

***Chapter 11. Review of Health
Emergency Management System***

CHAPTER 11. REVIEW OF HEALTH EMERGENCY MANAGEMENT SYSTEM

11.1 Introduction

Health emergency activities during a massive earthquake disaster have very specific characteristics and considerably different nature from those in other natural or man-made disasters since the activities occur in the following unusual situations.

- 1) A very specific area is affected in a short time.
- 2) Health service capacity in the affected area is overwhelmed, and in consequence needs external assistance.
- 3) Hospital capacity and capability crumples or gets interrupted by facilities and equipment being damaged.
- 4) Health personnel are also affected and are less able to be mobilized.
- 5) Transportation and communication system is also damaged

Only through a well-planned and prepared system to manage mass casualty can people cope with such harsh consequences after the occurrence of an earthquake. This requires review of the capacity of health organizations in Metropolitan Manila for their ability to handle potential earthquake from more severe viewpoints than those for usual disasters such as flood or typhoon.

11.2 Objectives

The study in health sector has the following three objectives:

- 1) To assess the organization of the health sector and its response capability in disaster situations from potential earthquakes in Metropolitan Manila.
- 2) To compile the suggestions for emergency disaster relief and medical response plan at following two administrative levels. Those suggestions will be involved essentially in comprehensive ones for Earthquake Disaster Management Plan.
 - National Capital Region (NCR) level.
 - Community (Barangay) level
- 3) To propose necessary programs to improve and strengthen the existing system and resources for health emergency management.

The primary assessment of the health sector capabilities to cope with potential earthquake disasters is the initial task of the study. The general process of the assessment is carried out according to the “Guidelines for Assessing Disaster Preparedness in the Health Sector” issued by Pan American Health Organization (PAHO) in 1995, but items to be assessed are selected properly from it in consideration of Philippine’s situation.

11.3 Methodology

11.3.1 Assessment Area

Assessment area covers organizational, institutional and physical set-ups for disaster emergency situations. Table 11.3.1 shows the major assessment areas and their own essential components. These are identified crucial in PAHO’s guideline to strengthen the preparedness and response capability against disasters, especially earthquakes.

Table 11.3.1 Assessment Areas and Their Components

	Assessment Area	Components
1	Organization and Network	<ul style="list-style-type: none"> ✓ Organizations and their institutional set-up from national level down to barangay, and budget allocation ✓ Responsible units in charge of emergency preparedness and relief activities, ✓ Staff allocation and its professional level and coordinating mechanism, etc.
2	Regulation and Guideline	<ul style="list-style-type: none"> ✓ Regulations, guidelines and institutions for preparing emergency management program ✓ Official arrangement to mobilize all kinds of resources fully
3	Emergency Management Program	<ul style="list-style-type: none"> ✓ Present condition of preparedness activities from national down to barangay level, ✓ Progress of health emergency management plan at different levels
4	Pre-hospital Care	<ul style="list-style-type: none"> ✓ First-aid providers at the disaster scene: Organization, team and personnel ✓ System to provide Emergency Medical Service in NCR ✓ A setting of resources for pre-hospital care such as ambulance
5	Hospital Care	<ul style="list-style-type: none"> ✓ Number, ownership, location and specialty of hospitals for inpatient care ✓ Health referral system in NCR ✓ Progress of formulation of hospital emergency program and practise of disaster drills. ✓ Building and facilities information, stock of medical necessities, etc.
6	Sanitary and Epidemiology	<ul style="list-style-type: none"> ✓ Anticipated epidemiology in NCR during the disaster period ✓ Responsible agencies and their network from national level down to barangay
7	Training and Public Education	<ul style="list-style-type: none"> ✓ Technical training to health staff in hospitals and health offices ✓ Workshop and seminar on disaster management for health personnel ✓ First-aid training and public awareness activities for community level
8	Stockpile and Logistics	<ul style="list-style-type: none"> ✓ Stock of medical necessities and relief goods ✓ Resource and system for radio communication ✓ Resource and system for transportation of victims and logistics

11.3.2 Target Organization

The survey, in order to collect information extensively, covers not only organizations in the health sector but other agencies in other sectors, which have responsibilities for search, rescue and emergency relief activities. And the survey also covers ones ranging from national level down to city/municipal level vertically. Table 11.3.2 shows the target organizations to survey by assessment area, since every organization covers the assessment areas partially according to its characteristics.

Table 11.3.2 Organizations to be Studied by Assessment Area

Administrative Level		National					NCR				City		
[Target Organization]		DOH	BFP	OCD	PNRC	WHO	DOH	OCD	MMDA	DSWD	CHO/MHO*	HEALTH CENTER	HOSPITAL
[Assessment Area]		DOH	BFP	OCD	PNRC	WHO	DOH	OCD	MMDA	DSWD	CHO/MHO*	HEALTH CENTER	HOSPITAL
1	Organization and Network	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Regulation and Guideline	✓		✓	✓	✓	✓	✓			✓		✓
3	Health emergency Management Program	✓	✓		✓		✓		✓		✓		
4	Pre-hospital Care	✓	✓		✓		✓		✓		✓	✓	✓
5	Hospital Care	✓				✓	✓				✓		✓
6	Sanitary and Epidemiology	✓			✓		✓				✓		
7	Training and Public Education	✓	✓		✓		✓				✓		✓
8	Stockpile and Logistics	✓			✓		✓			✓	✓	✓	✓

Note: CHO/MHO* means City Health Office/Municipal Health Office

DOH: Department of Health, BFP: Bureau of Fire Protection

OCD: Office of Civil Defense, PNRC: Philippine National Red Cross

WHO: World Health Organization, DSWD: Department of Social Welfare Development

Health related functions of the organizations that we visited are summarized as follows.

- BFP: provides Emergency Medical Service (EMS) all over the country.
- OCD: provides almost all disaster related activities except hospital services.
- PNRC: provides the disaster relief activities with worldwide network in private sector.
- DSWD: provides disaster relief goods and coordinates relational activities.

11.3.3 Survey Method

Information and data have been collected through following two methods.

- 1) Interview to concerned persons based on the questionnaire sent in advance of visits
- 2) Questionnaire sent by fax

The former method is principally adapted to all target organizations but the later is also taken to the survey of the City Health Offices (CHOs) only on account of time constraint.

11.4 Review of Present Organization and Resources

11.4.1 Organizational and Institutional System

Since an occurrence of a massive earthquake necessitates the mobilization of all medical resources, the organizational set-up inevitably stretches from national to community (barangay) level. In Figure 11.4.1, DOH at National Level – DOH at NCR – CHO/MHO at LGUs – Health Counselor at Barangay, forms a vertical administrative ladder for health emergency management in concert with a similar Disaster Coordinating Councils set-up. According to this hierarchy, Health Emergency Management Staff* (HEMS) in DOH – Local Health Assistance in DOH.NCR – Health emergency coordinator in CHO/MHO, plays a role of emergency coordinator. However, private sector is not actively involved in current DOH-HEMS program or in any other government programs, except for some major private hospitals.

