REVISITING MANILA'S CLUP IN PREPARATION FOR CLIMATE CHANGE AND A MORE SUSTAINABLE DEVELOPMENT GROWTH PATTERN

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Outline

- Salient Features of MCLUPZO
- Definition of Risk, Hazards, Exposure, & Vulnerability
- MMDA's Metropolitan Manila Earthquake Impact Reduction Study (MMEIRS)
- NDRRMC's GMMA Risk Analysis Project
- Policy Recommendations

What is the Comprehensive Land Use Plan (CLUP)?

For guiding, regulating growth and development of a city or municipality.

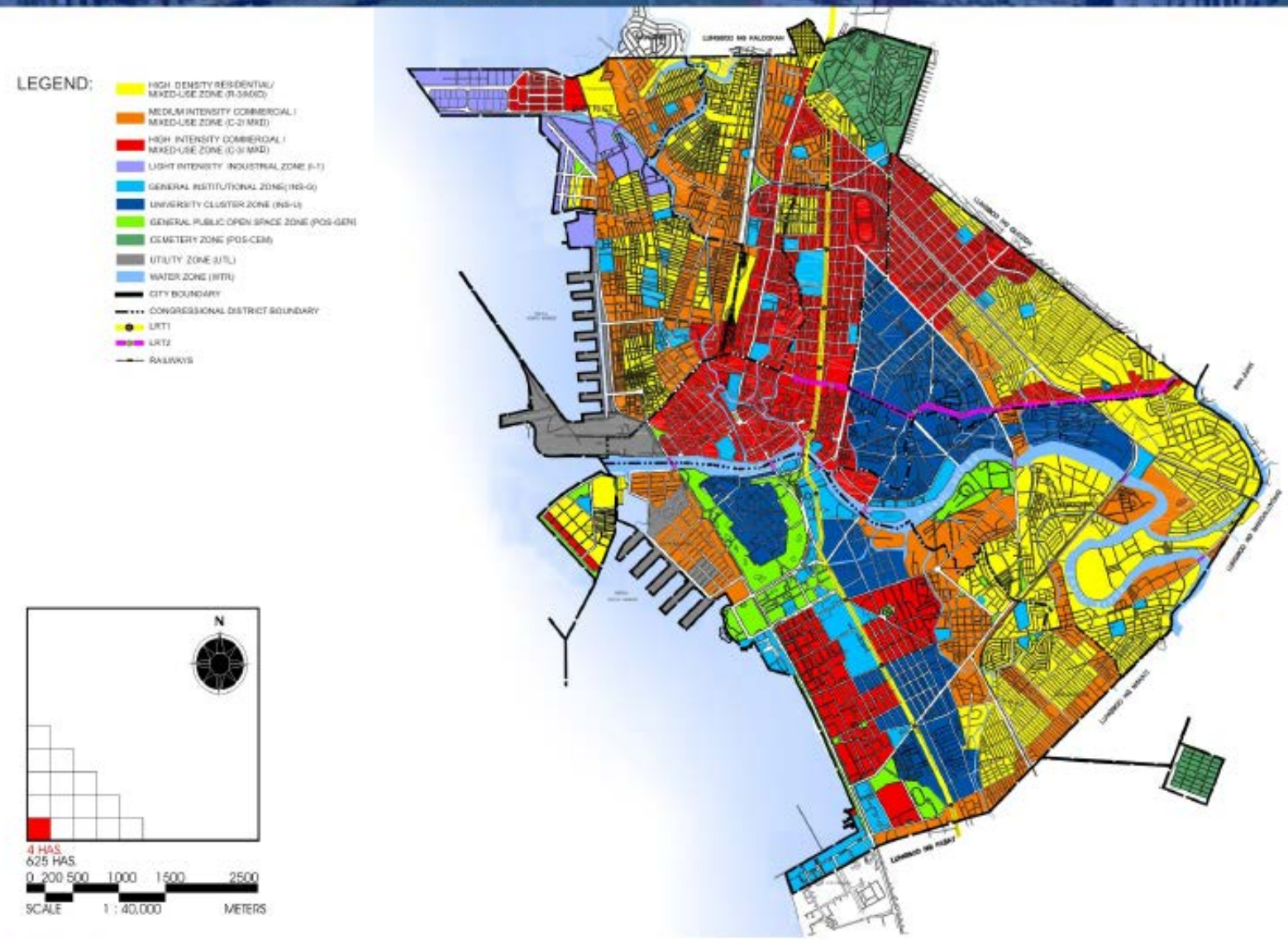
The CLUP document includes:

1. The **Comprehensive Development Land Use Plan**
2. **Zoning Ordinance**
3. **Sectoral Studies** (a documentation of the supporting studies that were undertaken to arrive at the resultant CLUP).

MCLUPZO CLUP

COMPREHENSIVE LAND USE PLAN AND ZONING ORDINANCE

OFFICIAL ZONING MAP 2005-2020



PALAFOX ASSOCIATES

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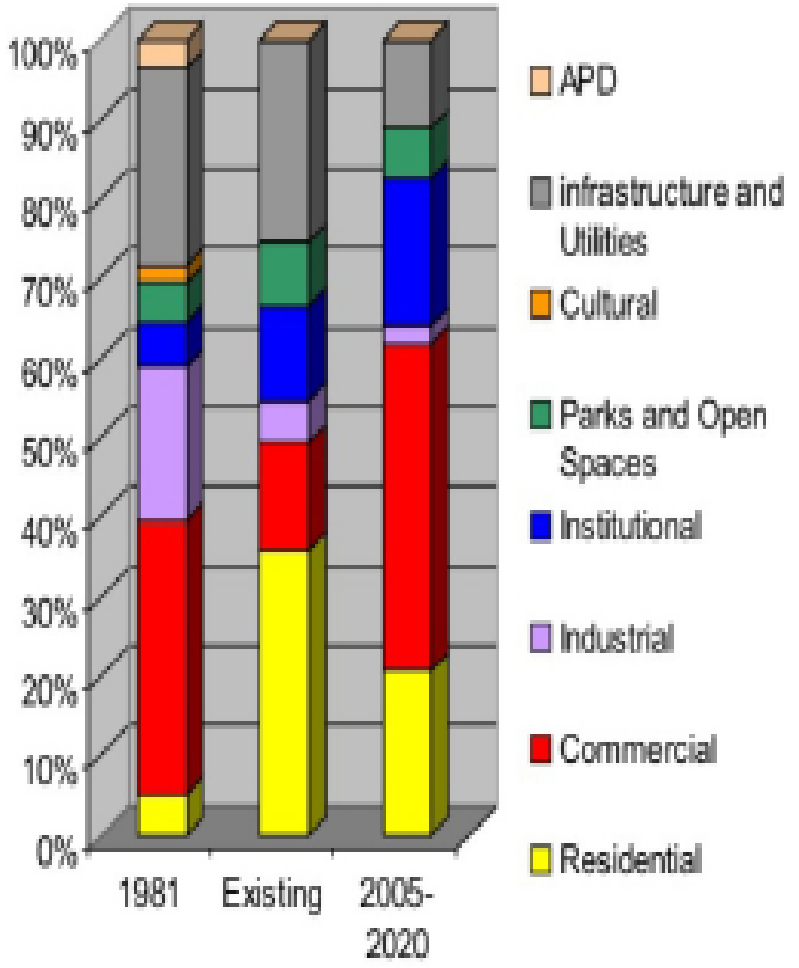
MCLUPZO

OFFICIAL ZONING MAP

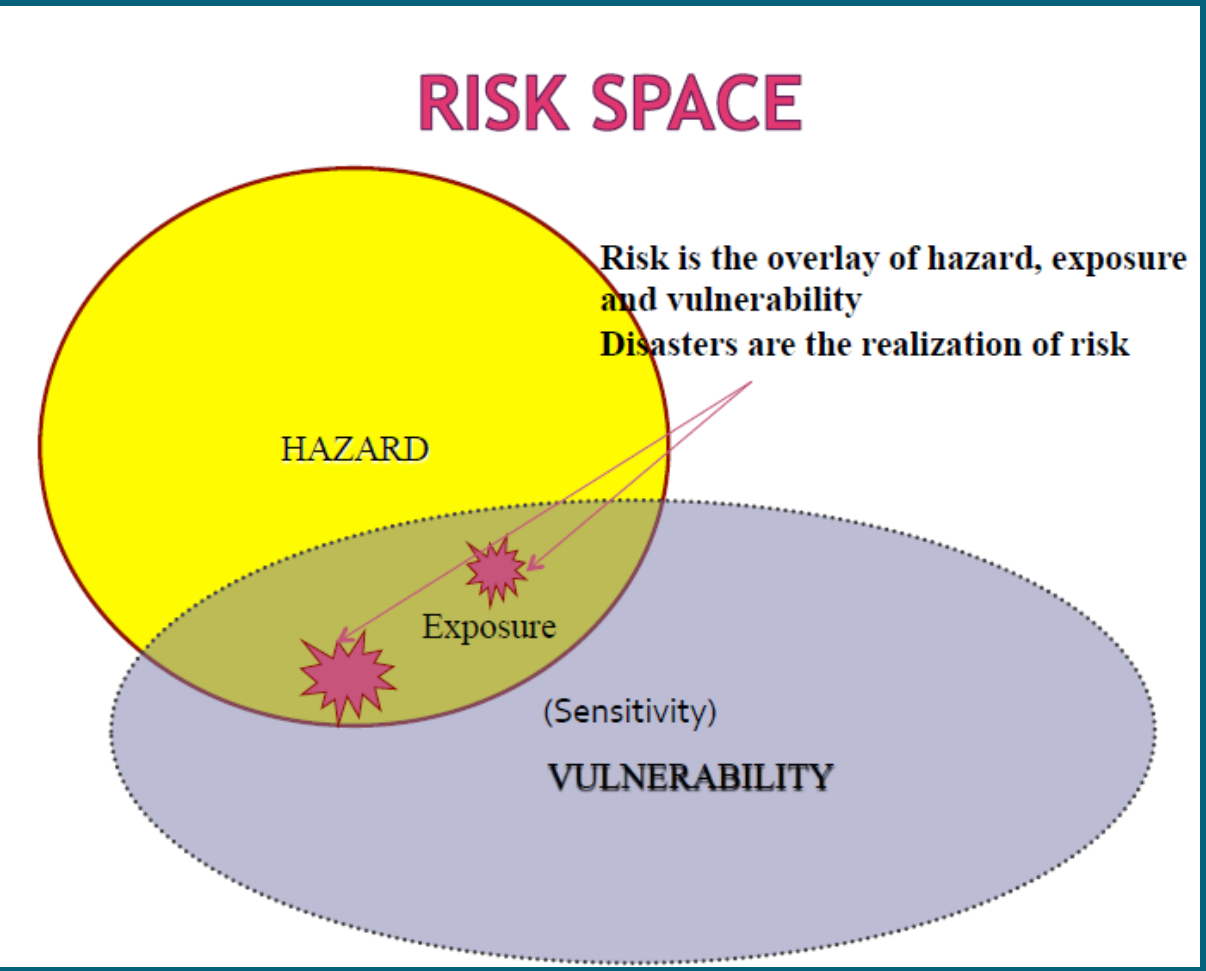
LAND USE ALLOCATION
1981 Zoning, Existing Land Use, 2005-2020 Land Use and Zoning

ZONES	% share		
	1981	Existing	2005-2020
Residential	5.15	35.84	20.69
Commercial	34.38	13.44	41.01
Industrial	19.26	5.26	2.31
Institutional	5.76	12.06	18.62
Parks and Open Spaces	4.88	7.95	6.17
Cultural	2.26	0	overlay
infrastructure and Utilities	24.62	25.45	11.20
APD	3.69	*	as new PUD
TOTAL	100	100	100
TOTAL LAND AREA (ha)	3085	4045	4192.25

Source: Digital Land Use Map
** same as 1981 Zoning



Projects/Programs: LRT4, Old Bilibid, Overlay zoning of Historic district/APD/PUD, TDR, FAR bonus incentives , Pasig River Ferry system, Port modernization



Risk – likelihood of harm, loss, disaster

Hazard – physical impact of a disturbance

Exposure – elements (people, property, systems) affected by the hazard

Vulnerability – lack of capacity of community to prepare, absorb, recover from hazard

RISK = Hazard x Exposure x Vulnerability

Source: Vulnerability Assessment, Dr. Rosa Perez , 2011

Rankings on Risks to Disasters

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2015)

- Philippines 3rd on a list of countries most prone to natural disasters for the past 45 years including exposures to earthquakes, storms, floods, droughts and sea level rise.

Swiss re (2014)

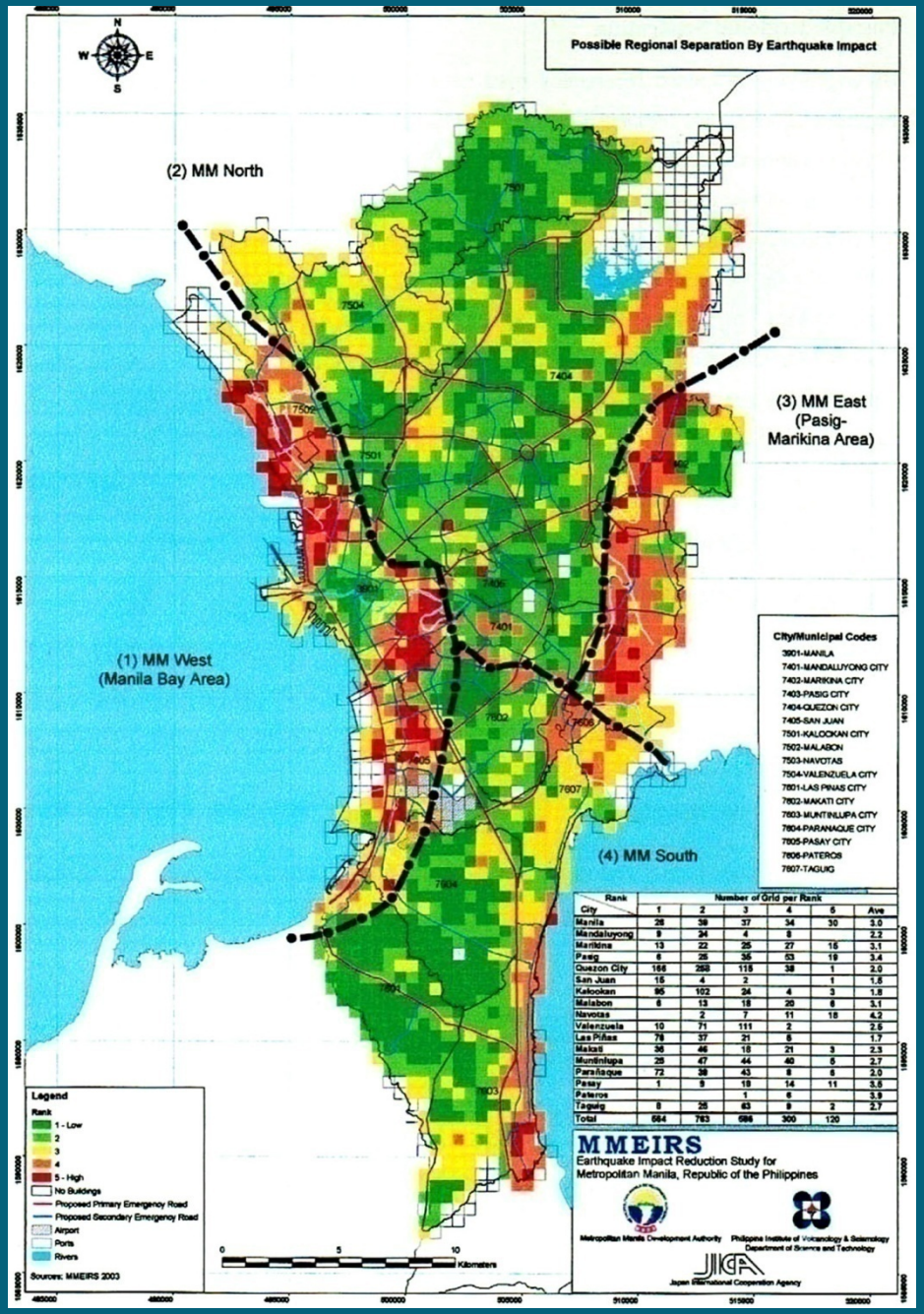
- Manila placed as the 2nd highest in the world out of the 10 cities most at risk of being hit by natural disasters based on aggregated potential risks from earthquakes, storms, storm surges, tsunamis, and river floods.

