and creeks with the exception of some western barangays where floods are more widespread over very low and flat topography. In the western barangays, flood levels range from 1 to 3 meters along the creeks and 0.15 to 1.0 meter for residential areas alongside these creeks. The extent of residential areas affected by floods stretches to almost a kilometer in certain sections. In the eastern part of the city, flood levels reach from 1 to 3 meters along the Pateros River and 0.15 to 1.0 meter for a narrow area adjacent to the river.¹¹ The eastern barangays (Barangays East Rembo, Pembo, Comembo, Rizal) and the northwestern barangays (Barangays Kasilawan, Tejeros, Singkamas, Olympia) have some of the highest population densities in the city which means that more people are affected by floods in these areas.

¹¹ Alfredo Mahar A. Lagmay, Geohazard Assessment Report for Makati City (Preliminary Report), 2012

Makati City's Most Vulnerable Communities

A large section of Makati is comprised of what used to be a 25.78 square-kilometer military camp established during the American Colonial period known as Fort Mckinley, and later renamed Fort Bonifacio when it was turned over to the Philippines in 1949. The privatization of Fort Bonifacio in 1995 gradually transformed a large section of the military camp into a master planned business district called the Bonifacio Global City (BGC) which has a full complement of high-priced residential, office and mixed-use developments. However, to the north and east of the Bonifacio Global City are situated some of the most vulnerable communities in Makati. Many of these settlements were established in the 1950s as housing for the families of the enlisted men serving in the military camp but were later occupied by other families seeking low-cost urban housing in the 1970s up to the 1990s. These settlements are now known as Barangays Cembo, South Cembo, West Rembo, East Rembo, Comembo, Pembo, and Rizal.

Since most parts of the barangays that belong to the Eastside Cluster developed in a spontaneous manner, geo-physical and hydro-meteorological hazards were simply overlooked or ignored when informal settlements started to develop. After several years since land tenure was finally granted, many of the settlers have transformed their houses into permanent structures in spite of the presence of the natural hazards. The communities in these barangays can be characterized as having narrow streets, small lots, and practically no open spaces. Many of the families in the densely populated Barangay Rizal belong to the lowest income group in Makati.



- **Figure 6. Areas Susceptible to Flooding in Makati City**
- The areas in the city that are most susceptible to 2 to 10-year cycle flooding (areas in yellow) are the northwestern barangays bordering the City of Manila. Barangay Magallanes which is drained by the Maricaban Creek has areas adjacent to the creek and other drainage channels also prone to flooding. The Eastside barangays (areas in blue) are susceptible to 50 to 100-year cycle floods.

6.0 Land Use and Urban Design Proposals

According to the Philippines’ NEDA manual “Mainstreaming Disaster Risk Reduction”, DRR measures may be classified into four major categories as follows:

- a. Risk avoidance or elimination – removal of the risk trigger by not locating in areas of potential hazard impact, not acquiring/utilizing vulnerable land or building, or denying a risk by refusing to engage in a function that could potentially be affected by risks;
- b. Risk reduction or mitigation – reduction of frequency of occurrence or the severity of the consequence by changing physical characteristics or operations of a system or the element at risk;
- c. Risk sharing or risk transfer – transfer of risk-bearing responsibility to

another party, involving financial measures particularly the use of insurance system to cover and pay for future damages; and

- d. Risk retention or acceptance – the “do nothing approach” where risks are fully accepted and arrangements are made to pay for financial losses related to the impact of the hazard.

Since physical planning is mainly concerned with the first two categories, the land use and urban design proposals presented here will not dwell at all with the last two categories. Land use interventions which fall under the “Risk avoidance or elimination” category will also be limited in terms of application considering that practically all the land in the City have been built up. It would be easy to designate or zone a fault line area as a green belt or a flood plain as a wetland reservation if the areas being planned are “greenfields” but not when these areas are already occupied by communities.