***Note:** HEMS is a unit that deals with the health emergency and disaster management at national level, which is provided with 24 professional staff for 2 divisions of Preparedness and Response under a Director. It is under the direction of the Health Secretary.

It should be given attention that Annex “F”, Health Service in the National Calamities and Disaster Preparedness Plan, emphasizes that ‘the basic concept of the Health Service is local government –community effort’. In this sense, CHO/MHO and community health workers are vital players to protect and preserve life of the populace.

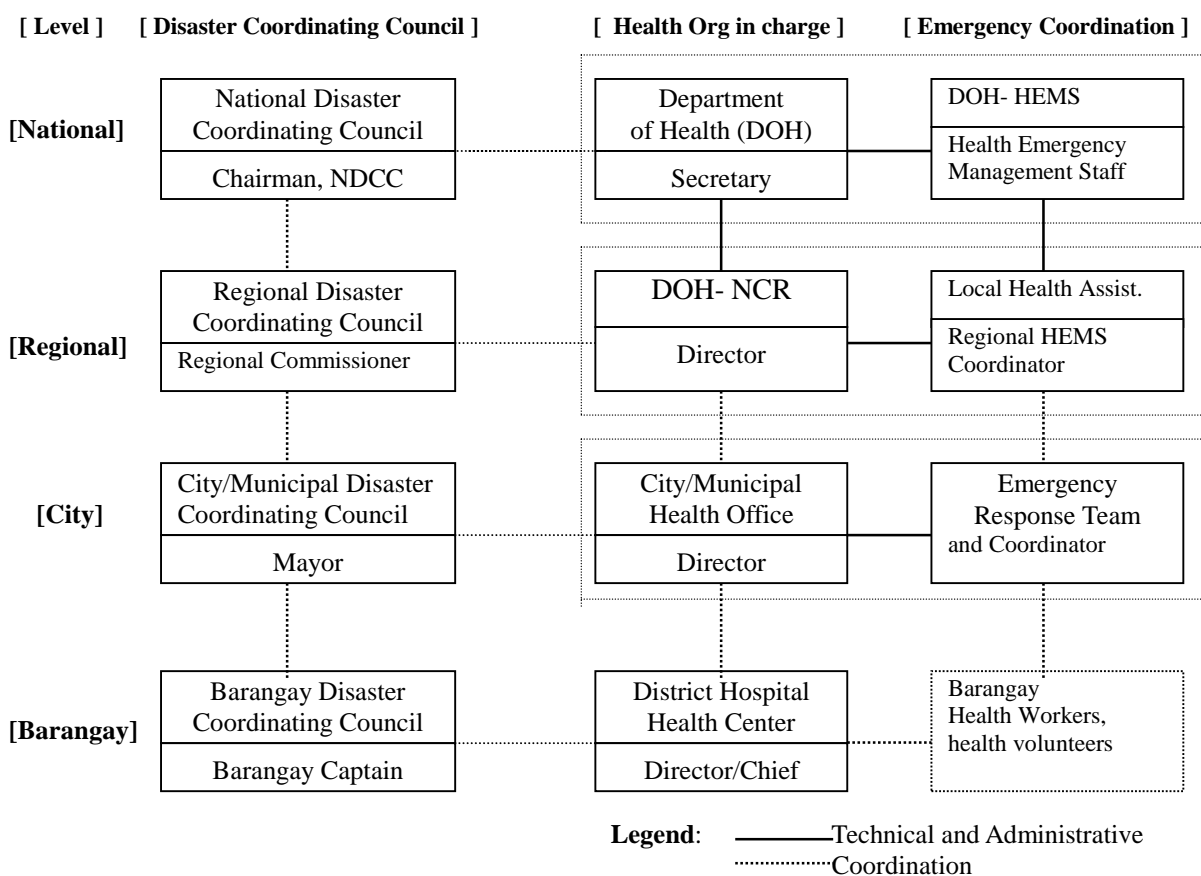


Figure 11.4.1 Organizational Spectrum in Emergency Health Service

Major findings about the organizational and institutional system through the field survey are:

1) Organizational Framework

Essential organizational framework has been established as shown in Figure 11.4.1, even though not quite completely. ‘Health Service Units’, which is defined in the Annex ‘F’ Health Service in the National Calamities and Disaster Preparedness Plan, have not been realized at any level so far. In addition, local government-community effort focused concept in the national plan is appropriate in general but may not be applicable to large-scale disasters by potential earthquake due to its vast extension and overwhelming severity beyond the LGU’s capability. From this point of view, any government agency/department’s capacity to manage disaster is far below the required level in staff and facilities.

2) Official Responsibility

DOH-Administrative Order No.6-B, with the subject ‘Institutionalization of a Health Emergency Preparedness and Response Program within the Department of Health’, states in it that:

While the 1991 Local Government Code has transferred the responsibility for health services from the DOH to the LGU's, one of the remaining functions of the DOH is disaster management focused on preparedness and prevention. Immediate and direct response to disaster is the primary responsibility of the LGU's.

However, in cases where disasters have reached proportions, which area beyond the capability of the LGU's, the National Government takes control. Under section 105 of the Local Govt. Code, in the event of epidemic, pestilence and other widespread public dangers, the Secretary of DOH may, upon the direction of the President and in consultation with the govt. Unit concerned, temporary assume direct supervision and control over health operations in any LGU for the duration of the emergency.

3) Resource Mobilization

System to mobilize public health institutions and health staff has already established in both local and central government organizations. Although Republic Act defines that private hospitals are under obligation to take part in providing emergency services at disasters, any arrangement to involve them effectively in the existing government EMS network, has not been argued or made between the government and private entities.

4) DOH Budget

DOH annual budget has been staying at around 10 billion pesos in the past five years as shown in Table 11.4.1, then the share to the national government has consistently been falling from 5.00% in 1992 down to 1.44% in 2002. In the expense class, Personnel has been increasing steadily although Operation/Maintenance has been restrained, and Capital Outlay is growing stagnant at less than one billion pesos.

Table 11.4.2 says that although total government share in national health expenditure keeps 38%, Central government share has been decreasing down to 20% in 1999 , in contrast Local government has been increasing. It is clear that Central DOH has cannot afford to develop the emergency management capacity, mitigation and preparedness measures further. Now those have been shifting to the local government responsibilities.

Table 11.4.1 DOH Budget Allocation by Expense Class, CY1998-2002

(Unit: billion pesos)

Expense Class	1998	1999	2000	2001	2002
Personnel	4.97	5.04	5.03	5.02	5.40
	39%	45%	47%	53%	48%
Operation/Maintenance Expenditure	5.43	5.30	5.31	4.39	4.98
	42%	47%	47%	45%	44%
Capital Outlay	2.54	0.92	0.40	0.04	0.90
	19%	8%	6%	2%	8%
Total	12.94	11.26	10.74	9.45	11.28
	100%	100%	100%	100%	100%

Source: DOH data in web site

Table 11.4.2 Increasing Budget for Health in Local Government

(Unit: %)

Source of Funds	% Share of Gov't Health Funds								
	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Gov't Share in Nat'l Health Expenditure	39	35	36	37	35	36	38	38	38
a) National	35	31	24	21	19	20	20	20	20
b) Local	4	4	12	16	16	16	18	18	18

Source: UPSE (1991-1994), NSCB (1995-1999)

11.4.2 Health Emergency Management Program

1) Program Development at Administrative Institutions

At any level of the disaster coordinating councils in Metropolitan Manila, from national to city/municipal, comprehensive Calamities and Disaster Preparedness Plan has been prepared. Role of the health sector is stated only as a part of this comprehensive plan, but it is important to note that any definite plans by activity field or sector (including health) has not been developed yet. Consequently, lack of sector-wide plan makes the Study Team almost impossible to get an overview of the progress of health emergency preparedness.