Metropolitan Manila Earthquake Impact Reduction Study (MMEIRS), 2004

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

Three (3) Models (for earthquake ground motion, liquefaction potential, slope stability and estimation of tsunami height):

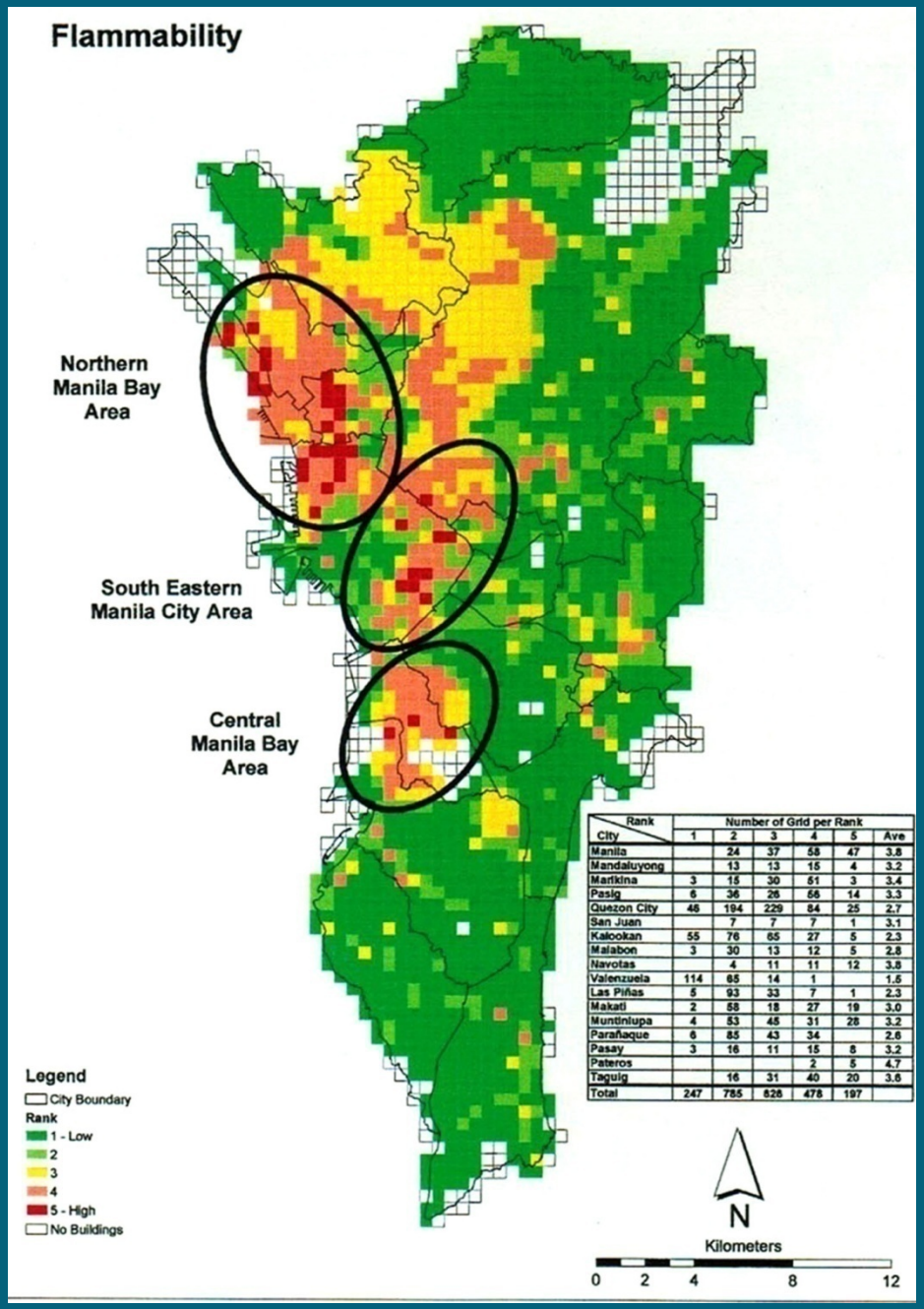
1. **Marikina West Valley Faults (MWVF)with a Magnitude of 7.2**
2. Manila Trench with a Magnitude of 7.9
3. Manila Bay with a Magnitude of 6.5.



Rank	Number of Grid per Rank					
City	1	2	3	4	5	Ave
Manila	28	39	37	34	30	3.0
Mandaluyong	9	34	4	8		2.3
Marikina	13	22	25	27	15	3.1
Pasig	8	25	35	53	19	3.4
Quezon City	166	258	115	38	1	2.0
San Juan	15	4	2		1	1.8
Kalookan	95	102	24	4	3	1.8
Malabon	8	13	18	20	8	3.1
Navotas		2	7	11	18	4.2
Valenzuela	10	71	111	2		2.5
Las Piñas	78	37	21	6		1.7
Makati	36	46	18	21	3	2.3
Muntinlupa	25	47	44	40	6	2.7
Parañaque	72	38	43	8	6	2.0
Pasay	1	8	19	14	11	3.5
Pateros			1	6		3.9
Taguig	8	25	63	9	2	2.7
Total	664	783	586	300	120	

Possible regional separation by earthquake impact

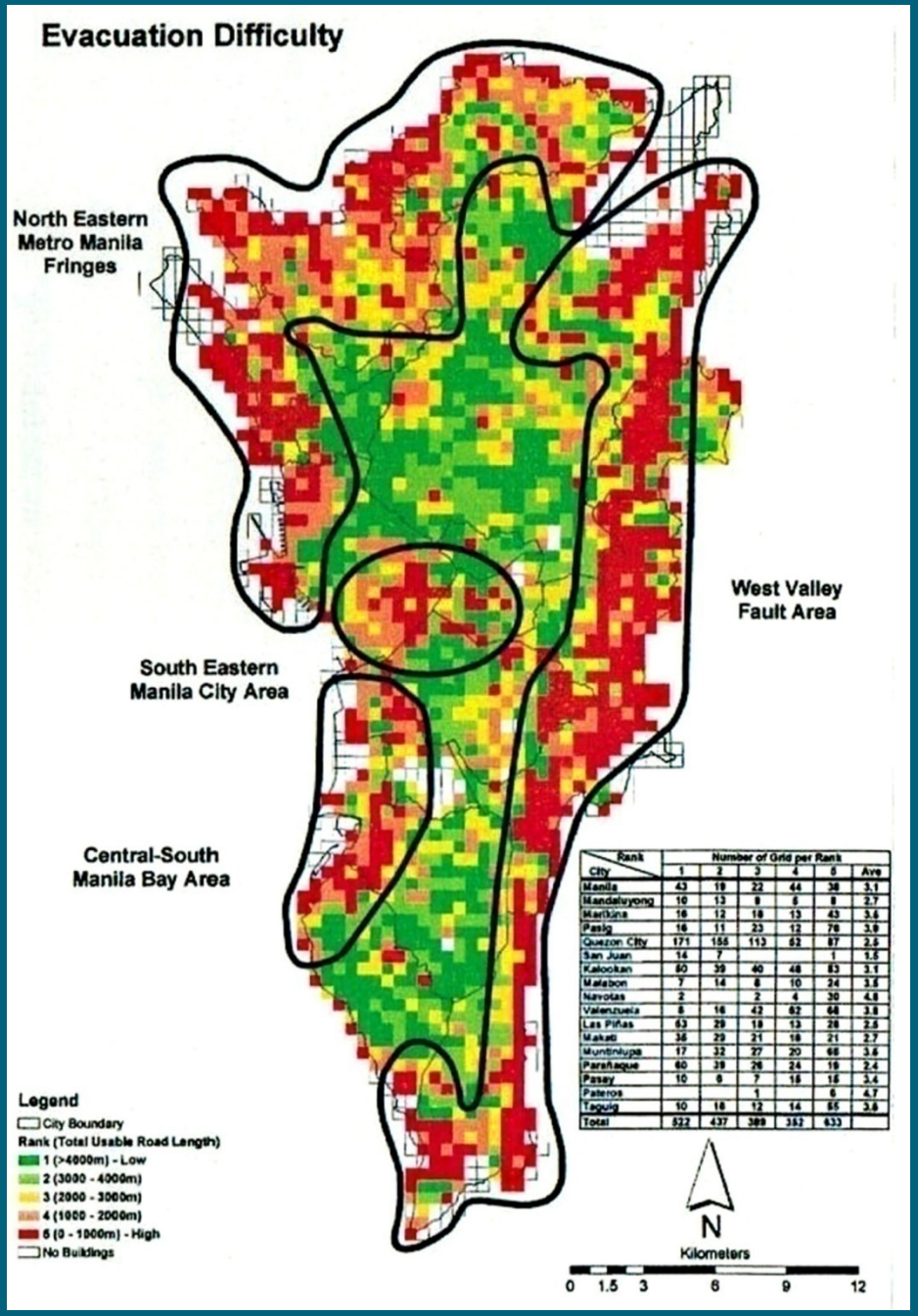
These were based on three susceptibility measures- flammability, building collapse, and evacuation difficulty.



Rank / City	Number of Grid per Rank					
	1	2	3	4	5	Ave
Manila		24	37	58	47	3.8
Mandaluyong		13	13	15	4	3.2
Marikina	3	15	30	61	3	3.4
Pasig	6	36	26	56	14	3.3
Quezon City	48	194	229	84	25	2.7
San Juan		7	7	7	1	3.1
Kalookan	55	76	65	27	5	2.3
Malabon	3	30	13	12	5	2.8
Navotas		4	11	11	12	3.8
Valenzuela	114	65	14	1		1.6
Las Piñas	5	93	33	7	1	2.3
Makati	2	58	18	27	19	3.0
Muntinlupa	4	53	45	31	28	3.2
Parañaque	6	85	43	34		2.6
Pasay	3	16	11	15	8	3.2
Pateros				2	5	4.7
Taguig		16	31	40	20	3.8
Total	247	785	626	478	197	

Flammability

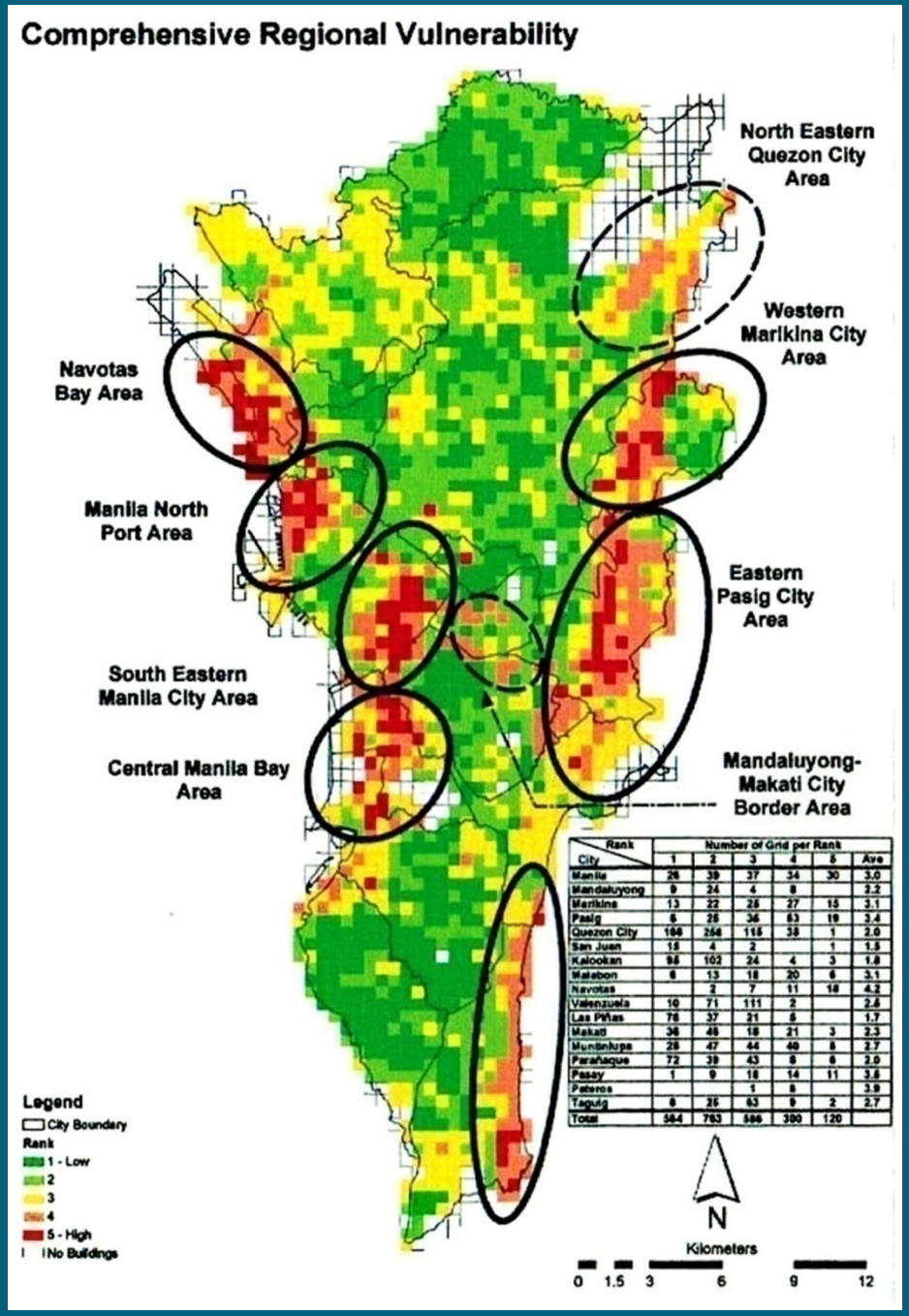
The areas in **Manila are found vulnerable to flammability.**



City \ Rank	Number of Grid per Rank					
	1	2	3	4	5	Ave
Manila	43	19	22	44	38	3.1
Mandaluyong	10	13	8	5	8	2.7
Marikina	16	12	18	13	43	3.6
Pasig	16	11	23	12	78	3.9
Quezon City	171	155	113	62	87	2.5
San Juan	14	7			1	1.5
Kalookan	80	39	40	48	83	3.1
Malabon	7	14	6	10	24	3.5
Navotas	2		2	4	30	4.8
Valenzuela	8	16	42	62	68	3.8
Las Piñas	63	29	18	13	28	2.5
Makati	36	29	21	18	21	2.7
Muntinlupa	17	32	27	20	66	3.6
Parañaque	60	39	26	24	19	2.4
Pasay	10	8	7	18	18	3.4
Pateros			1		6	4.7
Taguig	10	18	12	14	65	3.8
Total	522	437	389	382	633	

Evacuation difficulty

The areas in **Manila are found vulnerable to evacuation difficulty.**



Rank / City	Number of Grid per Rank					
	1	2	3	4	5	Ave
Manila	26	39	37	34	30	3.0
Mandaluyong	9	24	4	8		2.2
Marikina	13	22	25	27	15	3.1
Pasig	5	25	36	63	19	3.4
Quezon City	166	266	115	38	1	2.0
San Juan	15	4	2		1	1.5
Kalookan	96	102	24	4	3	1.8
Malabon	6	13	18	20	6	3.1
Navotas		2	7	11	16	4.2
Valenzuela	10	71	111	2		2.4
Las Piñas	76	37	21	8		1.7
Makati	36	46	18	21	3	2.3
Muntinlupa	25	47	44	40	8	2.7
Parañaque	72	39	43	8	6	2.0
Pasay	1	9	18	14	11	3.8
Pateros			1	8		3.9
Taguig	8	25	63	9	2	2.7
Total	564	763	586	300	120	

Comprehensive regional vulnerability

Metropolitan Manila Earthquake Impact Reduction Study (MMEIRS), 2004

- Highest deaths from collapse of buildings – Manila & Quezon City
- Manila Bay area will be isolated from other parts of Metro Manila due to fire and building collapse.
- Safe ground for the West quadrant (Manila) – 23 has. Intramuros Golf course
- Emergency road/access network - Roxas Boulevard, Taft Avenue & Pasig River

Metropolitan Manila Earthquake Impact Reduction Study (MMEIRS), 2004

- Evacuation facility shortage – Manila North Port Area & south eastern Manila City area
  - Public schools
    – colleges (2km. radius)
    - secondary schools (1 km. radius)
    - elementary schools (0.5 km. radius)

Metropolitan Manila Earthquake Impact Reduction Study (MMEIRS), 2004

- Hospital Service shortage – South eastern Manila City area

- Manila City and adjacent area have certain levels of service; however, there is a high probability of hospitals burning due to fire.