Securing the West Valley Fault (WVF)

Knowing about the existence and the location of the West Valley Fault (WVF) has given the city government the following levels of physical planning response:

- a. No new building, addition or renovation to existing building policy along the 10-meter easement (5 meters on both sides) of the WVF line which is currently partially enforced;
- b. Removal/demolition of public buildings owned by city government that are on the WVF easement to guarantee safety of the occupants and to serve as an example for others to follow; and
- c. Condemnation of buildings or gradual clearing by private owners of buildings that are situated along the WVF.

The third level of response is considered the most difficult to enforce (see Figures 7 and 8).

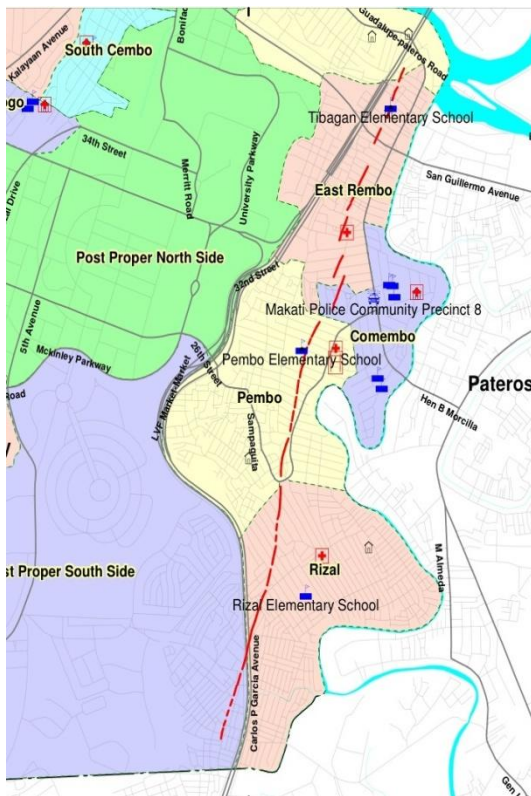


Figure 7. The West Valley Fault Line in Makati City
The West Valley Fault (red broken line) cuts across Barangays East Rembo, Comembo, Pembo, and Rizal.



Figure 8. Easement of the West Valley Fault Zone
• The drawing shows the buildings including a public school that have been built above the WVF line easement.

Controlling Building Densities in Areas Prone to Liquefaction

Areas that have been identified as prone to liquefaction also have to be addressed in the New Makati Comprehensive Land Use Plan (2013-2023). The height and density of new buildings in these areas will have to be controlled based on what the sub-surface conditions will allow. Structural engineering designs that are able to withstand the impact of liquefaction will also have to be required.

Increasing Building Height Limits for Areas Prone to Flooding

To cope with the frequency and rising levels of floods in Makati City, flood prone areas such as residential areas have been considered for increase in Building Height Limits. Such a provision will allow existing and new buildings in these flood-prone areas to raise floor levels that would prevent or reduce the damage caused by floods. Such Climate Change Adaptation measures that allow increases in Building Height Limits will be reflected in the Zoning Ordinance.

Clearing the Easements of Rivers and Creeks

Flood hazard maps have shown that most floods in Makati are in areas adjacent to drainage channels such as rivers and creeks. More frequent and extreme rainfall attributed to Climate Change will put areas adjacent drainage channels at risk to floods especially if the waterway easements are illegally occupied by informal settlers. One of the first tasks is to strictly enforce the standard easements of these drainage channels as they increase the volume of water that can be conveyed. Furthermore, constant programs of preventing the throwing of trash into creeks and dredging will allow these channels to continue doing their job of draining the run-off in Makati. All of the rivers and main creeks of Makati are actually the natural boundaries with adjacent cities. This only means that all programs that aim to improve the drainage channels should be planned and managed in collaboration with the adjoining city.