Metropolitan Manila Calamities and Disaster Preparedness Plan requires all government offices to organize their own Disaster Control Groups (DCGs) and to prepare their respective disaster preparedness plans. In response to this requirement, DOH compiles to distribute three kinds of manual on health emergency management in July, 2001.

- 1) Guidelines on Hospital Preparedness and Response Planning
- 2) Guidelines on Health Emergency Management for the Centers for Health Development
- 3) Manual for the DOH Operation Center

These manuals are spread only in the DOH organization including DOH-hospitals and DOH-regional offices, but not distributed to other organizations yet.

Stop DEATH Program, which is an acronym for Strategic Tactical Option for the Prevention of Disasters, Epidemics, Accidents and Trauma for Health, is the important and major strategy to consolidate the resources and capacities of DOH towards an effective response in times of crises or emergencies. This program, which was initiated in 1994 within the DOH’s organizational mechanism, is developed over the country to provide emergency disaster related services and research-oriented program with the organizational set-up shown in Figure 11.4.2.

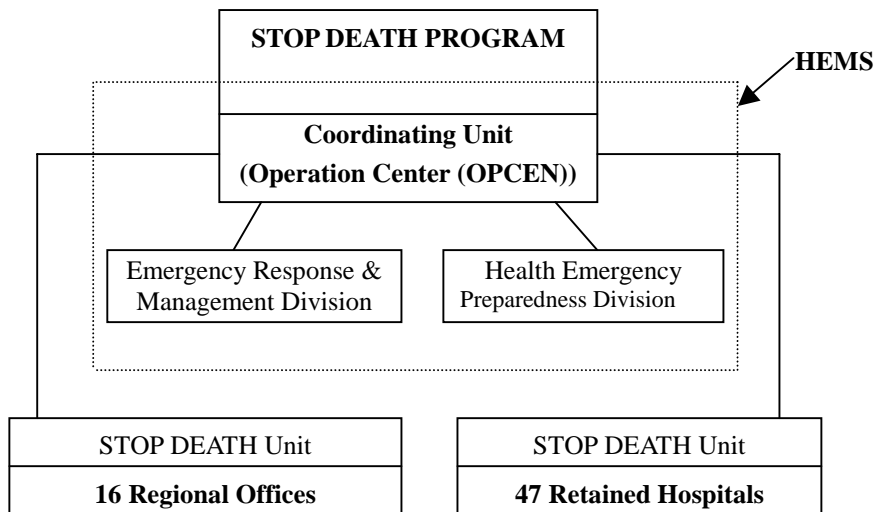


Figure 11.4.2 Organization Chart of Stop DEATH Program

The program consists of following components. At central level, HEMS has a Coordinating Unit, which is called Operation Center (OPCEN), together with Emergency Response & Management Division and Health Emergency Preparedness Division. This OPCEN coordinates with the Regional Office and the Hospitals as well as the different offices at the central office. And at peripheral level, Stop DEATH coordinators are designated in each Stop DEATH unit within the Regional Office and the Hospital. Each Unit has services of Emergency service, Training, Research, Social Mobilization, and Networking and Community Involvement.

2) Program Development at Health Institutions

DOH carries out its regular inspection on both public and private hospitals from primary to tertiary level* about the conditions of hospitals’ service quality and infrastructure once a year. The inspection extends its field to whether the hospital is provided with the Emergency Preparedness Plan, since DOH recommends them strongly to prepare it.

***Note:** Hospitals are categorized into three levels according to the complexity of services they provide: primary, secondary and tertiary. Tertiary level hospital provides the most complex and specialized services, and secondary some sub-specialties in addition to the fundamental four disciplines and.

The result of inspection in 2001, which is summarized in Table 11.4.3, shows several interesting facts, which are:

- 1) Nearly 80% of tertiary level hospitals in both public and private sector in NCR have set up 'Disaster Control Program'. It is a big surprise that almost 20% of tertiary hospitals do not arrange the emergency procedures, because the tertiary ones are expected to play vital roles for emergency services at disasters.
- 2) Many hospitals have meeting/lectures more frequently than expected. However this may be explained that issues on Disaster Control are come up for discussion at regular top management meetings in the hospital.
- 3) Number of hospitals, which have contact with local disaster coordinating councils, are less than that of hospitals with disaster control program. Coordination with local council is that crucial, but it is not clear how close the relationship is from this inspection result.
- 4) Every hospital is obliged to practice the fire drill at least once a year. However, the inspection makes surprisingly clear the fact 25 to 30% of hospitals have not executed the drills ever.

Table 11.4.3 Survey on "Disaster Control Program" at Tertiary Level Hospitals in NCR

Government Hospitals					
Question	No. of answer 'Yes'		No. of answer 'No'		Total
1. Organized	22		5		27
2. Frequency of meetings/lectures	Monthly	Quarterly	Semi-annually	Annually	26
	16	5	2	3	
3. Coordination with Civil Defense Disaster Coordinating Council in the City/Municipality	21		6		27
4. Fire Drills	19		8		27
Private Hospitals					
1. Organized	35		7		42
2. Frequency of meetings/lectures	Monthly	Quarterly	Semi-annually	Annually	30
	13	12	3	2	
3. Coordination with Civil Defense Disaster Coordinating Council in the City/Municipality	30		12		42
4. Fire Drills	33		9		42

Source: DOH's answer to Team's inquiry about the result of 2001's inspection.

11.4.3 Medical Service System

1) Service Delivery System

Ambulant services are provided through three major channels: private practitioners, public health centers and outpatient units in hospitals. Although the number of private practitioners in

Metropolitan Manila is not reported statistically, 424 public health centers, which are run by LGU, exist in 2001. These are allocated at every city/municipal in substantially density with ratio to population of 10,000 to 60,000, on average 26,000, which is shown in Table 11.4.4. Viewing from a disaster point, health centers must play a vital role as the base to support the field teams at the frontline.