Metropolitan Manila Earthquake Impact Reduction Study (MMEIRS), 2004

- Evacuation area shortage – along Manila Bay, Manila North Port area, south eastern Manila City area

  - Open space and parks (at least 2 has.) – correlated to no. of seriously damaged bldgs. and service area density of parks and open spaces.

Risk Analysis Project
Multi-Hazard & Risk Maps

Greater Metropolitan Manila Area (GMMA) Risk Analysis Project (2013)

Agencies: NDRRMC, PHIVOLCS, DENR-MGB, DND, PAGASA, NAMRIA, AUSAID, & Australian Gov't.

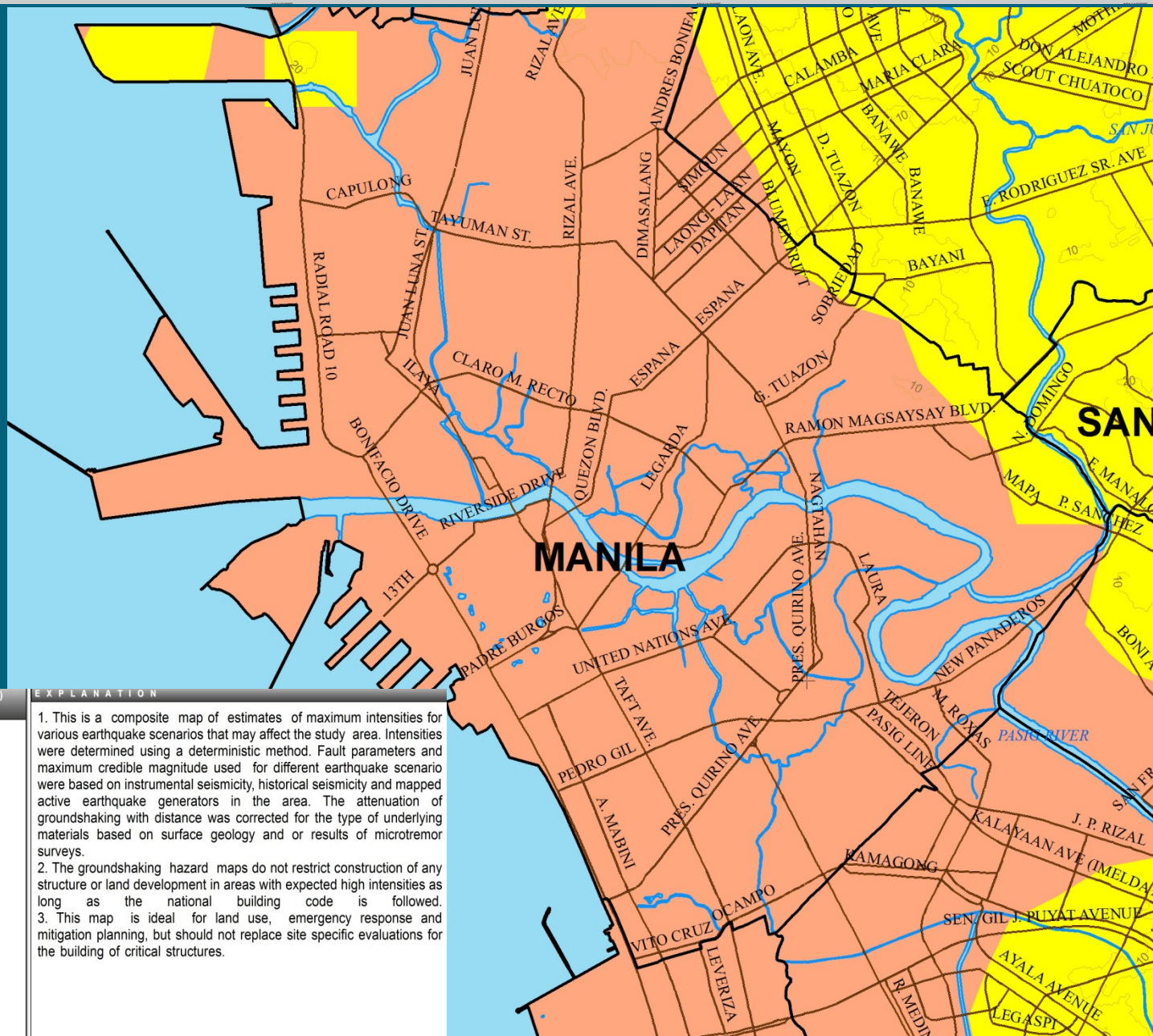
LIDAR Data

- Laser scanning device
- Maps out:
  - Population density
  - Building density
  - Building heights
  - Age & type of buildings
  - Current land use
- Flood, earthquake, severe wind

Measuring Risks

- Damage to physical elements
- Economic loss
- Number of fatalities/injured

RISK ANALYSIS PROJECT: GROUND SHAKING HAZARD MAP
EVENT SCENARIO: MAGNITUDE 7.2 EARTHQUAKE ALONG THE WEST VALLEY FAULT



EARTHQUAKE HAZARD LEGEND (PEIS)

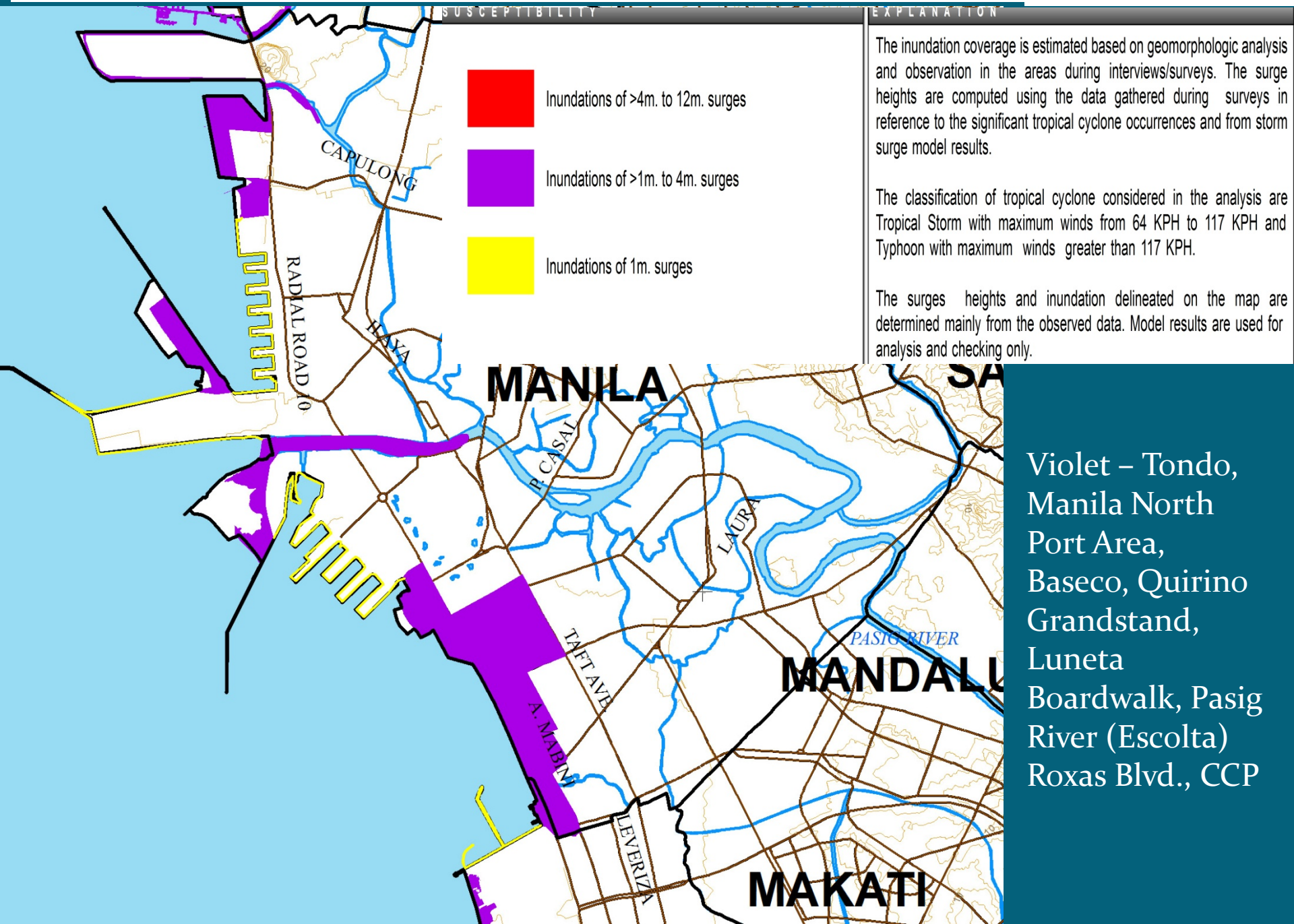
*PHIVOLCS Earthquake Intensity Scale

- Intensity 6
- Intensity 7
- Intensity Low 8
- Intensity High 8
- Intensity Low 9
- Intensity High 9

EXPLANATION

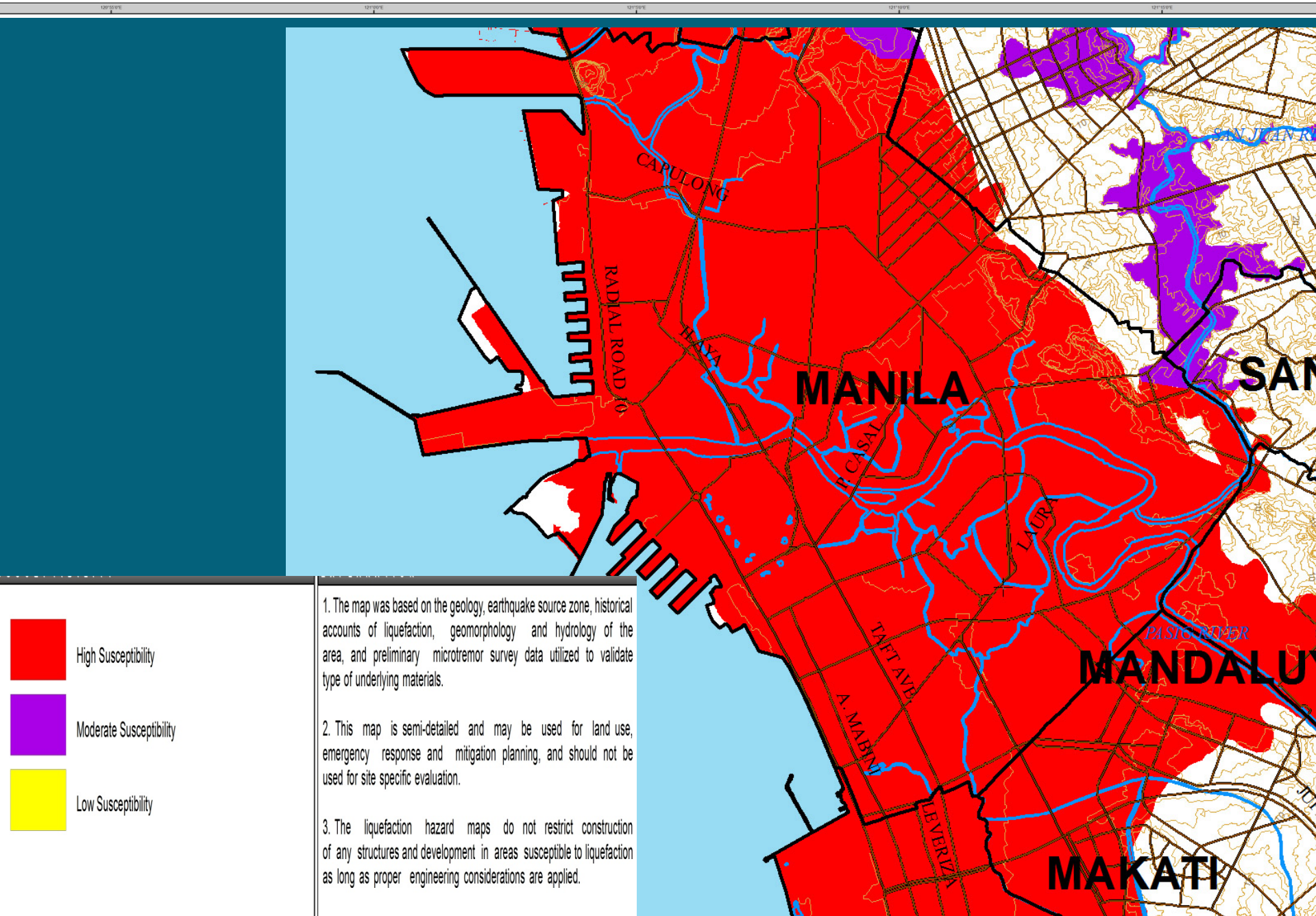
1. This is a composite map of estimates of maximum intensities for various earthquake scenarios that may affect the study area. Intensities were determined using a deterministic method. Fault parameters and maximum credible magnitude used for different earthquake scenario were based on instrumental seismicity, historical seismicity and mapped active earthquake generators in the area. The attenuation of groundshaking with distance was corrected for the type of underlying materials based on surface geology and or results of microtremor surveys.
2. The groundshaking hazard maps do not restrict construction of any structure or land development in areas with expected high intensities as long as the national building code is followed.
3. This map is ideal for land use, emergency response and mitigation planning, but should not replace site specific evaluations for the building of critical structures.