It would also be a good idea for the bigger buildings and residences to install individual rain water harvesting systems that store rainwater on site rather than discharging into the city's storm drainage systems. This sustainable practice of water management will relieve the pressure on the rivers and creeks during extreme rainfall events. With new mixed-use developments anticipated along Chino Roces Avenue, rainwater harvesting systems may be imposed on the new developments before they are allowed to construct. Huge lots along Chino Roces Avenue are transitioning from warehouse-type buildings to high-rise mixed-use developments. The new developments along Chino Roces Avenue are mostly in Barangays Pio del Pilar, Bangkal and Magallanes. Barangays Post Proper Southside and Post Proper Northside are areas where new high-density developments are also taking place. Barangays Pio del Pilar, Bangkal, and San Lorenzo have creeks that eventually drain in to Estero Tripa de Gallina while Barangays Forbes Park, Dasmariñas, Post Proper Northside, Post Proper Southside, and Magallanes drain into Maricaban Creek. Barangay Magallanes is situated downstream of Maricaban Creek and is the southern natural boundary with Pasay City.

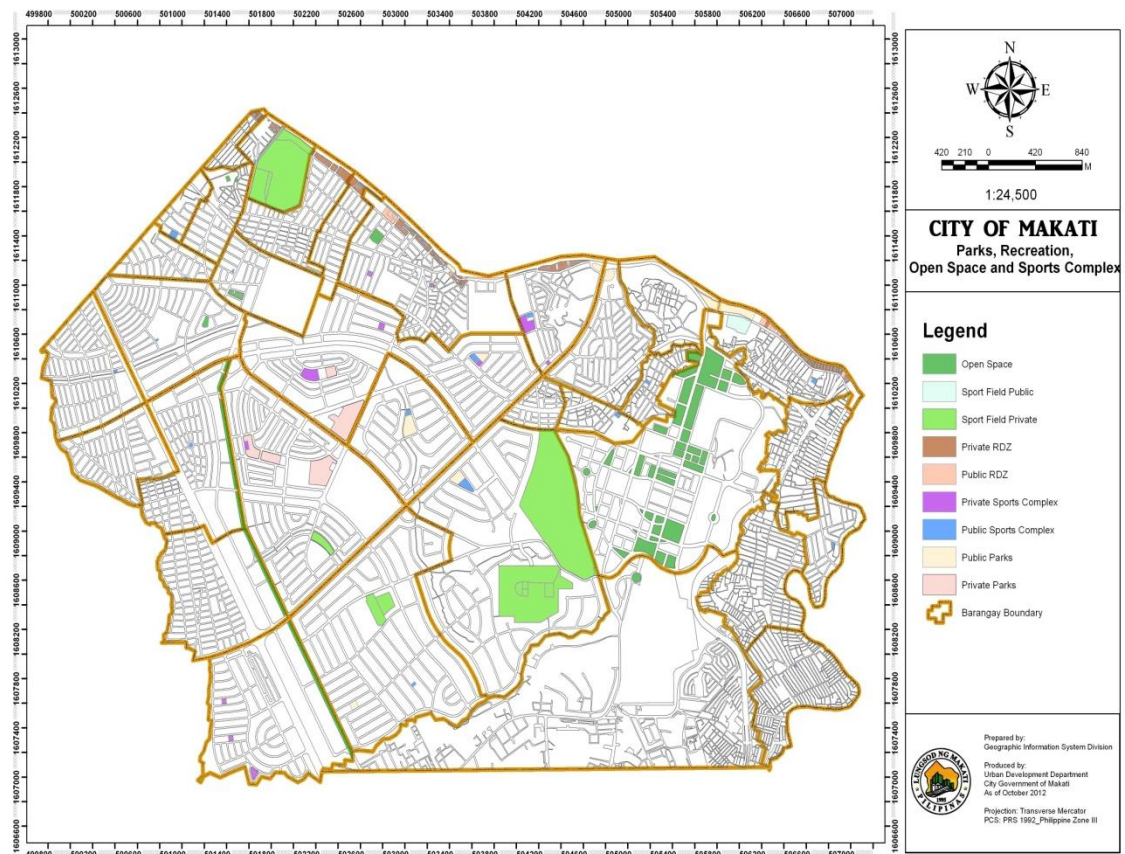
Collected rainwater can be used for watering landscaping and cleaning of grounds and paved areas. To encourage building/property owners to invest in such rainwater harvesting systems, tax breaks or other incentives may be offered.