Table 11.4.4 Number and Ratio of LGU Facilities in 2001

Administration Area	City/Municipal		Population (A)	Health Center		LGUs Health Staff	
				Number (B)	Ratio to Pop. (A)/(B)	Medical Doctor	Nurses
National Capital Region: NCR	1	Malabon	393,276	23	17,099	34	49
	2	Navotas	252,949	9	28,105	15	14
	3	Valenzuela	533,064	39	13,668	28	31
	District 1		1,179,289	71	16,610	77	94
	4	Marikina	417,906	16	26,119	18	16
	5	Pasig	543,544	40	13,589	45	59
	6	Pateros	56,351	5	11,270	3	6
	7	Taguig	521,030	20	26,052	21	25
	District 2		1,538,831	81	18,998	87	106
	8	Makati	490,995	29	16,931	49	51
	9	Mandaluyong	295,706	25	11,828	31	45
	10	San Juan	114,189	9	12,688	10	11
	District 3		900,890	63	14,300	90	107
	11	Las Pinas	584,078	28	20,860	34	46
	12	Muntinlupa	535,086	12	44,591	23	42
	13	Paranaque	463,660	17	27,274	15	42
	District 4		1,582,824	57	27,769	72	130
14	Manila	1,542,071	48	32,126	199	222	
15	Quezon City	2,168,301	54	40,154	97	110	
16	Caloocan City	1,224,413	39	31,395	36	26	
17	Pasay City	421,828	11	38,348	23	22	
Cities		5,356,613	152	35,241	355	380	
NCR Total (A)		10,558,447	424	24,902	681	817	

Health Statistics 2001, Center for Health Development Metropolitan Manila

Source:

As for the in-patient services, DOH-NCR's Health Statistics 2001 reports that there are 176 hospitals in Metropolitan Manila. Among them 50 is run by the government and 126 by private entities, while two third of total 26,400 beds belongs to the government hospitals. Hospital bed ratio to 10 thousand populations in NCR comes up to 25.5, which does not clearly come up with the need of the metropolitan population. It is a feature that the private and local government hospitals have been increasing rapidly while government ones remain stagnant. Another statistics

in Table 11.4.5 from Philippine Hospital Association (PHA) says 203 hospitals and 31,161 beds exist and 47 of them are government owned in September 2002. Accordingly 10% of total hospitals and 33% of beds in the country concentrates in NCR while 14% in population.

Table 11.4.5 Membership Profile, As of September 30, 2002

	Government		Private		Grand Total	
	Hospital	ABC	Hospital	ABC	Hospital	ABC
NCR	47	19,275	156	11,886	203	31,161
% to Nation	7%	40%	11%	25%	10%	33%
Nation	666	48,577	1,429	47,146	2,095	95,723

Legend: ABC – Authorized Bed Capacity

Source: Hospital Journal Vol.xxxv No.2, PHA

In NCR, 21 out of 50 government hospitals are owned by DOH while other 29 by Non-DOH agencies consisting of 10 LGUs, Office of the President, Department of National Defense (DND), Department of Interior and Local Government (DILG) and others. Among LGUs, Manila City runs 4 hospitals and others such as Quezon, Pasay or Makati City run one respectively.

Hospitals in Philippine are rated into following three categories according to the complex of services: primary, secondary and tertiary. Table 4.4.6 shows the distribution of hospitals and their bed capacity by category in 2002. Tertiary level hospitals, which provide the more sophisticated services than secondary and primary, account for 38% in number and 88% in bed capacity to the total.

Table 11.4.6 Number of Hospitals by Category in NCR on September 30, 2002

	Tertiary		Secondary		Primary	
	Hospital	ABC	Hospital	ABC	Hospital	ABC
Government	28	18,077	16	1,120	3	78
Private	49	9,300	69	2,108	38	478
Total	77	27,377	85	3,228	41	556

Legend: ABC – Authorized Bed Capacity

Source: Hospital Journal vol.xxxv No.2, PHA

Hospitals are distributed very partially in terms of geographic distribution. Figure 11.4.3 shows the geographic allocation of both government and public hospitals with bed capacity of 200 and more, most of which are categorized in tertiary level, and Table 11.4.7 indicates the distribution of hospitals and beds by city/municipal. It is clearly recognized that, tertiary level hospitals, which are vital for inpatients treatment at disasters, concentrate on the central part of NCR comprised of Manila, Quezon, Mandaluyong and Makati City, with leaving northern, southern and eastern areas in Metropolitan Manila out of service range of these hospitals. In addition, Figure 11.4.4 shows clear that hospitals are distributed very partially over MM area in terms of geographic distribution.

2) Emergency Medical Service

Pre-hospital care during the disaster shall be provided through two major channels, one is existing Emergency Medical Service (EMS) in NCR and the other is local health workers at community.

Among several EMSs in NCR, STOP D.E.A.T.H by DOH and E.A.R.net by BFP are developed systematically and geographically, while MMDA, PNRC and Fire Brigade Volunteers provide supplementary EMS.

In Metropolitan Manila, EMS is provided through many agencies such as BFP, DOH-HEMS, PNRC, MMDA, Philippine General Hospital, LGU(Quezon, Marikina, Makati), AFP, Coast Guard, Chinese Volunteers, etc. These providers have following characteristics:

- 1) The largest provider among them is EAR.net by BFP equipped with 19 stations, 231 staff and 25 vehicles including ambulances in Metropolitan Manila. The EAR.net operation center can communicate with DOH-HEMS, MMDA and PNRC by its wireless system and it may be a regional center in a massive disaster situation.
- 2) Stop DEATH by DOH is considered secondary largest provider with 21 retained hospitals. It sets up a unique zoning system to divide the whole metropolitan area into 7 service zones, in which one lead hospital and several supporting ones are designated. Figure 11.4.5 shows the zoning plan. DOH system has a great advantage to have Emergency Units at retained hospitals connected directly with EMS. 12 ambulances are allocated at hospitals.
- 3) Quezon, Marikina and Makati provide its own rescue and emergency services apart from services by other agencies. People, who are living in these cities and others 10 cities with local government hospitals, can depend on the city's EMS as well as EAR.net and Stop DEATH system.

It is a notable feature that various government agencies provide the EMS independently. In addition, some barangay captains own their ambulances, consequently, no one can answer the total number of ambulances as well as number of physicians in Metropolitan Manila.

Table 11.4.7 Distribution of Hospitals and Bed Capacity by Level of Health Care and by City in 2001

Government Hospital								
LGU	Number				Bed			
	Tertiary	Secondary	Primary	Total	Tertiary	Secondary	Primary	Total
NCR	27	14	8	49	9,455	1,705	343	11,503
City of Las Pinas		1		1		50		50
City of Manila	8	2		10	3,669	100		3,769
City of Makati	1	2		3	200	300		500
City of Mandaluyong		1		1		50		50
City of Marikina	1			1	150			150
City of Muntinlupa	1	1		2	50	500		550
City of Paranaque		1		1		50		50
City of Pasig	2			2	400			400
City of Valenzuela		1		1		100		100
Calookan City	1	1		2	40	200		240
Malabon City			2	2			28	28
Nabotas				0				0
Pasay City	2		1	3	250		25	275
Pateros				0				0
Queson city	11	3	3	17	4,696	205	230	5,131
San Juan		1	1	2		150	12	162
Taguig			1	1			48	48
Private Hospital								
LGU	Number				Bed			
	Tertiary	Secondary	Primary	Total	Tertiary	Secondary	Primary	Total
NCR	42	52	32	126	8,621	1,615	456	10,692
City of Las Pinas	3	3	1	7	308	60	10	378
City of Manila	13	7		20	3,090	218		3,308
City of Makati	2	1	1	4	675	20	6	701
City of Mandaluyong	2	1		3	561	25		586
City of Marikina		5	2	7		144	24	168
City of Muntinlupa	1	4	2	7	90	85	30	205
City of Paranaque	2	3		5	145	105		250
City of Pasig	1	6	3	10	40	210	31	281
City of Valenzuela	1	2	4	7	150	65	35	250
Calookan City	1	6	5	12	200	228	56	484
Malabon City		1		1		15		15
Nabotas				0				0
Pasay City	2			2	380			380
Pateros				0				0
Queson city	12	11	12	35	2,616	370	245	3,231
San Juan	2			2	366			366
Taguig		2	2	4		70	19	89