READY FOR GMMA PROJECT : PRELIMINARY STORM SURGE HAZARD MAP



Violet – Tondo, Manila North Port Area, Baseco, Quirino Grandstand, Luneta Boardwalk, Pasig River (Escolta) Roxas Blvd., CCP

READY FOR GMMA PROJECT : PRELIMINARY LIQUEFACTION HAZARD MAP



High Susceptibility

Moderate Susceptibility

Low Susceptibility

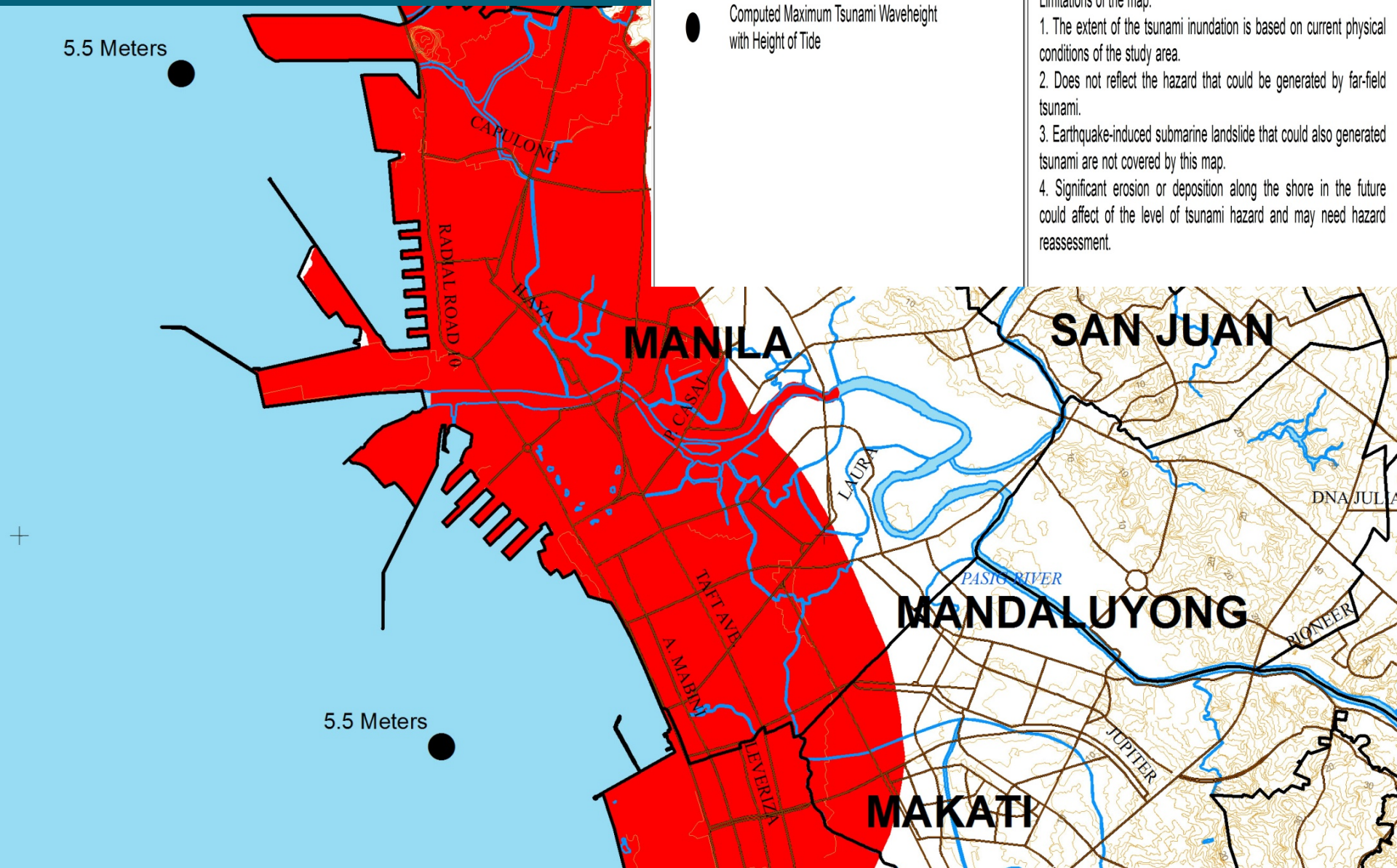
1. The map was based on the geology, earthquake source zone, historical accounts of liquefaction, geomorphology and hydrology of the area, and preliminary microtremor survey data utilized to validate type of underlying materials.

2. This map is semi-detailed and may be used for land use, emergency response and mitigation planning, and should not be used for site specific evaluation.

3. The liquefaction hazard maps do not restrict construction of any structures and development in areas susceptible to liquefaction as long as proper engineering considerations are applied.

READY FOR GMMA PROJECT : PRELIMINARY TSUNAMI HAZARD MAP

Pasig River – up to Nagtahan Bridge (river side); before Malacanan (landside)



SUSCEPTIBILITY

Tsunami Inundation Area

Computed Maximum Tsunami Waveheight with Height of Tide

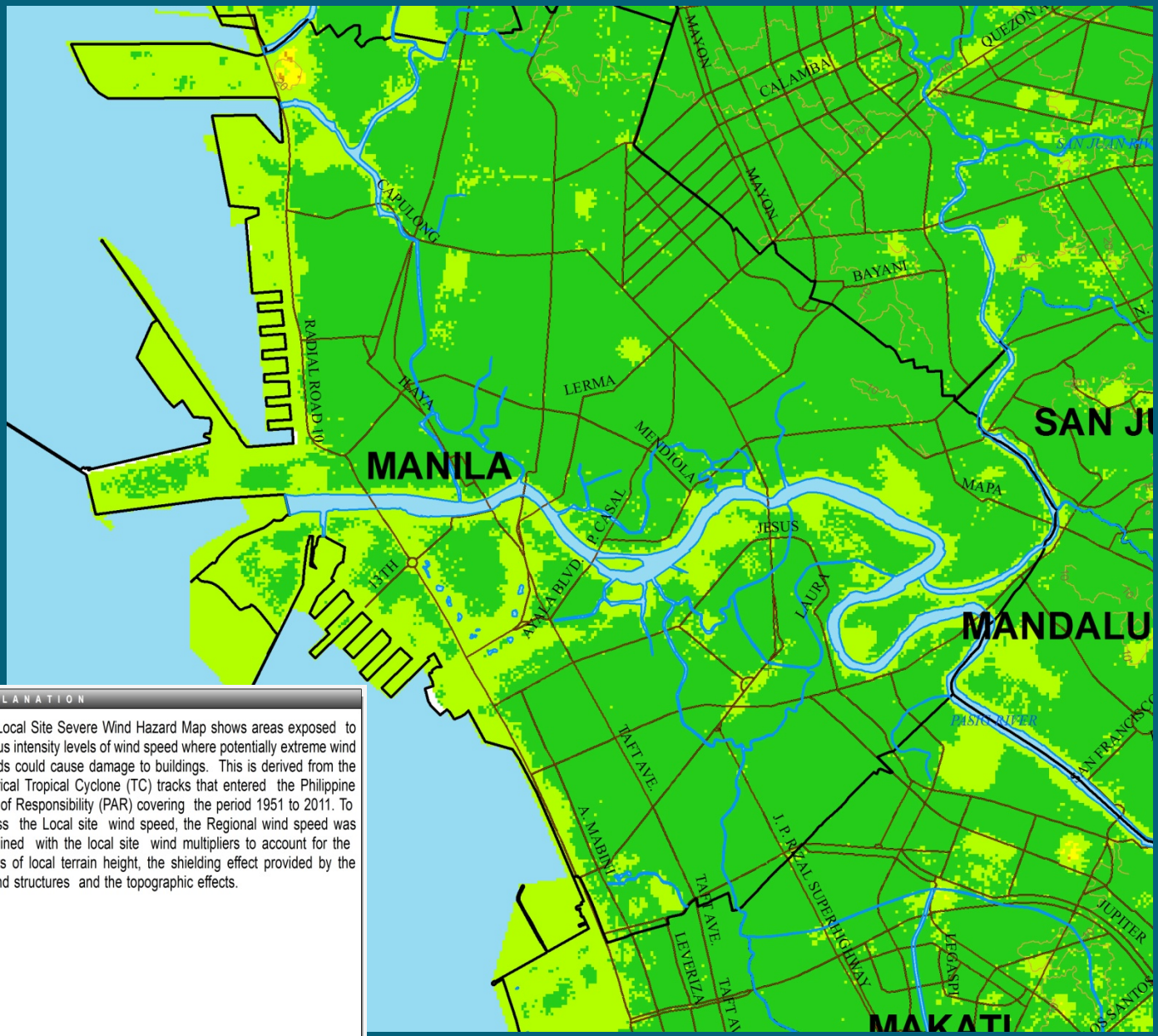
EXPL

This tsunami hazard was generated using available tsunami programs, earthquake and tectonic data, and topographic and batymetric maps.

Limitations of the map:

1. The extent of the tsunami inundation is based on current physical conditions of the study area.
2. Does not reflect the hazard that could be generated by far-field tsunami.
3. Earthquake-induced submarine landslide that could also generated tsunami are not covered by this map.
4. Significant erosion or deposition along the shore in the future could affect of the level of tsunami hazard and may need hazard reassessment.

RISK ANALYSIS PROJECT: SEVERE WIND HAZARD MAP
EVENT SCENARIO: 5% ANNUAL EXCEEDANCE PROBABILITY (1/20)



WIND SPEED (IN KPH)

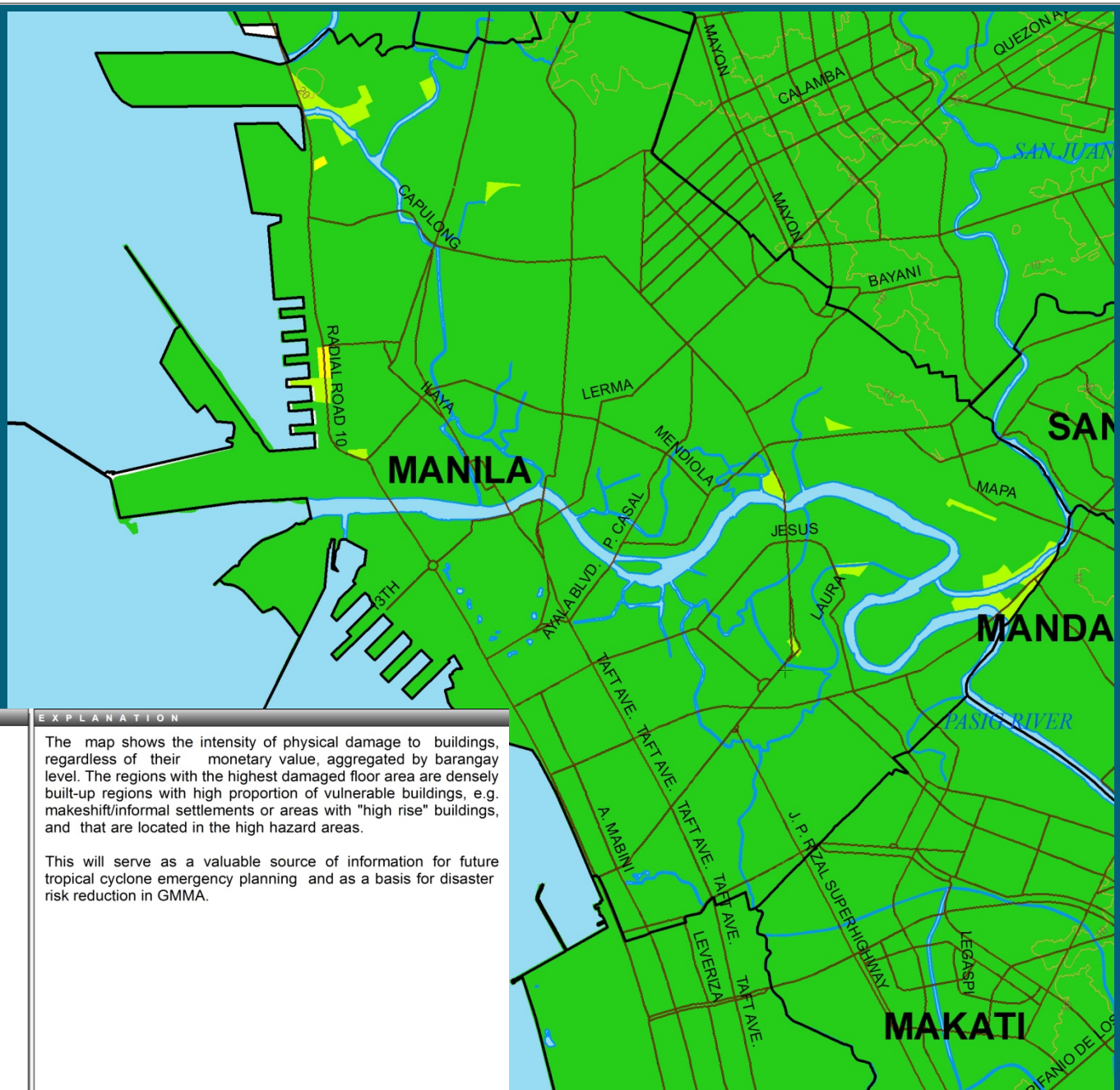
- 60 - 100
- 101 - 140
- 141 - 170
- 171 - 200
- 201 - 230
- > 230

EXPLANATION

The Local Site Severe Wind Hazard Map shows areas exposed to various intensity levels of wind speed where potentially extreme wind speeds could cause damage to buildings. This is derived from the historical Tropical Cyclone (TC) tracks that entered the Philippine Area of Responsibility (PAR) covering the period 1951 to 2011. To assess the Local site wind speed, the Regional wind speed was combined with the local site wind multipliers to account for the effects of local terrain height, the shielding effect provided by the upwind structures and the topographic effects.