In residential areas adjacent to the City of Manila (western barangays) that are situated in low elevations, community retention or detention ponds have to be set up to help impound surface run-off. Such detention ponds have to be creatively designed so that they can be used as parks, playgrounds, and other community spaces during dry periods.

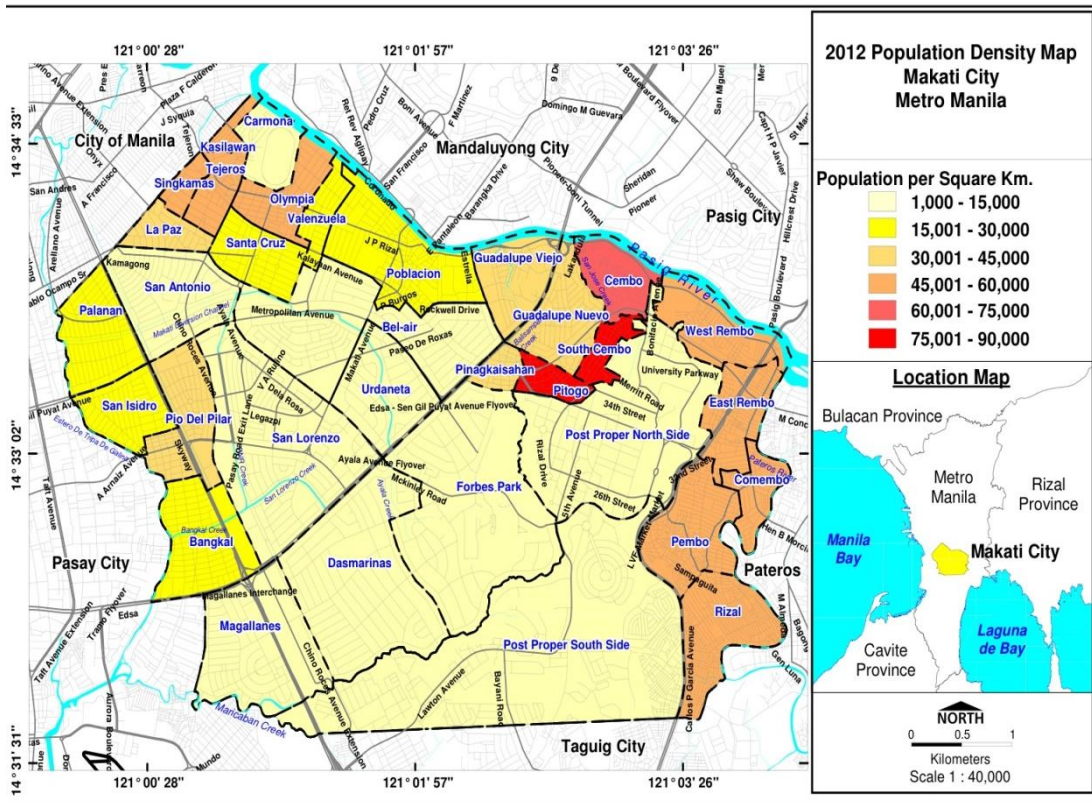
Increasing Parks and Open Spaces

Makati has a disproportionate distribution of open spaces wherein the exclusive gated communities have huge but underutilized parks while high-density barangays (e.g. eastside barangays) have none. Parks and open spaces have the potential to serve secondary roles as evacuation centers or staging areas for emergency response and relief during disasters. Moreover, increasing unpaved areas or permeable surface areas provide opportunities for surface runoff to percolate into the ground and thereby reducing the severity of floods. Another policy response to climate change is climate change mitigation which seeks to reduce greenhouse gas (GHG) emissions and/or enhance the removal of these gases from the atmosphere. Aside from reducing the use of fossil fuels, parks with trees and natural vegetation also contribute to offsetting greenhouse gas emissions. The multiple uses offered by parks and open spaces provide the impetus to actually increase the city's inventory of such amenities.