Source: Health Statistics 2001: DOH-CHD Metropolitan Manila

* Population: National Statistics Office

** Barangay No: National Barangay Operation Office, DILG

***Government hospitals in Muntinlupa are the New Bilibid Prison Hospital with 500 beds and Research Institute for Tropical Medicine with 50 beds.

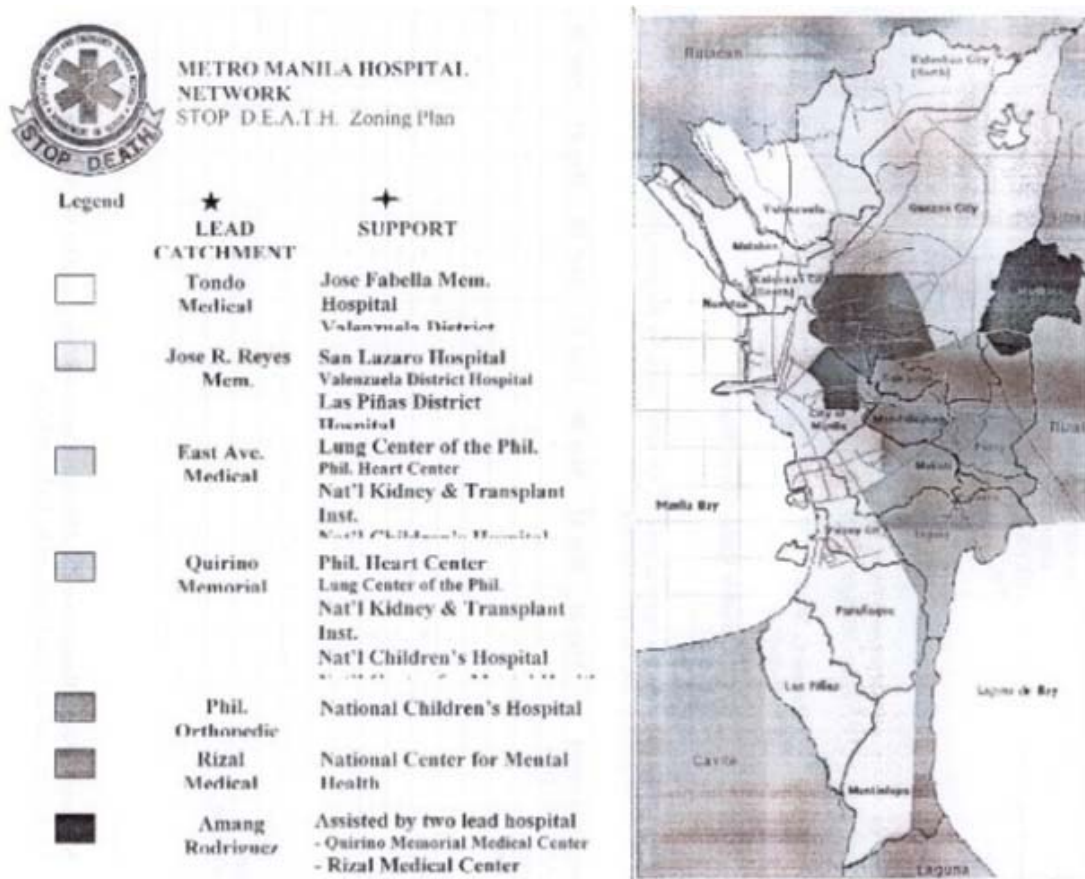


Figure 11.4.5 Metropolitan Manila Zoning System by Stop DEATH Program

11.4.4 Training and Public Education

Every agency, which provides EMS, gives its staff First Aid and Basic Life Support technique, while chances to attend workshops/seminars on disaster management are provided by DOH-HEMS, PNRC and WHO-WPRO only. Table 11.4.8 shows the DOH-HEMS annual plan to provide the health personnel related to disaster management with training and knowledge.

Activities are divided broadly into 2 areas: EMS techniques such as Basic Life Support and the other disaster related knowledge/skills. As well, Target Participants into 2 groups, one is LGU's staff and the other DOH's. Although number of activities for health personnel other than DOH is few, the annual plan surely covers the most field of Health Emergency Management.

Annual Campaign and Training Program of DOH-NCR Office, showed in Table 11.4.9 has the similar structure to HEMS, and it should be noticed that almost all programs are realized with the assistance of HEMS staff.

Table 11.4.8 DOH-HEMS Annual Training and related Activities Plan in 2003 (Abstract)

Activity		Target	No. of Participant
1	First National Training Course on PHEMAP sponsored by WHO	HEMS, Stop DEATH, ARD	70
2	Basic Life Support CPR for LGU medical and non-medical Staff	LGU med. and non-med Staff	40 & 40
3	Training of Trainers (TOT) in BLS	Selected DOH/LGU Staff	50
4	Emergency Medical Technician Basic Training Courses	HEMS and LGU Staff	210 (3 x each 70)
5	TOT in Emergency Medical Treatment (EMT)	Graduate of EMT-B	70
6	2 nd . National Disaster Convention by the Health Sector	Health Sector	100
7	Power Communication Course	Coordinators & Spokesperson	40-50
8	Training on Environmental Sanitation	DOH-CHD sanitary engineers	30
9	Training on Food and Nutrition during Displacement of People	DOH-CHD nutritionists	30
10	Training on Communication	Operation Center Staff	60
11	Consultative Workshop for Radio Technicians	Radio Operators/Technicians	40
12	Basic Epidemiology and Data Analysis	HEMS-OPCEN Staff	15
13	Geographical Information System (GIS)	HEMS-OPCEN Staff	15

Source: DOH-HEMS plan in 2003

Table 11.4.9 DOH-NCR's Campaign and Training Program in 2002

Activity		Target	No/ Y	Responsibility
1. Social Mobilization/ Advocacy–Observation of National Events	a. Fire Prevention & Safety Month	17 LGUs, 18 Non-DOH Hospitals	1	HEMS
	b. National Disaster Consciousness Month		1	HEMS/HEPO
	c. Oplan Iwas Paputok		1	HEMS/RESU
2. Capability Building	a. Drills/Simulation Exercise	Health Sector	2	HEMS
	b. System Upgrading	HEMS Office	1	
3. Networking/Linkage/Coordination	a. Meeting with Health Sector	Identified agencies LGUs/NGOs	1	HEMS
	b. Workshop for coordination system		2	
4. Technical Assistance/Monitoring/Evaluation	a. Health Emergency Response	LGU	4	HEMS
	b. Post-Mortem		4	HEMS
	c. Reporting and Recording			
	d. Stockpiling of drugs/meds			
5. Medical Assistance/Crisis Management		Senators, G.O.s. NGOs, POs	4	

Source: DOH-NCR Budget Plan in 2002

11.4.5 Sanitary Service and Epidemiology

- 1) Sanitary Service: Center for Family and Environmental Health-DOH, Regional Sanitary Engineers-NCR, Sanitary Engineers in LGUs and Sanitary Inspectors at barangay is a sole chain of services.
- 2) Epidemiology: National Epidemiology Center-DOH, Epidemiology & Surveillance staff-NCR Office and Epidemiology Officer Unit in hospitals and Staff in charge in CHO shall keep operating existing surveillance system during disasters.