RISK ANALYSIS PROJECT: SEVERE WIND RISK MAP
5% ANNUAL EXCEEDANCE PROBABILITY: BUILDING DAMAGED FLOOR AREA EQUIVALENT

(1/20)



RISK LEGEND

Building Damaged Floor Area Equivalent (ha/Sq.Km)

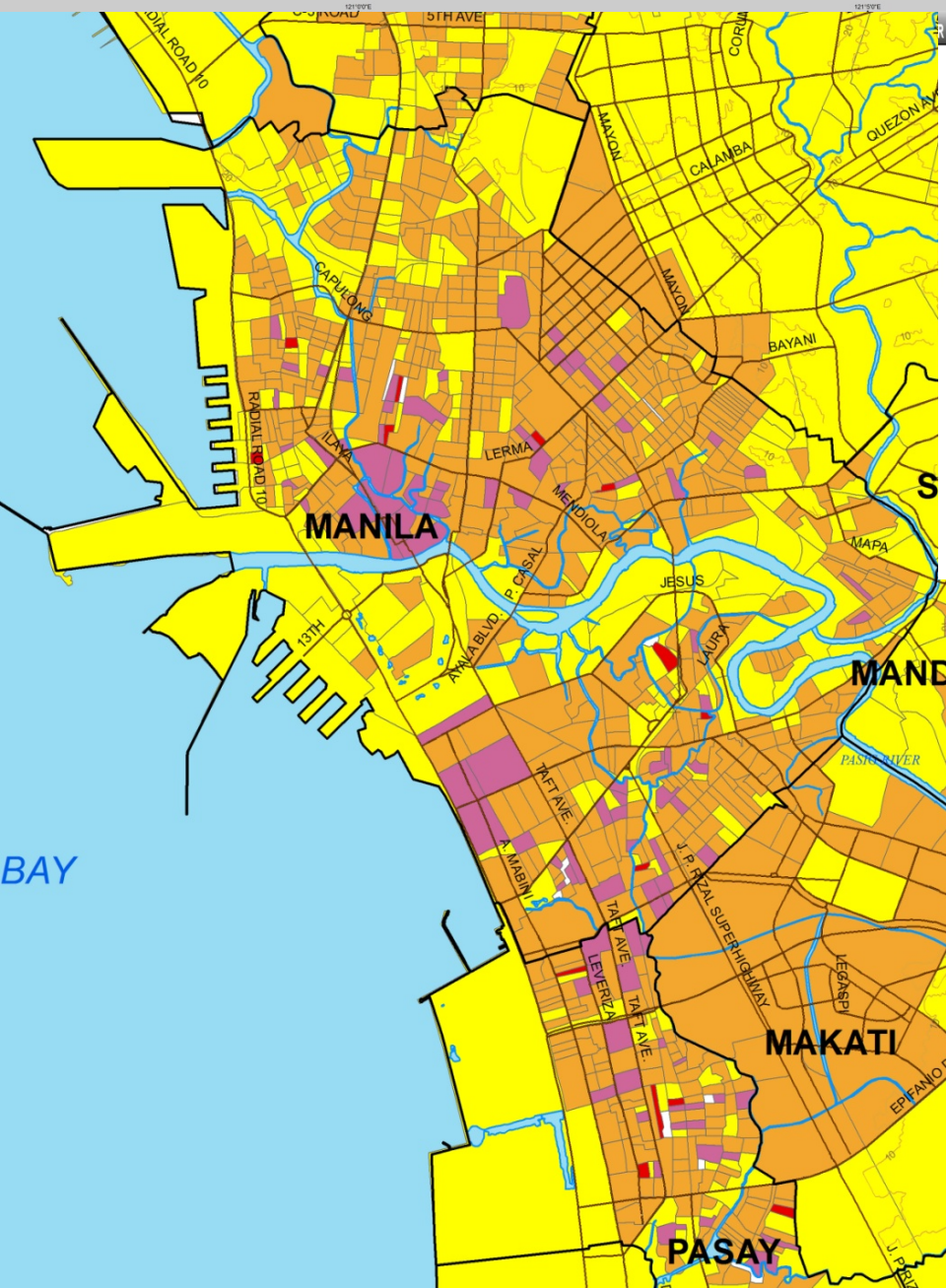
- < 0.50
- 0.51 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.01 - 2.50
- > 2.5

EXPLANATION

The map shows the intensity of physical damage to buildings, regardless of their monetary value, aggregated by barangay level. The regions with the highest damaged floor area are densely built-up regions with high proportion of vulnerable buildings, e.g. makeshift/informal settlements or areas with "high rise" buildings, and that are located in the high hazard areas.

This will serve as a valuable source of information for future tropical cyclone emergency planning and as a basis for disaster risk reduction in GMMA.

RISK ANALYSIS PROJECT: TOTAL FLOOR AREA IN COLLAPSED DAMAGE STATE PER BARANGAY FOR A MAGNITUDE 7.2 WEST VALLEY FAULT EARTHQUAKE



RISK LEGEND

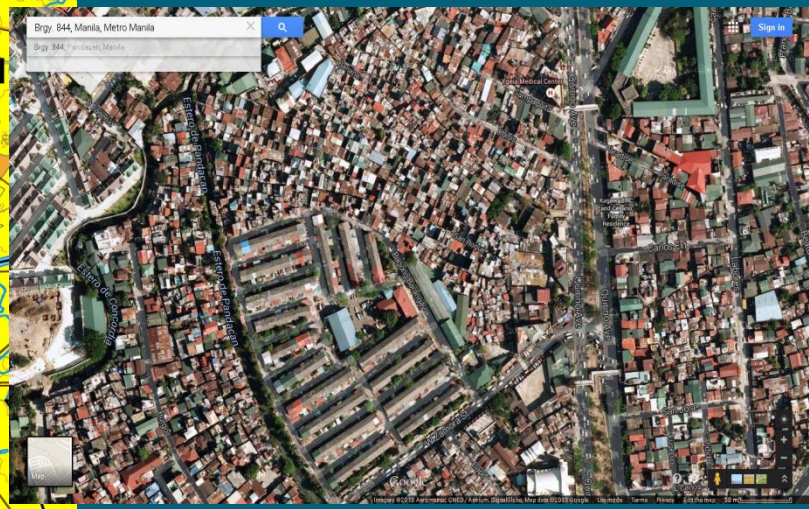
(In 10,000 sq.m. of Floor Area per 1 sq.km. Barangay Area)

- 0, No Collapse
- 1 - 3, Low Complete Collapse Damage Density
- 4 - 6, Medium Complete Collapse Damage Density
- 7 - 9, High Complete Collapse Damage Density
- more than 9, Very High Complete Collapse Damage Density

EXPLANATION

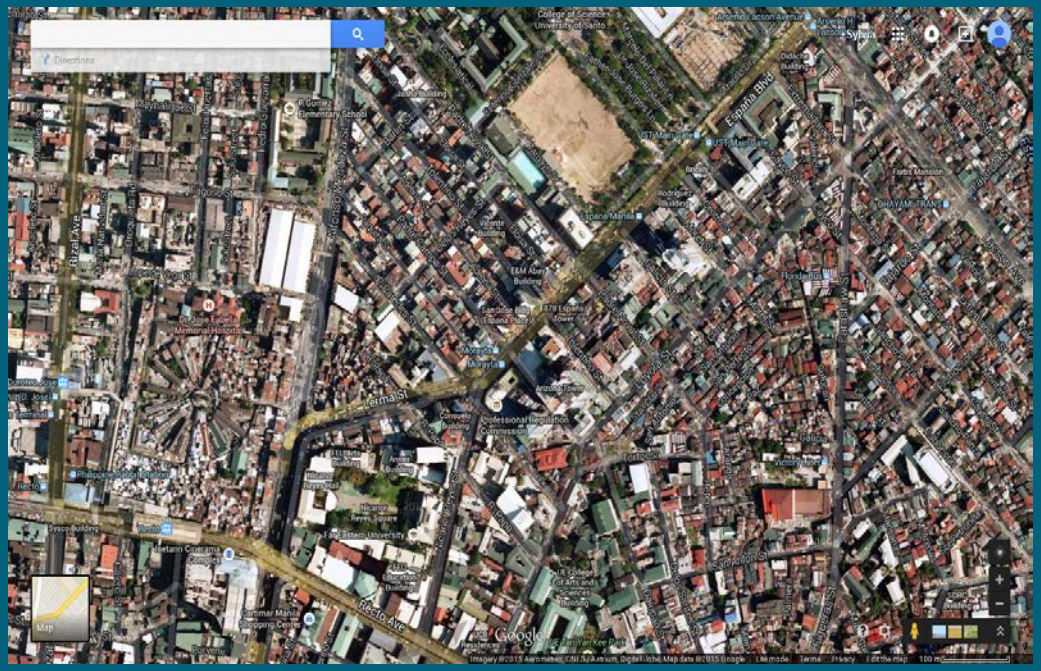
The earthquake risk maps were prepared using a Magnitude 7.2 earthquake scenario from the Valley Fault System, an exposure database developed using an area-based approach and vulnerability and fragility curves developed by engineers for Philippine building types.

*as of June 2013

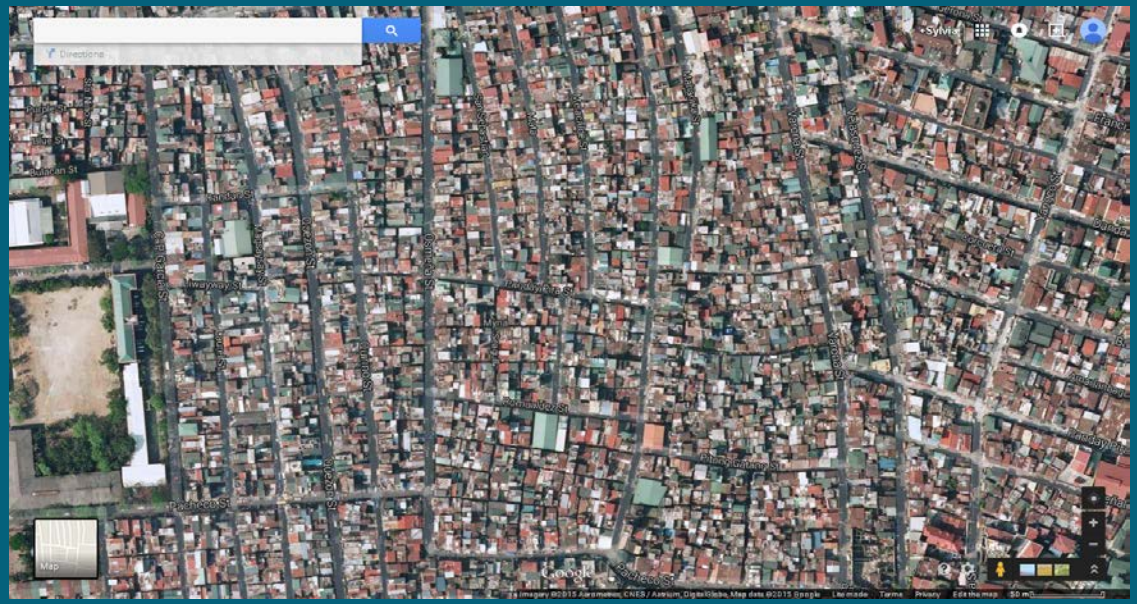


Red -Pandacan area (brgys. 842 & 843). Data obtained from *Google Maps, 2015.*

High Complete Collapse Damage Density

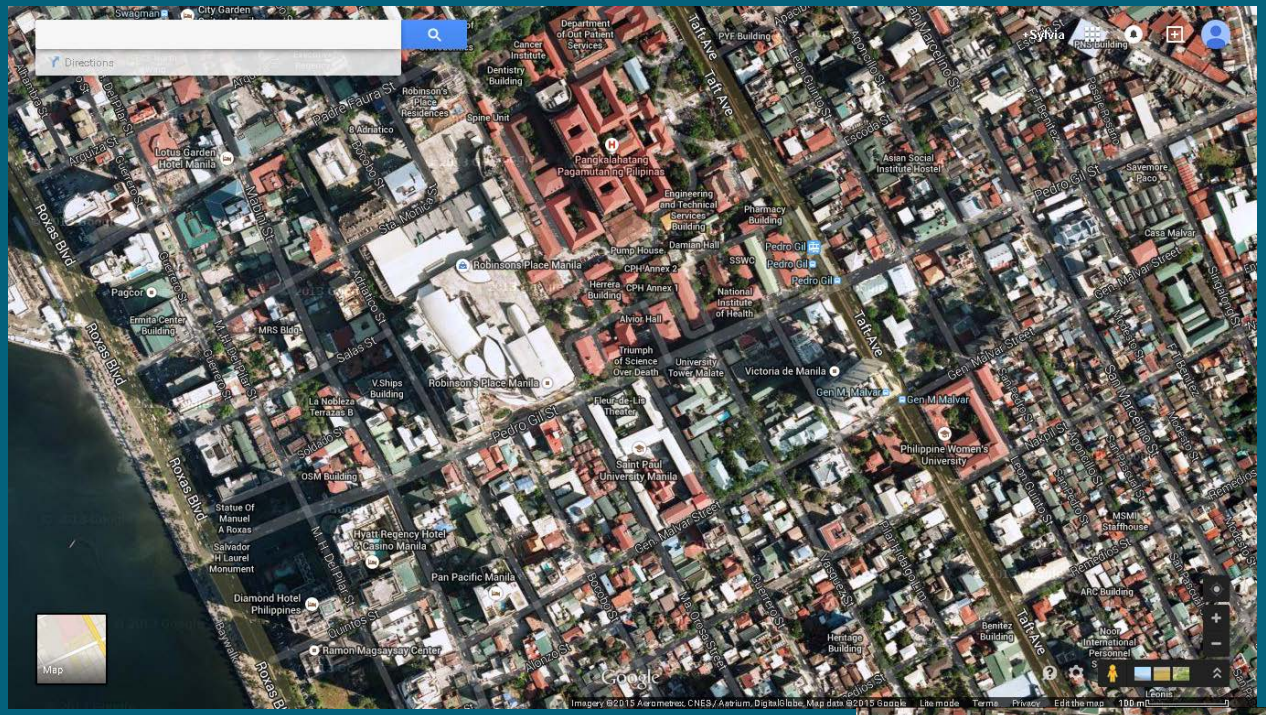


Sampaloc district along España blvd. Data obtained from *Google Maps, 2015.*

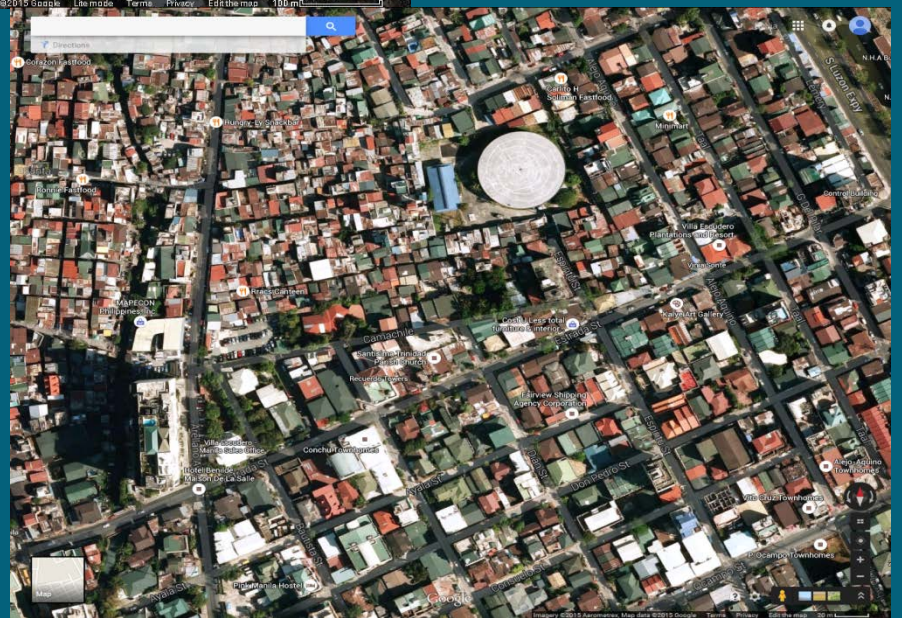


Tondo (brgys. 67, 70, 79, 109, & 111). Data obtained from *Google Maps, 2015*

High Complete Collapse Damage Density

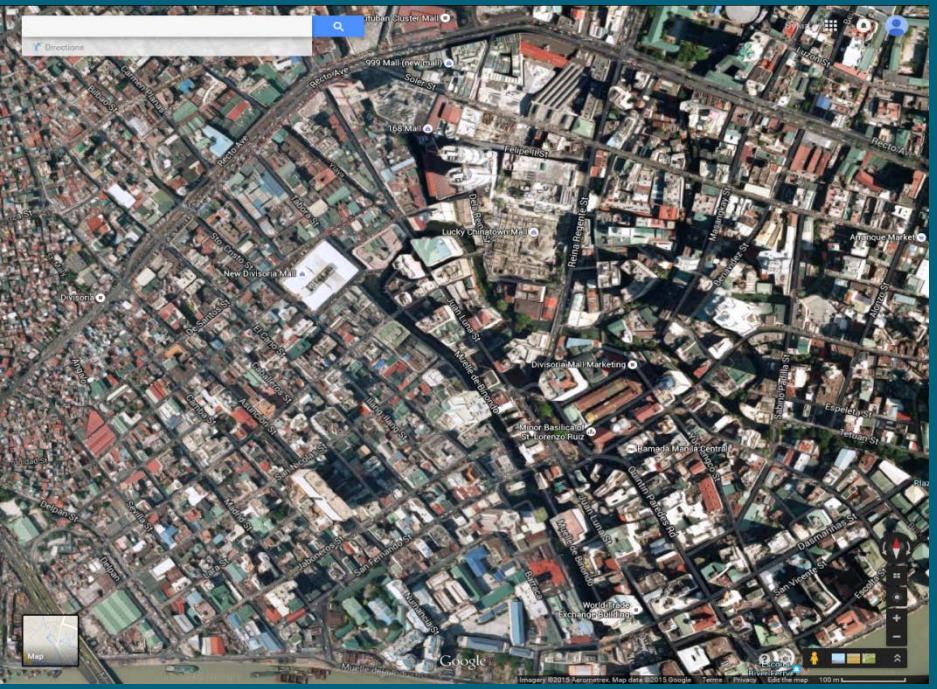


Ermita, with its numerous commercial, institutional, and office buildings such as Robinson's Place Manila, Hyatt Regency Hotel, Pan Pacific Manila, Diamond Hotel, Ramon Magsaysay Center, Phil. General Hospital. Data obtained from *Google Maps, 2015*.