The 10-meter easement of the West Valley Fault Line if it is ever cleared of structures is an excellent opportunity for conversion into a strip park.



- **Figure 9. Inventory of Open Spaces and Recreational Areas**
- Many barangays in Makati are deprived of open spaces. Potential open spaces may be recovered by re-blocking existing developments.



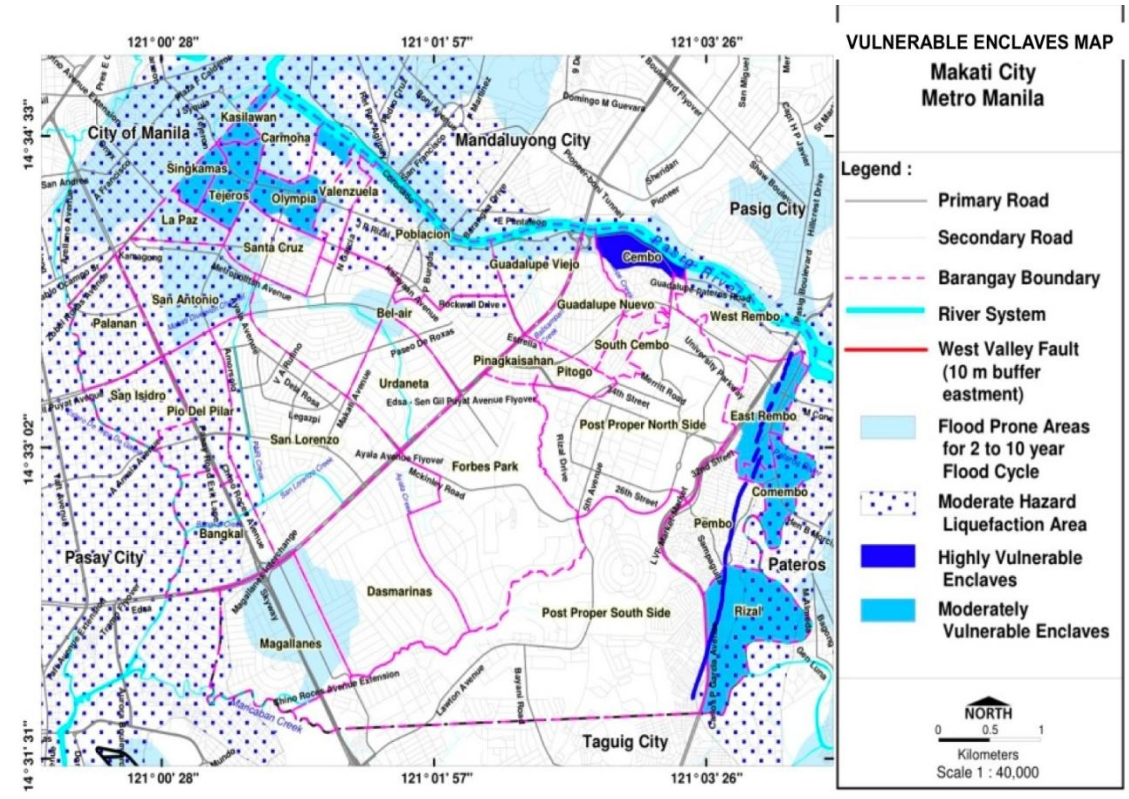
- **Figure 10. 2012 Population Density Map**
- The most densely populated barangays in Makati City are Barangays Pitogo, South Cembo and Cembo. Sadly, these areas have limited access to open spaces.

Urban Redevelopment – Disaster Resiliency Initiatives for Vulnerable Enclaves (DRIVE)

The redevelopment of degraded areas has been a constant preoccupation of cities for centuries. Many of the large-scale urban renewal projects in the twentieth century have been undertaken to remove urban blight, improve the social and economic conditions of the communities, and to prevent further depreciation of real estate values. Urban renewal may entail the transfer of businesses, demolition of structures, the relocation of households, and the use of eminent domain as a legal instrument to consolidate private land for a development project that is considered for the benefit of the majority.