- 3) System to provide epidemiological information to national and international health agencies is not established.

11.5 Local Government Capability for Health Emergency Management

The study on LGU's capability for health emergency management is another important field as well as that of central government units. Table 11.5.1 shows the summary of the questionnaire result at the first field survey. Common or different points/tendencies among LGUs are summarized briefly as follows.

11.5.1 Organization of Health Office

Number of Health Department staff: It include both administration staff in the CHO and service staff in health centers and local government hospital(s). You should pay attention that some cities answer the number of the staff working at the Health Office as the total number. The least in total is about 40 staff in Mandaluyong and San Juan, averagely around 200. Four local government hospitals in Manila City contribute to the most number of 1,267.

Every city other than San Juan has already arranged the city disaster preparedness program, in which the role of the health office is defined in it. And most cities have exclusive units or staff designated for the disaster preparedness and coordination. However, it is clear that disaster exercises are not very active, since most cities carry out the exercises once in every two or three years only.

11.5.2 Coordinating Activities

Frequency of coordinating meeting with CDCC is considered to be a good indicator to see how the city disaster program grows matured. It is held every month in Makati and Manila, once a year in most cities and once in every two or three years in small cities like San Juan. But the meeting is not on a regular basis in many cities.

Nine cities work out an arrangement with private hospitals or NGOs about emergency activities to mobilize resources maximally in each city, on the other hand, six do not.

11.5.3 Mass Casualty Management

1) Pre-hospital Activities

- 1) Most cities answer that pre-hospital activities will be done by CHO and Health Centers. These cities also have already set up Emergency Response Teams for this purpose, consisting of personnel from the health centers and hospitals if any. It seems very odd to have little answer mentioning DOH-Stop DEATH Program or Project EARnet by BFP.
- 2) Number of ambulances that city owns varies from one to 34, for some cities informs the number including ones that barangay captains possess. CHO has no more than several ambulances.

Table 11.5.1 Summary of the Answers from LGU's about Their Capability for Health Emergency

Question	[District]	1			2				3			CITIES				
	Malabon	Nabotas	Valenzuela	Marikina	Pasig	Pateros	Taguig	Makati	Mandaluyon	San Juan	Las Pinas	Paranaque	Manila	Caloocan	Pasay	
1. Organization of Health Office																
1.1	Number of HO staff: (1) Total	300	110	280	160	303	67	188	366	44		24	15	1,267	61	12
	(2) Medical Doctor	28	14	27	18	45	4	21	48	1	4	30	22	193	33	25
	(3) Nurse and Midwife	90	54	109	-	126	27	93	150	6	9	115	2	333	66	75
	(4) Paramedicals (and Others)	182	40	113	-	221	12	64	96	37	11	63	2	406	131	48
1.2	(1) Existence of Exclusive Unit or Person assignment for Disaster Preparedness	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
	(2) Number of officers assigned, if any	1	-	1	1	>2	>2	-	7	>2	0	8	>2	1	>2	>2
1.3	(1) Existence of Disaster Preparedness Program	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
	(2) Stipulation of Health Office's role in the program	Y	Y	Y	Y	-	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
1.4	Frequency of disaster exercise per year	N	1	<1	<1	-	<1	1	1	<1	<1	1	1	1	1	1
2. Coordinating Activities																
2.1	Frequency of CDCC coordinating meeting in a year	1	1	1	1	1	<1	1	12	1	<1	<1	1	12	1	1
2.2	Arrangement with private hospitals, NGOs for disaster	N	Y	Y	N	Y	N	N	Y	Y	Y	N	N	Y	Y	Y
3. Mass Casualty Management																
3.1	Prehospital Activities: (1) Prehospital care provider															
	(2) Arrangement with private practitioners	Y	Y	N	N	-	Y	N	N	Y	N	N	N	Y	N	Y
	(3) No. of ambulances in public sector	5	1	16		34	4	6	8		3	2	18	21	3	6
	(4) Behavior instruction to barangay	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y
	(5) Availability of First Aid Kits at barangay	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
3.2	Hospital Activities: (1) Private hospitals involvement	Y	NA	Y	N	Y	NA	Y	Y	N	Y	-	Y	Y	Y	Y
	(2) Recognition of Hospital disaster preparedness plan	Y	NA	N	Y	Y	NA	N	Y	N	Y	-	-	Y	Y	Y
	(3) CHO supervision on hospital disaster drills	N	NA	N	N	Y	NA	N	N	N	N	-	N	N	N	N
	(4) CHO inspection on safety measures	N	NA	N	N	Y	NA	N	N	N	N	-	N	N	N	N
	(5) CHO's recognition of hospital capacity for casualties	N	NA	Y	N	Y	-	Y	Y	Y	Y	Y	N	Y	Y	Y
	(6) Victims transfer coordination	Hos	NA			CHO	CHO	-	Hos		-	-		Hos	CHO	
	(7) Health facilities assessment on earthquake-resistant capacity	Y	Y	N	Y	Y	Y	N	Y	N	N	N	N	N	Y	Y
4. Epidemiology/Sanitation/Relief activities																
4.1	In charge of Surveillance of epidemiology ¹⁾	DOH	SO		CHO	CHO	NS	CHO	MDC	CHO	MHO	CHO	CCC	DPD	CCC	CHO
4.2	Portable water provider ²⁾	FT	FD			CH	CH	FD	FD	-	-	CH		BFP	CH	
4.3	Sewage disposal agency ³⁾	S.W.M.O	ESC			ED	CH	GP	SWD	-	-	CH		CH	CH	-
4.4	Shelter: (1) Type of temporary shelters ⁴⁾	S.G	S.	S.G	S.C	S.G	S.	S.C	S.G	S.C	-	S.	S.	S.G	S.	S.G
	(2) Confirmation of their structural safety	Y	-		Y	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y
	(3) Capacity to be housed per facility	500	-	100	N	-	200	-	200	-	-	-	100	400	N	-
5. Training																
5.1	Annual program for health personnel	N	Y	N	Y	Y	N	N	Y	N	N	N	Y	N	Y	-
5.2	Annual education program for local populations	Y	Y	N	Y	-	N	N	Y	N	N	N	Y	N	Y	-
6. Resources and Logistical Support																
6.1	Communication System: (1) Radio system with health institutions in city	N	N	N	N	N	N	N	N	Y	N	N	N	N	Y	Y*
	(2) CHO emergency operation center with radio equipment	Y	N	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	Y*
6.2	Supplies: (1) List of essential drugs and supplies	N	Y	N	Y	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	(2) Volume of medical stockpile: How many days usage	>3	-	3	>3	2	2	3	3	2	2	2	1	2	3	3
	(3) Stockpile of medical consumables: (1) C.H.Office		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
	(2) Health Centers and/or Hospitals	✓				✓	✓	✓	✓				✓	✓		✓
	(4) Financial source for stockpile: (1) City Budget	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓
	(2) DOH subsidy	✓	✓	✓				✓			-				✓	✓
	(3) Donation or others										-					