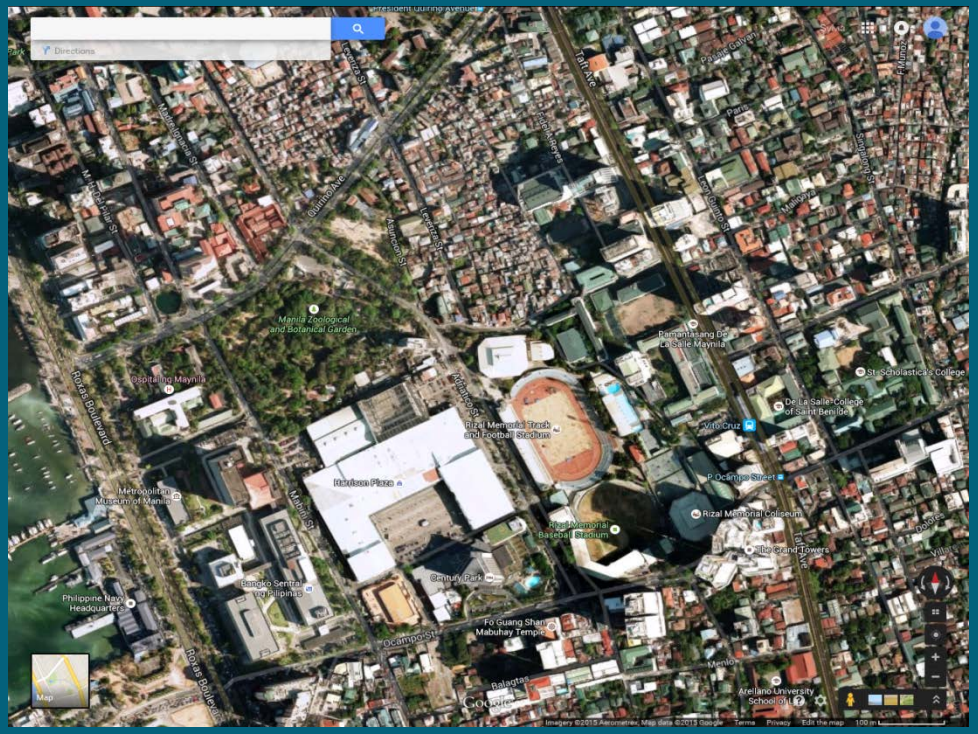


Malate (brgy. 752). Data obtained from *Google Maps, 2015*.

High Complete Collapse Damage Density



Binondo is a highly-densed commercial area with its old and new commercial malls such as Divisoria Mall, 168 Mall, Lucky Chinatown Mall, etc. and also new residential and office towers rising in the district. Data obtained from *Google Maps, 2015*

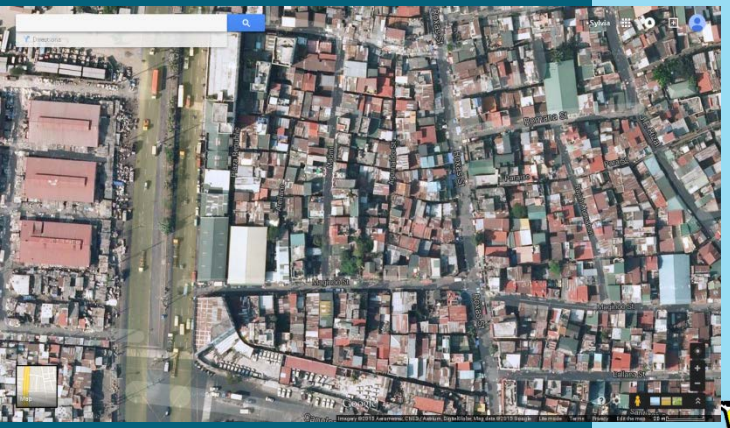


Malate (brgys. 707, 708, 709, & 715, & 727). Data obtained from *Google Maps, 2015*.

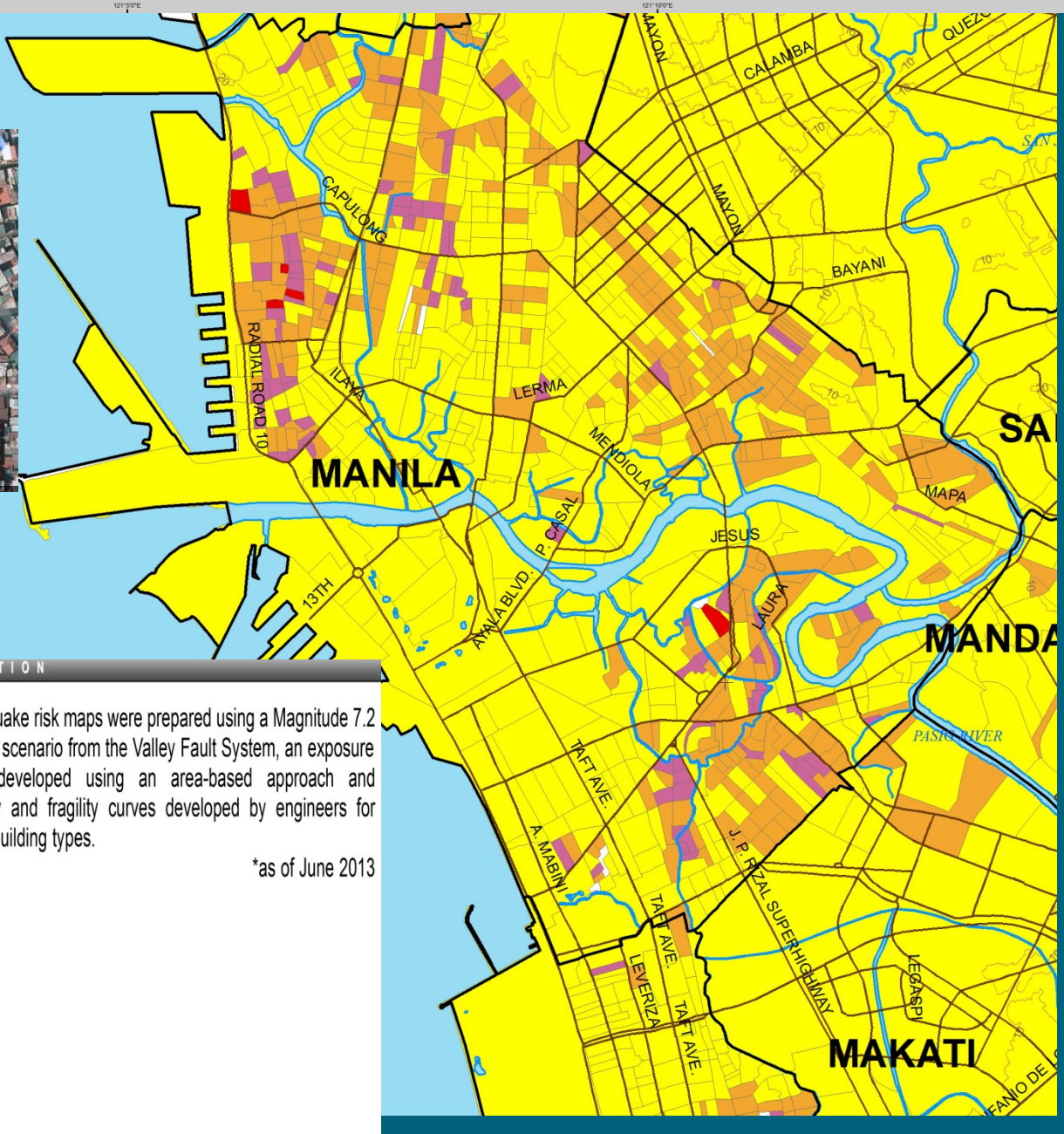
Located in the area are: Enrique M. Razon Sports Center, Ninoy Aquino Stadium, Rizal Memorial Track and Football Stadium, De La Salle University, Harrison Plaza, and Century Park Hotel.

RISK ANALYSIS PROJECT: ESTIMATED NUMBER OF FATALITIES PER BARANGAY FOR A MAGNITUDE 7.2 VALLEY FAULT EARTHQUAKE

Red – Pandacan, Tondo



Tondo (brgy. 105). Data obtained from *Google Maps, 2015. Source: Google Maps, 2015*



RISK LEGEND

(Count per 1 sq.km. Barangay Area)

- 0, No Fatality
- 1 - 200, Low Fatality Density
- 201 - 500, Moderate Fatality Density
- 501 - 1200, High Fatality Density
- more than 1200, Very High Fatality Density

EXPLANATION

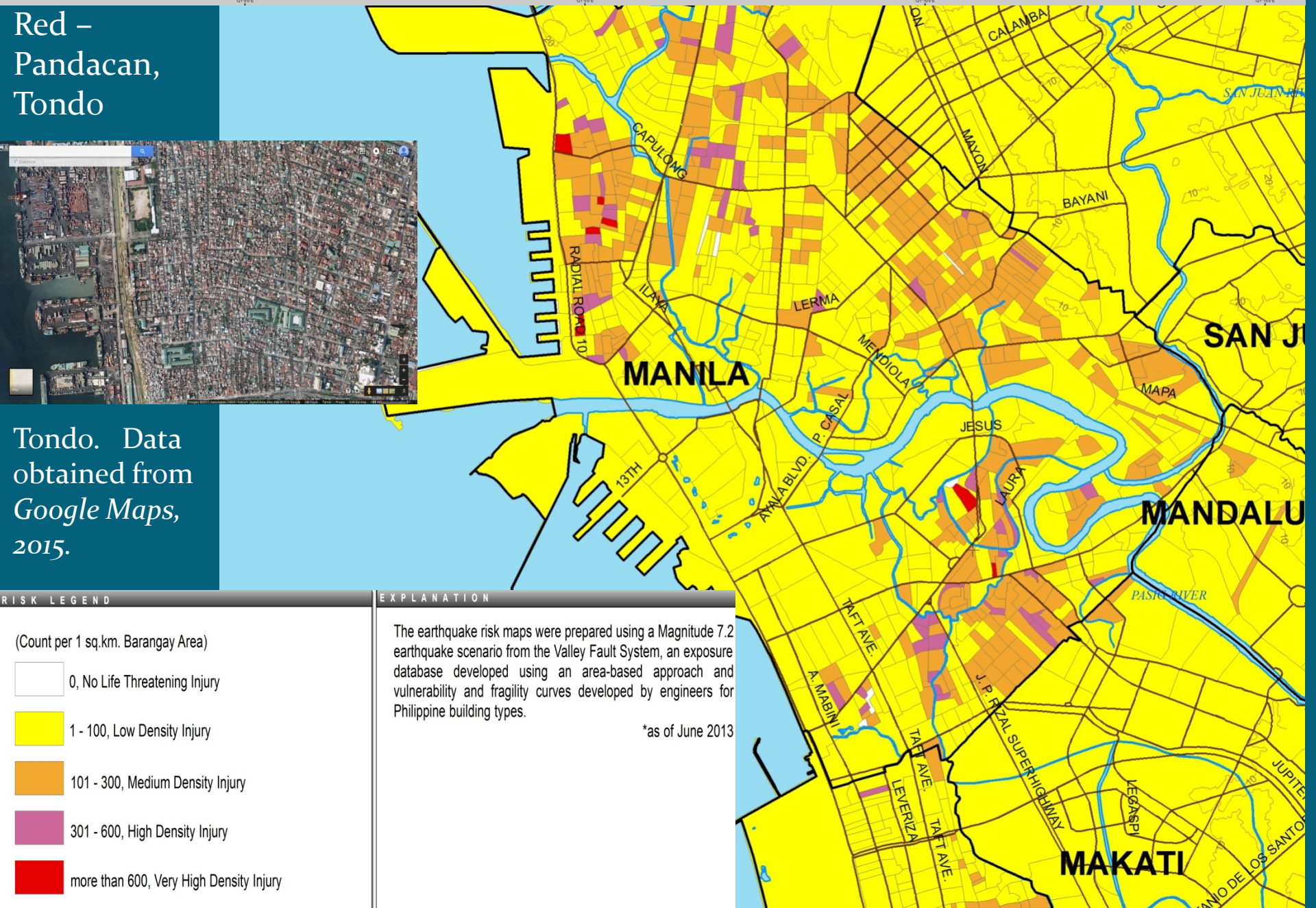
The earthquake risk maps were prepared using a Magnitude 7.2 earthquake scenario from the Valley Fault System, an exposure database developed using an area-based approach and vulnerability and fragility curves developed by engineers for Philippine building types.