An assessment of Makati’s natural hazards has shown that many areas are exposed to geological and hydro-meteorological hazards. Since all of these high-risk areas are built up and inhabited, there should be some kind of redevelopment efforts to deal with the hazards present. The vulnerability of communities occupying the hazardous areas should be a compelling enough reason for their redevelopment. A vulnerability-focused urban renewal program called “Disaster Resiliency Initiative for Vulnerable Enclaves” or DRIVE is proposed to focus on highly vulnerable communities. Based on the presence of natural hazards and other vulnerability factors (shown in previous

maps), a composite map has been formulated to highlight communities in the City that are considered most vulnerable (See Figure 10 - areas in dark blue and blue).



• **Figure 11. Vulnerable Enclaves Map**

- The Vulnerable Enclaves Map is a composite map incorporating all thematic maps that indicate the location of natural hazards and other factors that determine vulnerability. Based on the presence of natural hazards and other vulnerability factors, several areas in Makati have been identified which need immediate attention (Areas in dark blue and blue).

Away from Makati’s Central Business District and plush residential enclaves are some of the most congested and blighted areas that are vulnerable to disasters. In such areas, urban renewal and disaster risk reduction are only possible if the community comes together and lot owners pool their lots so that an efficient layout that is more disaster-resilient may be drawn. Such a voluntary urban renewal initiative in a highly urbanized area has never been successfully executed but should still be attempted if a natural disaster is to be averted. Other means of consolidating lots include expropriation by the local government (eminent domain) and land banking through purchase.

Concept plans have been prepared for three pilot DRIVE sites which demonstrate urban design interventions that would deal with specific hazards present in a site. The three demonstration sites are as follows:

a. DRIVE Site 1: Redevelopment of an In-City Resettlement

Barangays Rizal and Pembo

Barangays Pembo and Rizal are two of the more congested and inadequately planned areas in Makati City. The two barangays have predominantly medium density residential land uses (2-3 storeys), narrow roads and hardly any open spaces. The narrow roads will slow down any emergency response teams during disasters and the absence of open spaces deprives residents of safe refuge during evacuation. The West Valley Fault cuts across the barangays of the Eastside Cluster which includes Barangays Pembo and Rizal. Structures along the West Valley Fault are considered as “Highly Vulnerable Enclaves” (See Hazardous Areas Map). Since several buildings are already at risk of structural damage because they are sitting on faults, some kind of urban renewal has to be undertaken in the area that involves removal of households situated on the West Valley Fault as well as other vulnerable areas and relocation to a new in-city housing development. The five meter easements on both sides of the West Valley Fault have to be gradually cleared and converted into a linear park (See Drive Site 3). It was estimated that there are about 115 parcels (11,560 square meters) in Barangay Pembo and another 115 parcels (11,030 square meters) in Barangay Rizal traversed by the West Valley Fault.

Areas in Barangays Pembo and Rizal have to be identified for redevelopment into a low to medium-rise housing complex where affected families can be relocated. The site for the new medium to high-rise housing complex could be several parcels consolidated into a bigger lot. The new housing complex has to be designed in such a way that at least 30% of the consolidated lot will be allocated for open space. This will ensure that the community will have a space for recreation as well for evacuation during emergencies.

b. DRIVE Site 2: Redevelopment of Blocks for Flood Mitigation

Barangay Tejeros

Several areas in Makati have also been identified as flood prone areas with severity ranging from the 50-100 year cycle to the more frequent 2-10 year cycle. Many of the flood-prone (2-10 year flood cycle) barangays are located in the northwest cluster. The entire areas of Barangays Kasilawan, Singkamas, and Tejeros, for example, are considered flood prone. A DRIVE project for Barangay Tejeros has been conceptualized which consists of redeveloping entire blocks including a BLISS Housing Project. The project will involve housing, complementary commercial spaces and the provision of open spaces. To mitigate the flooding in the area, it is proposed that the open space be designed as a sunken park which will also function as a detention

pond during extreme rainfall events. The sunken open space can temporarily impound excessive run-off to prevent the flooding of streets and homes. Some of the recreational/ community facilities that can be introduced include a skateboard park (X-Park or extreme sports park), amphitheater or outdoor performance venue, and a children's playground.