Legend

[Y]: Yes, [N]: No, and [✓]: shows the answer meets this category. [>A] means Number comes less than A.

¹⁾ DOH: Department of Health, SO: Surveillance Officer and RSI, CHO: City Health Office, CDCC: City Disaster Coordinating Council, NS: Nurse Supervisor, DPD: Division of Preventable Disease

²⁾ FT: Fire Truck, FD: Fire Department, CH: City Hall, BFP: Bureau of Fire Protection

³⁾ S.W.M.O: Solid Waste Management Office (borrow Portalets from private company), ESC: ESC Department, C/GP: Clean/Green Personnel, SWD: Solid Waste Department, ED: Engineering Department

⁴⁾ S.G: School and Gymnasium, S: School, S.C: School and Church

- 3) Most cities instruct the populations how to behave for medical relief in the disaster situation, but not in a positive manner. For example, CHO transmits its instructions to the communities not directly but takes advantage the regular meeting with Barangay officials to do it.
- 4) Every city besides Pasig set for the so-called First Aid Kits in the health centers at barangay level.

2) Hospital Activities

- 1) Most cities answer that private hospitals can be mobilized to provide any victims with EMS unconditionally.
- 2) Most CHOs are not involve in inspecting the safety measures of hospital building item such as emergency exits or fire alarms. Although most answer that they know the hospital capacity to receive the injured, further inquiry to them makes it clear that they only figure out the authorized bed capacity. It should be reminded that many patients always occupy most existing hospital beds in Metropolitan Manila.
- 3) As for the patients transportation between hospitals during the disaster, 3 answer CHO will do, 3 hospital itself and others no answer. This fact shows that very few CHOs has clear image of a disaster by any massive earthquake, since it is well known that hospitals will face the big difficulties to find out ones with room to take patients in.
- 4) 8 cities have already implemented the technical assessment of hospital and HC buildings on earthquake-resistant capacity, while 7 not yet. Further inquiry, however, brings out the fact that these assessments were not on the earthquake-resistant capacity but on the building conditions, especially cracks on the structures, just after the 1990's Luzon Earthquake.

11.5.4 Epidemiology, Sanitation and Relief Activities

- 1) There is no pattern to the responsible agency for epidemiological surveillance, some say DOH, CHO or CDCC. This implies the surveillance system in the disaster situation is not known commonly and familiarized itself. Diarrhea and Acute Respiratory Infections are much anticipated commonly and Dengue Fever with the season.
- 2) School, church and gymnasium are answered as the evacuation shelters commonly and assured to be safe structurally. However, this answer seems unreasonable, since many cities have not checked even the medical facilities yet. In addition, housing capacity of shelters differs city by city or is not answered. All this things shows that respondents to the question do not take serious to answer or do not have correct information about the arrangement for relief activities in his/her own city.
- 3) City Hall or BFP is an answer to the question about portable water supply in emergency. This indicates responsible agency is not recognized commonly. On the other hand, every

answer is consistent about the sewage disposal to be a city department responsibility such as Solid Waste Dept. or Clean Personnel. Some explain they will borrow the Portalet, which is a kind of mobile toilet, from the private providers. The result of many cities giving no answer to this question shows that responsible agencies/departments for relief activities are not known properly, although every city disaster preparedness plan defines it clearly.

11.5.5 Training

- 1) 6 cities implement the staff training based on the annual plan, while 8 not on the regular basis. Generally there are two ways to have suitable trainer, one from in-house and other from external organizations such as DOH, OCD and National Security Council.
- 2) 5 cities provide emergency and disaster education and training to the population. Some answer that the health center staff usually takes part in training and staff from PNRC occasionally. This kind training to the community seems generally dull over the Metropolitan Manila.

11.5.6 Resources and Logistical Support

- 1) 4 cities are provided with radio communication equipment in the health facilities, while other 12 do not. And 7 cities have radio system in their operation centers, but 8 do not. Lack of radio communication system will be fatal to carry out relief activities smoothly, once landline and mobile phone system have cut off.
- 2) Medical supplies: Essential drug list is prepared at any government hospitals and LGUs, and amount of 2 to 3 days usage at ordinary times is usually stocked in them. They purchase medical supplies mainly from their own budget and slightly from DOH's subsidy, and stock them at CHO, Health Center and Hospital. It is notable that emergency supply of consumables is not arranged between the local government or government hospitals and the private providers.

11.5.7 LGU's Special Concerns for Earthquake Disasters

- 1) The questionnaire includes a free answer question about local government concerns in health sector once they have hit by a massive earthquake. Table 11.5.2 summarizes their anxiety.
- 2) Major concerns that appear commonly in the answer are: logistics of drugs and supplies, capacity of hospitals to receive patients, rescue capability, insufficient radio communication system, and lack and shortage of disaster preparedness plan and training. The result spotlights the situation that local health authorities have great anxiety in almost all areas of disaster preparedness.

Table 11.5.2 Major Concerns of LGU's to Cope with Potential Earthquake Disaster

City/Municipal	Major Concerns
Las Pinas	✓ We have no mass casualty preparedness plan (Training, Equipment, Coordination)
Makati	✓ Provision of First Aid/Emergency Medical Service to the injured. ✓ Provision of Transport (ambulance) services of patients to hospitals
Mandaluyong	✓ Organizational chain of command, ✓ Availability of drugs, blood, emergency functions
Marikina	✓ Hospital capacity to receive inpatients
Paranaque	✓ Enough medical supplies and equipment provided, ✓ Availability of Evacuation area ✓ Immediate transport of victims, Communication equipment for immediate rescue
Pasig	✓ Logistics requirement ✓ No adequate communication facilities available ✓ Training program inadequate to reach all of the targeted participants- no budget for training
Valenzuela	✓ Immediate Rescue Capabilities ✓ Maintenance of basic needs
Caloocan	✓ Search & rescue operation, Giving First Aide, ✓ Evacuation and Emergency Shelter, Mass Feeding ✓ Mobile Medical Team, Information Management
Malabon	✓ Communication System, Hospital Capacity ✓ Outbreak of Epidemiology (In particular, Diarrhea)
Nabotas	✓ Mobile the disaster team, Inspection of the different area, ✓ Provide medical services, Referred patients to the concern agency if necessary.
Pasay	✓ Research Operations, Food and Water Supply, ✓ Sanitation Concerns
Pateros	✓ Rescue of victims, Medicine and supplies, ✓ Consideration of hospital
San Juan	✓ Regular Training on Preparedness ✓ Equipment including communication equipment, ✓ Vehicle for Transport (BLS)
Taguig	✓ Capability of Health Personnel in management of emergency- Life threatening situation

11.6 Major Problems Identified

Assessment of the organizational capability for the health emergency management in MM is still on the way to be finalized, since the damage estimation by potential earthquakes is scheduled at the second field survey. Therefore, problems identified through the first field survey do not deal with the quantitative issues very much but the qualitative one.