*as of June 2013

RISK ANALYSIS PROJECT: ESTIMATED NUMBER OF LIFE THREATENING INJURIES PER BARANGAY FOR A MAGNITUDE 7.2 VALLEY FAULT EARTHQUAKE

Red – Pandacan, Tondo

Tondo. Data obtained from *Google Maps, 2015.*



RISK LEGEND

(Count per 1 sq.km. Barangay Area)

- 0, No Life Threatening Injury
- 1 - 100, Low Density Injury
- 101 - 300, Medium Density Injury
- 301 - 600, High Density Injury
- more than 600, Very High Density Injury

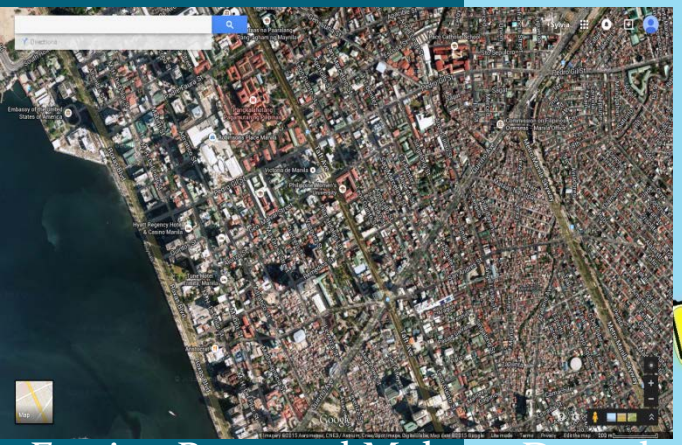
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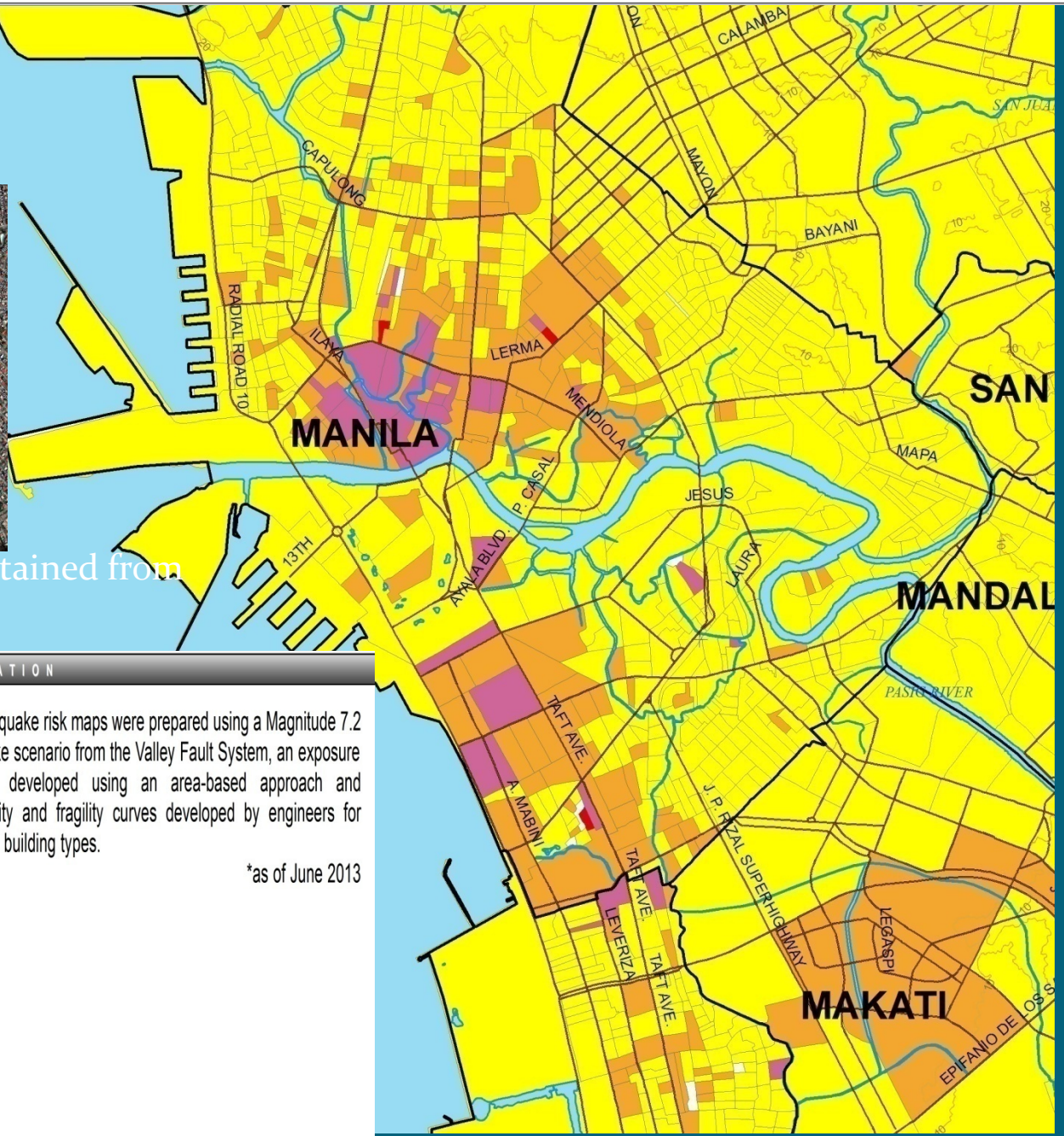
*as of June 2013

RISK ANALYSIS PROJECT: TOTAL FLOOR AREA IN EXTENSIVE DAMAGE STATE PER BARANGAY FOR A MAGNITUDE 7.2 WEST VALLEY FAULT EARTHQUAKE

Violet – Binondo, Ermita, Phil. Normal U.(?), UP-PGH(?), Malate



Ermita, Paco, and Malate. Data obtained from *Google Maps, 2015.*



RISK LEGEND

(in 10,000 sq.m. of floor area per 1 sq.km. barangay area)

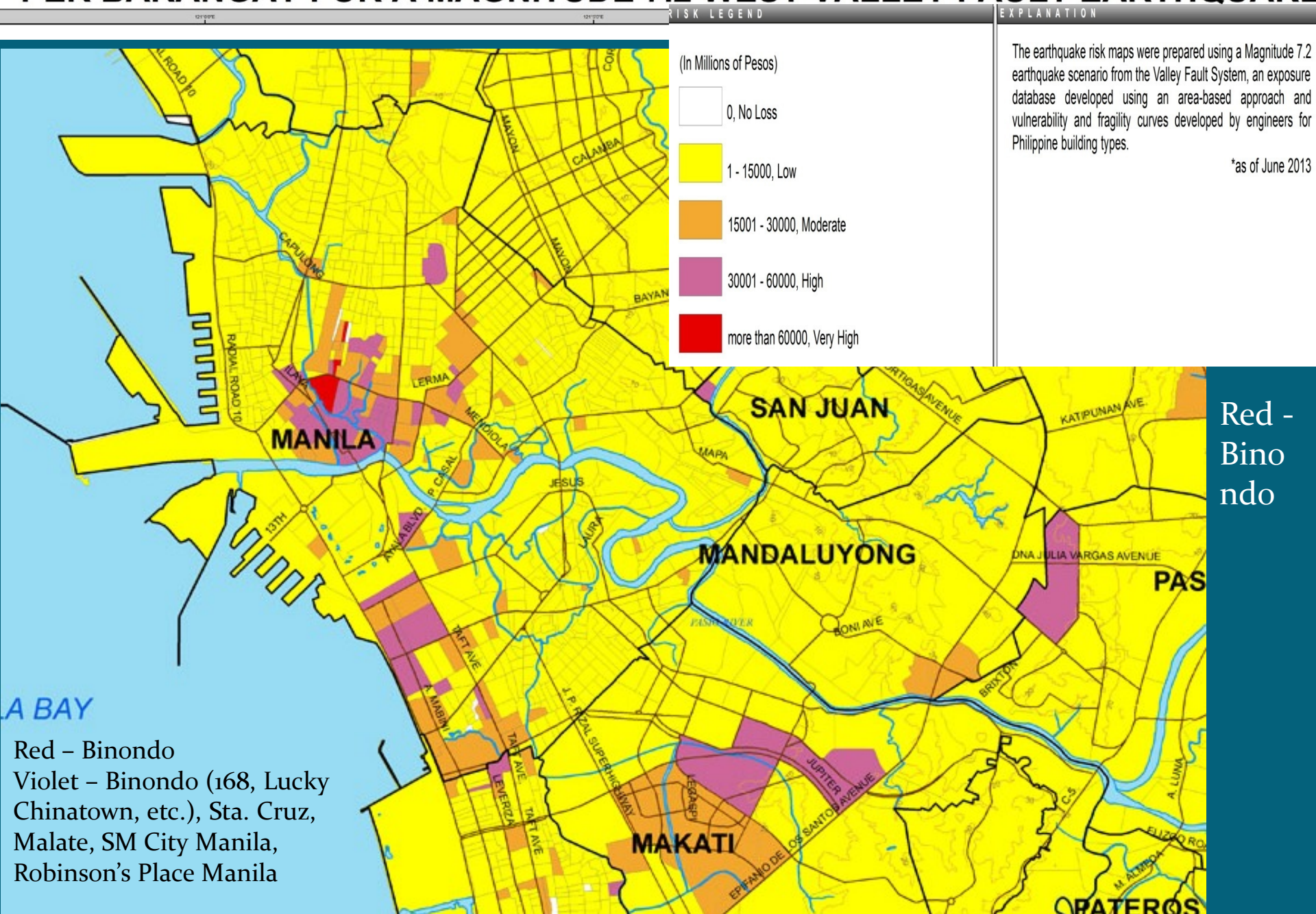
- 0, No Damage
- 1 - 30, Low Extensive Damage Density
- 31 - 60, Moderate Extensive Damage Density
- 61 - 90, High Extensive Damage Density
- more than 90, Very High Extensive Damage Density

EXPLANATION

The earthquake risk maps were prepared using a Magnitude 7.2 earthquake scenario from the Valley Fault System, an exposure database developed using an area-based approach and vulnerability and fragility curves developed by engineers for Philippine building types.

*as of June 2013

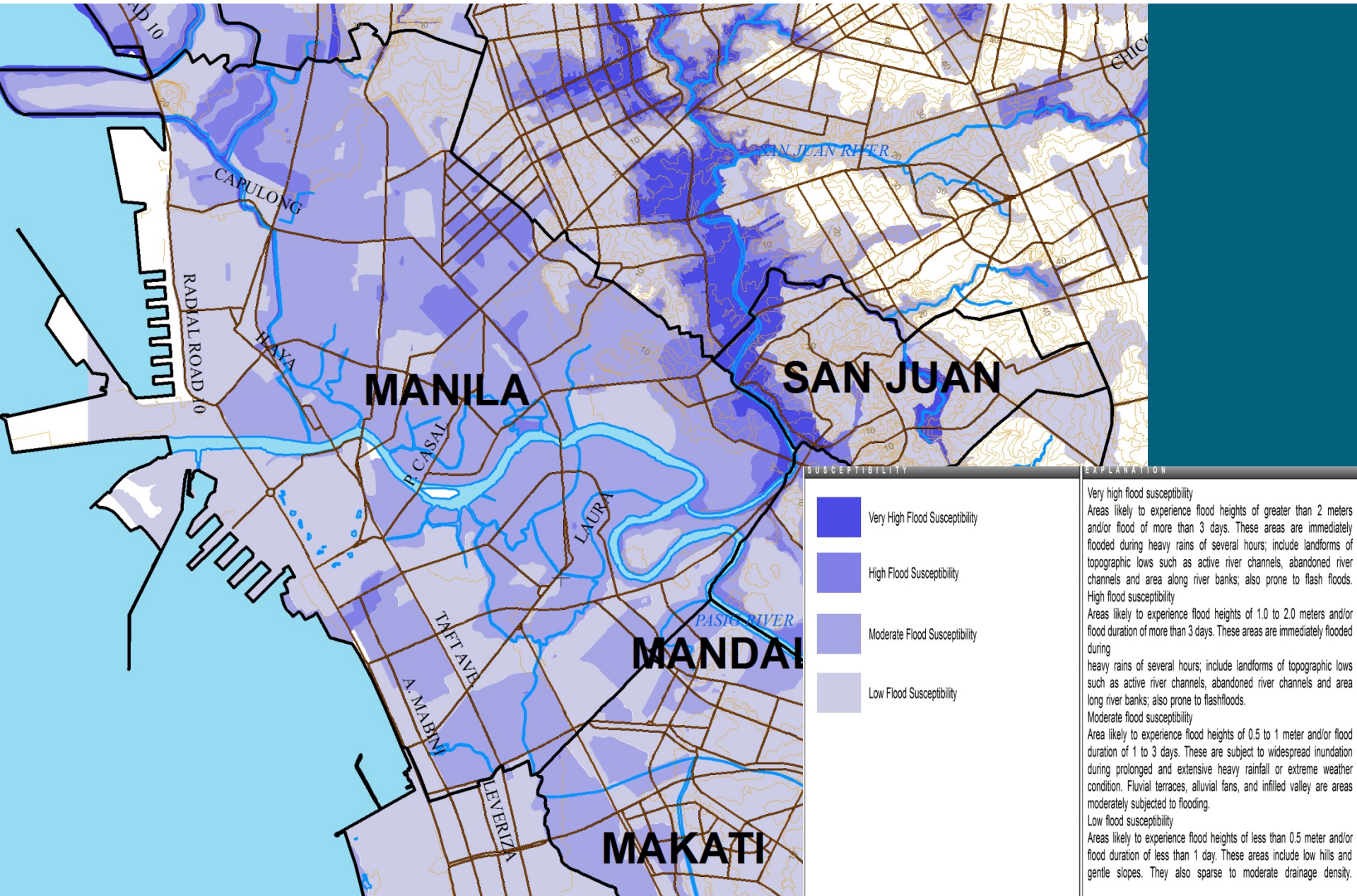
RISK ANALYSIS PROJECT: ESTIMATED ECONOMIC LOSS PER BARANGAY FOR A MAGNITUDE 7.2 WEST VALLEY FAULT EARTHQUAKE



Red – Binondo
Violet – Binondo (168, Lucky Chinatown, etc.), Sta. Cruz, Malate, SM City Manila, Robinson's Place Manila

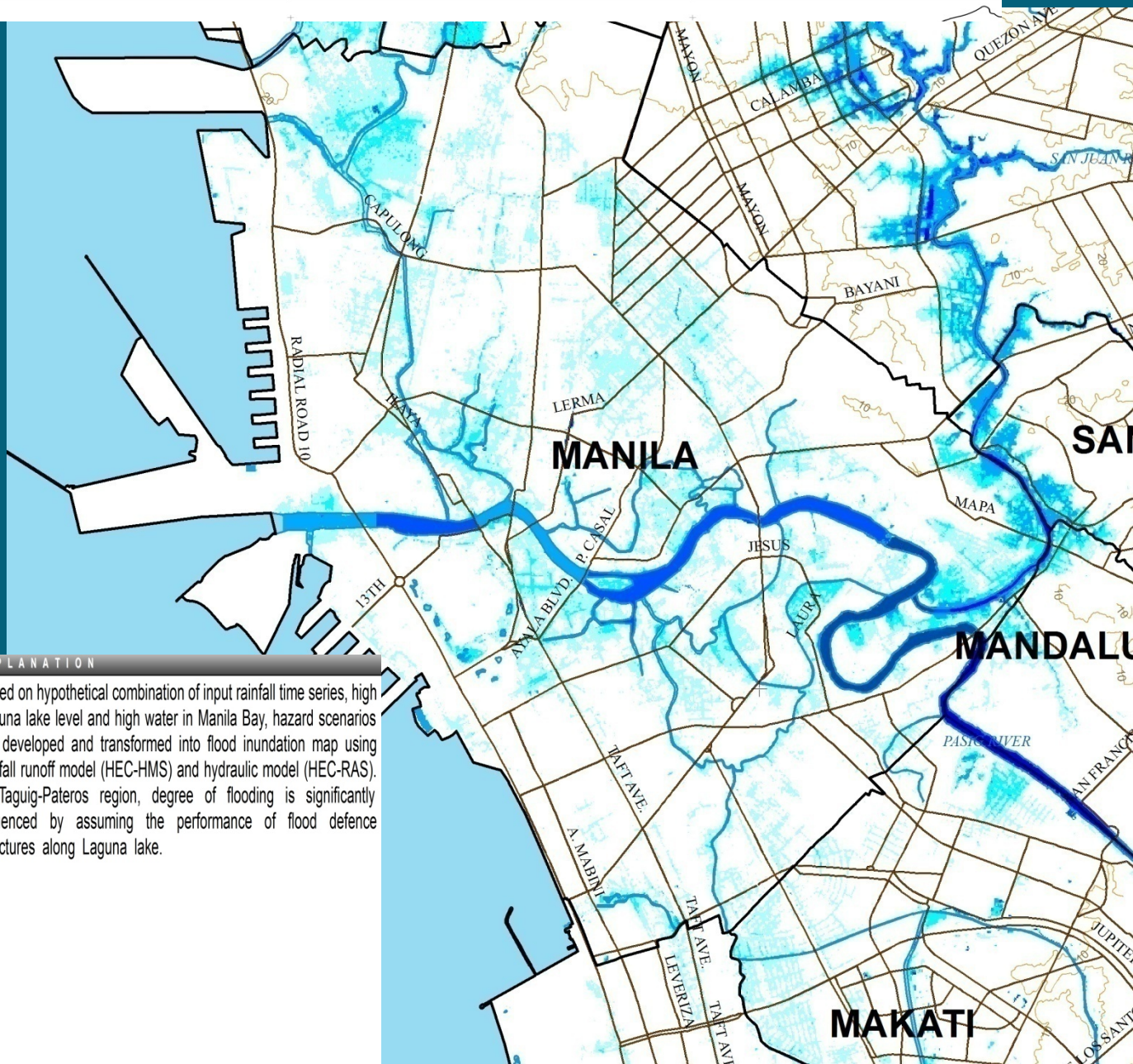
Red - Binondo

READY FOR GMMA PROJECT : PRELIMINARY FLOOD HAZARD MAP



RISK ANALYSIS PROJECT: FLOOD HAZARD MAP
EVENT SCENARIO: 20% ANNUAL EXCEEDANCE PROBABILITY (1/5)

Ermita, Intramuros, Pandacan, Sta. Mesa



FLOOD HAZARD LEGEND(IN METERS)

- 0.1 - 0.5 Ankle deep - Knee deep
- 0.5 - 1.0 Knee deep - Waist deep
- 1.0 - 2.0 Waist deep - Top of head deep
- 2.0 - 3.0 Top of head deep - 1-storey high
- 3.0 - 4.0 1-storey high - 1.5-storeys high
- > 4.0 1.5-storeys high or higher

EXPLANATION

Based on hypothetical combination of input rainfall time series, high Laguna lake level and high water in Manila Bay, hazard scenarios are developed and transformed into flood inundation map using rainfall runoff model (HEC-HMS) and hydraulic model (HEC-RAS). In Taguig-Pateros region, degree of flooding is significantly influenced by assuming the performance of flood defence structures along Laguna lake.