The BLISS Housing Project in Barangay Tejeros can also be redeveloped to create more residential units that can accommodate not only the existing residents but also additional units that can be sold at free market prices. Public-Private Partnership arrangements will allow the DRIVE renewal project in Barangay Tejeros to pay for itself. Similar projects may be developed for other flood-prone barangays once the DRIVE pilot project in Barangay Tejeros is proven to be successful.

c. DRIVE Site 3: Redevelopment of Land Slide Prone Area

Barangay West Rembo-East Rembo

A portion of Barangays West Rembo and East Rembo, there is an area prone to landslide either by earthquake or heavy-rain induced. This Area is another pilot for disaster risk reduction for landslide. A development template will be formulated in a form of Master Development Plan and development guidelines.

d. Conversion of Fault Zone Easements Into Parks and Open Spaces

Eastside Cluster has been consistently identified for its vulnerability to disasters. The West Valley Fault cuts across several buildings and residences in the Eastside Cluster thereby, exposing many of its residents to life threatening risks. The presence of so many homes and buildings over the West Valley Fault is probably the most serious disaster risk present in in the Eastside Cluster specially Barangay Rizal. Areas adjacent to the Taguig River are also susceptible to frequent floods while the rest of the barangays are considered susceptible to 50-100 year floods. Other factors that contribute to the Eastside Cluster's vulnerability are susceptibility to liquefaction of its eastern half specially Barangay Rizal, high population density, poor layout (i.e. narrow roads, minimal individual setbacks), lack of open spaces, and generally lower household incomes).

The prepared concept plan for Barangay Rizal under Makati Risk-Sensitive Urban Redevelopment Planning Project (MRSURP Project) should considered the provisions of the New CLUP and Zoning Ordinance such as it entails the prohibition of building new structures along the identified 10-meter wide West Valley Fault easement (5.0 meters on both sides of the fault). Lots sitting on the fault also have to be acquired so that no households are put in harm's way. The goal is to recover the ten-meter easement so that it can be converted into a linear park that also increases the inventory of open spaces

in the barangay. The linear park will improve the environment, provide a safe walking and bicycling path and increase the mobility of the residents. The linear park should terminate in a bigger park on the western part of the barangay beside Circumferential Road 5. The recovery of lots that are on the West Valley Fault to convert into a strip park is expected to take several years but each household removed will mean one less family at risk. The DRIVE project can be piloted in Barangay Rizal but can also be undertaken simultaneously for all the barangays crossed by the West Valley Fault.

DISASTER RESILIENCY INITIATIVES FOR VULNERABLE ENCLAVES (DRIVE)

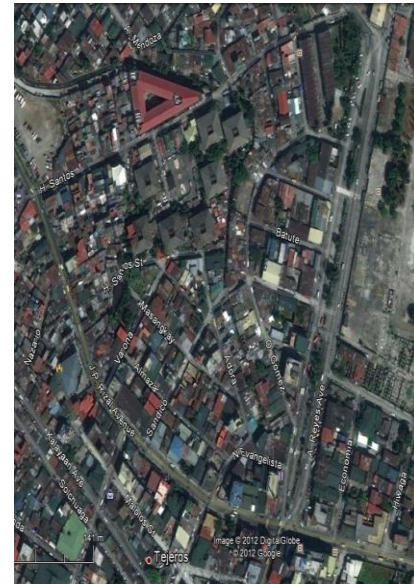
Redevelopment of Blocks for Flood Mitigation, Barangay Tejeros



Figure 12. Barangay Tejeros is one of the northwest barangays that are considered both flood prone and moderately susceptible to liquefaction.