RISK ANALYSIS PROJECT: FLOOD RISK MAP
20% ANNUAL EXCEEDANCE PROBABILITY (1/5) : BUILDING DAMAGE COST

Dark green – Tondo, Binondo, Ermita, San Miguel, Sta. Mesa, Pandacan



RISK LEGEND

DAMAGE FLOOR AREA EQUIVALENT (ha/km^2)

- 1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- > 25

EXPLANATION

This map estimates the degree of building damage caused by a flood which has a 20% probability of occurrence every year. It is derived by combining the results of a flood model with information on the building types and their susceptibility to flooding.

RISK ANALYSIS PROJECT: FLOOD RISK MAP
20% ANNUAL EXCEEDANCE PROBABILITY (1/5) : POPULATION WITH INUNDATED HOMES

Red – along esteros - Tondo, PNR Blumentritt, along esteros (Sta. Ana, Malate)



RISK LEGEND

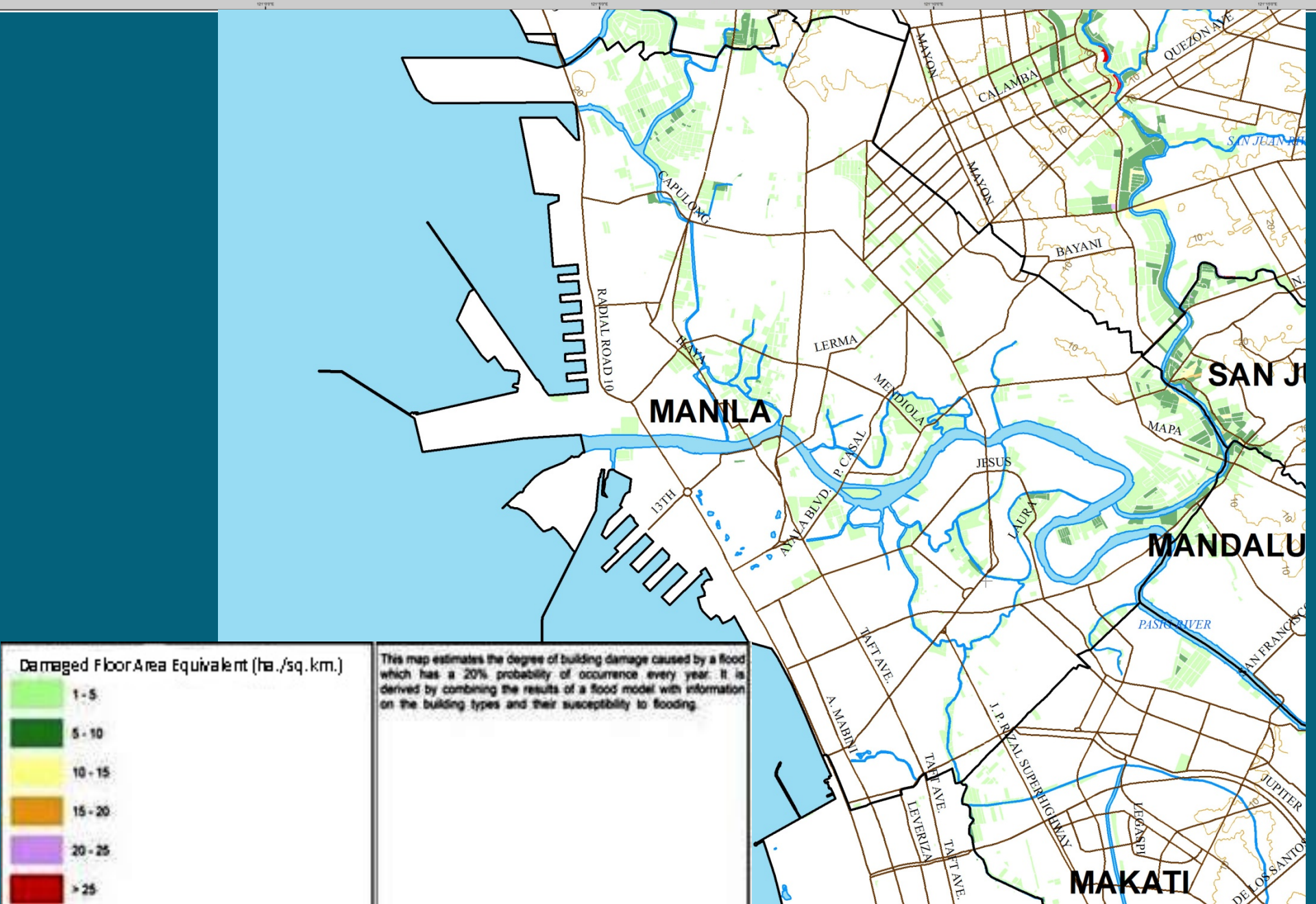
POPULATION WITH INUNDATED HOMES
(Thousands of People / km^2)

- 1 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- >100

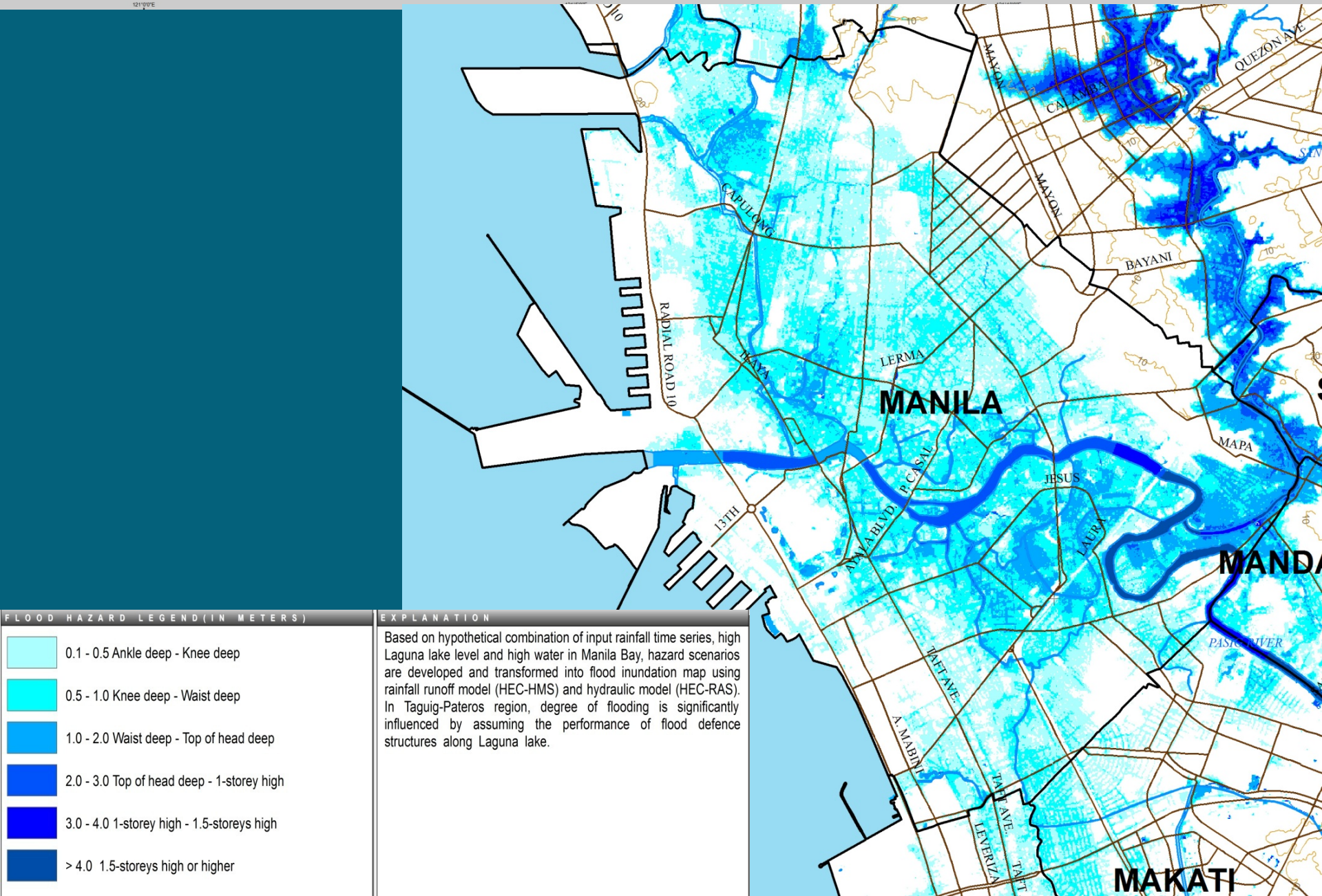
EXPLANATION

This map estimates the number of people whose homes would be inundated by a flood which has a 20% probability of occurrence every year.

RISK ANALYSIS PROJECT: FLOOD RISK MAP
20% ANNUAL EXCEEDANCE PROBABILITY (1/5) : DAMAGED FLOOR AREA EQUIVALENT



RISK ANALYSIS PROJECT: FLOOD HAZARD MAP
EVENT SCENARIO: 1% ANNUAL EXCEEDANCE PROBABILITY (1/100)



FLOOD HAZARD LEGEND(IN METERS)

- 0.1 - 0.5 Ankle deep - Knee deep
- 0.5 - 1.0 Knee deep - Waist deep
- 1.0 - 2.0 Waist deep - Top of head deep
- 2.0 - 3.0 Top of head deep - 1-storey high
- 3.0 - 4.0 1-storey high - 1.5-storeys high
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EXPLANATION

Based on hypothetical combination of input rainfall time series, high Laguna lake level and high water in Manila Bay, hazard scenarios are developed and transformed into flood inundation map using rainfall runoff model (HEC-HMS) and hydraulic model (HEC-RAS). In Taguig-Pateros region, degree of flooding is significantly influenced by assuming the performance of flood defence structures along Laguna lake.

Recommendations

Applying CCA-DRRM policies & sustainable design principles in urban planning

Recommendations:

- **Inclusion of Hazard overlays on the identified high-risk prone areas that will have its own Risk Sensitive Zoning Ordinance**, e.g., seismic zoning map based on expected peak ground acceleration especially for areas covered within the 10 km. distance from the MWVF.

- **Auditing of existing individual structures within the high-risk areas and retrofit and upgrade those that do not meet the minimum national building and structural codes**.
  - Priority on gov't. structures, utilities, infrastructure
  - IEC

Recommendations:

- **Provision of some form of economic and financial assistance to make the technology easily accessible to the private sector in retrofitting their structures.**

- **Repossession of encroached areas along the rivers and esteros to allow for proper flood control management and protection of structures constructed along the water easement especially, along the identified high-risk flood prone areas.**

Recommendations:

- **Ensuring the strictest implementation of the standards and guidelines on those covered under the Risk Sensitive Zoning Ordinance.** Future developments should be compliant to these higher standards and, if needed, the government may resort to the use of police powers to protect public interest.

- **Use of performance standards vis-a-vis design standards.**

Recommendations:

- **Fostering of a political environment that will encourage the private sector and the local stakeholders to meaningfully participate in the planning of their communities**. This means transparency in the planning process (e.g., conducting public consultations and hearings), full accountability of local officials, and active participation and involvement of the public in the local projects/programs.

Recommendations:

- **Review of the economic incentives in the Zoning ordinance such as bonus Floor Area Ratio (FAR), Transfer of Development Rights (TDR), idle land's tax, etc.**

- **Looking at other best practices in planning that can be possible models for solving Manila's urban blight problems like creation of Tax Increment Financing (TIF) districts for large scale urban renewal projects, Adequate Public Facilities Ordinance (APFO), Impact Fees, among other things.**

Recommendations:

- **Generating more open space than what is recommended in the MCLUPZO.** If Manila is to continue its growth plan and embark on densification, then there should be a corresponding need to expand and create more green and open space.

- **Preservation of the local identity and culture of the City by strengthening its "imageability" in urban design**, etc.

Recommendations:

- **Creating institutions and upgrading emergency facilities in light of new studies from NDRRMC.**
  - Strengthening the lifeline/emergency facilities such as power, water, sewage, telecommunications & road networks; and to the extent possible, creation of service redundancies
  - Mobilization of the entire community and institutionalization of CCA-DRRM programs thru massive IEC, inclusion in the curriculum of schools, regular conduct of emergency and evacuation drills resulting in the community's internalization of the programs.

Recommendations:

- **Enforcement of the "rule of law" and exercise of political will.** The LGU should monitor and enforce the laws especially on the zoning ordinances, building code, fire code, structural code, water code , etc.

- **Designating conservation easements and protected areas with the highest development restrictions and regulations to mitigate negative impacts of natural hazards in those areas**, e.g. Manila Bay, Pasig River, esteros,

Recommendations:

- **Promotion and provision of incentives for buildings and developments that adapt green architecture and sustainable design features to lessen the "Urban Heat Island Effect" and improve the urban design of the city.**

- **Making available public housing, revisiting "people's plan initiatives", and exploring alternative approaches to affordable housing to address the housing problem.**

Recommendations:

- **Coordination with the national government in the planning and implementation of key programs and infrastructure projects, e.g. LRT4, Old Bilibid Prison**

Future Challenges & Issues

- **The existing urban problems of flooding, traffic, non-conforming land uses, environmental degradation, and urban blight, demand serious attention if Manila is to compete in the global community.**

- **Social equity, environmental protection, and economic viability should be the key guiding principles in planning for our cities.**

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