Figure 13. By allocating an area for a sunken open space, it can also serve as a detention pond in cases of extreme rainfall events.



• **Photo 2.** Barangay Tejeros is also one of the densely populated barangays in Makati City.



• **Figure 14.** Redevelopment of strategic blocks could mitigate the floods and create new open spaces for the community.



Figure 15. The sunken open space can have an amphitheatre and a skateboard park.



• **Figure 16.** A new open space with flood mitigation provisions will improve the neighborhood environment and help generate economic opportunities.

DISASTER RESILIENCY INITIATIVES FOR VULNERABLE ENCLAVES (DRIVE)
Conversion of Fault Line Easement Into Parks, Barangay Rizal

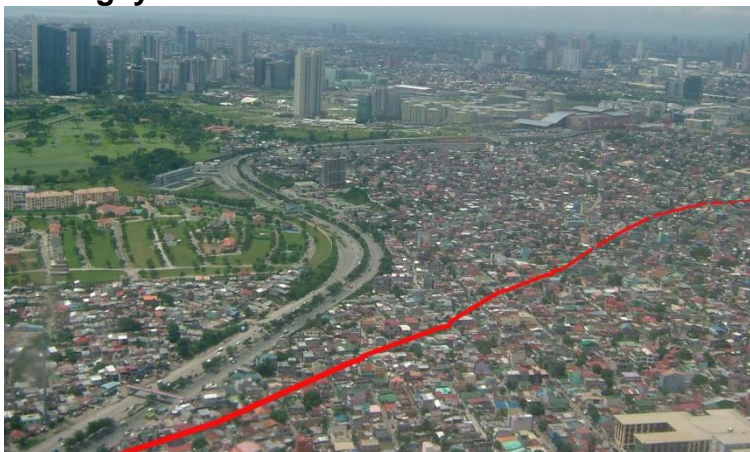


Figure 17. The West Valley Fault traverses five barangays in the eastern part of Makati City including Barangay Rizal in the foreground.



Figure 18. A proposed linear park will cut across 9 blocks and terminate in a bigger park along C-5.



Figure 19. It is proposed that five-meter easements on both sides of the West Valley Fault be cleared of buildings and converted into a linear park.



Figure 20. Plan shows conversion of easement into linear park.



Figure 21. Concept Drawing of entrance to Barangay Rizal's "Green Line" at Block 9. Clearing of the easement reduces the vulnerability of the communities in Barangay Rizal.

7.0 CONCLUSION

The national government has made Disaster Risk Reduction-Climate Change Adaptation (DRR-CCA) a national priority and made the necessary measures to empower the local governments to prepare development plans that take into account Disaster Risk Reduction. National agencies that are entrusted to gather and analyze geological, hydro-meteorological, and volcanic data have also been instructed to make information available to cities and municipalities. Like most cities in the Philippines, the City is complying with the national policy of mainstreaming DRR-CCA in the formulation of its Comprehensive Land Use Plan (2013-2023).

Makati has completed its disaster risk assessment and has mapped most of the identified natural hazards. Appropriate land uses and urban design interventions have been proposed to reduce the identified disaster risks.

A major part of disaster risk reduction-Climate Change Adaptation is the dissemination of the information of the disaster risks and the use of knowledge, innovation and education to build a culture of safety and resilience at all levels. Education plays a key role in the awareness of geo-physical and hydro-meteorological hazards and it is best if this knowledge is introduced early. The nature of natural hazards is part of the science classes in the grade school curriculums. More importantly, emergency drills are conducted on a regular basis not just as a reminder of the constant threats but more importantly to be ready for such eventualities.

The Hyogo Protocol calls for “disaster preparedness for effective response at all levels” and Makati City has taken the initiative of upgrading its disaster response capabilities, medical centers, and facilities for emergencies. However, it should be realized that when a natural disaster occurs, the nearest place where the assistance and rescue will come from is the community itself. A strong sense of community has to be sustained by the community members in order for them to help themselves. Much of the success of the land use and urban development proposals depend on local communities’ participation and willingness to carry them out.

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