11.6.1 General

The nature of health emergency management at massive disasters is fundamentally different from that of Emergency Medical Service (EMS) at ordinary times. It is defined as the all-out activities to manage the massive human damages occurred in many spots simultaneously, which extent is often beyond the capacity of health resources in the affected area and consequently needs external assistance.

From this viewpoint, existing health system has clearly both organizational/institutional and physical immaturities. The assessment is concluded that there does exist plural Emergency

Medical Systems for accidents and incidents but not exist any integrated Health emergency Management System at present. Even if the local health people claim the existing one as the health emergency system or operations, it should be understood as emergency medical services or operations to victims by incidents that could be managed within the existing resources. In other words, there exist the institutions and resources to cope with small-scale disasters such as floods, big traffic accidents or terrorism bombings, but not large-scale disasters like earthquakes.

Problems, which are found at every assessment area, will be good reasons to support the claim mentioned above. Those are:

11.6.2 Organization and Institutional System

- 1) MMDCC is not very active as well as most of CDCCs/MDCCs in Metropolitan Manila to compare with NDCC. Established MMDCC system in which MMDA is centered has not been confirmed. It is natural that MMDCC capability is very low since its member agencies are only regional offices with far lower staff capacities than its central offices. In consequence, MMDCC will surely function poorly or not at all in the event of a massive earthquake.
- 2) At any level of the disaster coordinating councils in Metropolitan Manila, from national to city/municipal, comprehensive Calamities and Disaster Preparedness Plan has been prepared. Role of the health sector is stated only as a part of this comprehensive, but it is important to note that any definite plans by activity field or sector (including health) has not been developed yet. Consequently, lack of sector-wide plan makes the Study Team almost impossible to get an overview of the progress of health emergency preparedness.
- 3) Health emergency mechanism is already set up in general at the city/municipal level. However, there is surely a big gap in the capacity to prepare the situations between the big cities like Quezon or Manila and the small like Malabon. And the fact that even disaster coordinating councils are not formulated yet at barangay level.
- 4) Immediate and direct response to disasters is regulated as the primary responsibility of the LGUs. However, LGUs' answers to the questionnaire and interviews reveal the disparity of their competence to manage the disaster situations among them.
- 5) Radio communication system in MMDA Operation Center, which is appointed as MMDCC Operating Center, does not cover DOH-NCR (Health), DSWD-NCR (Relief) directly as well as most of LGUs in NCR. DOH-NCR can communicate with major private hospitals and CHOs only through Radio System of BFP-E.A.R.net indirectly.

11.6.3 Health Emergency Management Program

- 1) Any government people seems aware of the potential threat by a big earthquake, but any disaster preparedness plan does not reflect such concerns. In consequence, very little

consideration is paid at any hospital to response on the assumption that hospitals itself get damaged severely.

- 2) DOH's capability to promote the Health Emergency Management Staff (HEMS) programs is very weak in terms of leadership due to its shortage of manpower and budget. It is very clear that DOH will become busily occupied once Metropolitan Manila is hit by a big earthquake and will not be able to afford to coordinate whole organizations activities. Because HEMS is manned 16 staff including 4 MDs and 4 nurses only, while NCR HEMS-coordinator is 5 staff consisting 1 nurse and 4 midwives. As the devolution of the responsibility for health services from DOH to LGUs has been developed, the role and responsibility of DOH-NCR for emergency preparedness and response activities has become very lesser and seems vague now.
- 3) These manuals are spread only in the DOH organization including DOH-hospitals and DOH-regional offices, but not distributed to other organizations yet. DOH-HEMS director wishes in the preface of 'Health Emergency Management for DOH regional office' that every Regional Office gets started to prepare the local version of the manual, but DOH-NCR has not responded to this so far.

11.6.4 Medical and Health Service System

- 1) System to mobilize public health institutions and health staff has already established in both local and central government organizations. Although Republic Act defines that private hospitals are under obligation to take part in providing emergency services at disasters, any arrangement to involve them effectively in the existing government EMS network, has not been argued or made between the government and private entities.
- 2) It must be reminded that many ambulances in government agencies are not available due to malfunctions. For example, only 2 ambulances are available among 5 at MMDA. Almost half of ambulances may be out of use in the worst case.
- 3) It is a notable feature that various government agencies provide the EMS independently. This causes the functional overlapping and often leads to the waste of resources since there is little coordination about their activities. In addition, some barangay captains own their ambulances; consequently, no one can answer the total number of ambulances as well as number of physicians in Metropolitan Manila.
- 4) Hospitals are distributed very partially in terms of geographic distribution. Considering that transportation of the injured in the aftermath may not be available through the traffic roads, Stop DEATH zoning program seems impractical due to transportation problems.

11.7 Toward the formulation of the Disaster Management Plan

To prevent potential earthquake disaster completely is quiet an impractical idea in any countries. Especially it is true in the country like Philippine in which the disaster management system is less

developed and financial resources to improve are restricted severely. When it comes unavoidable to get affected, there will be no alternatives but try to mitigate the impact and reduce the damage to the extent possible. Then, Disaster Mitigation, not Disaster Prevention, must be a fundamental policy in developing the disaster management system in this study.

Following four items are core strategies to realize the policy 'Disaster Mitigation'.

- 1) To promote retrofitting the hospital buildings and facilities to gain the higher earthquake-resistance capacity
- 2) To establish the GIS for Disasters to deploy the limited health resources over the affected area effectively
- 3) To build the capacity of communities for immediate rescue and detailed relief activities
- 4) To depend positively on the external humanitarian aids and involve them systematically in the management plan

Through implementing these strategies, the goal of the health emergency management plan, to establish a system to ensure providing the victims with health and relief services whenever and wherever they need it, can be reached as much as possible.

1) Promotion of Retrofitting Hospital Buildings and Facilities to Increase the Earthquake-Resistance Capacity

- 1) Any efforts to save lives and treat the victims will become vain, if hospital buildings had collapsed to kill and/or injure patients and health staff when hit by earthquakes. Damage estimation and Quick assessment of earthquake-resistance capacity of important buildings are planned to complete by the middle of 2003. Based on the result of the quick assessment, DOH and LGUs are strongly recommended to start implementing intensive Building Structure and Installations Assessment for earthquake-resistance over the retained hospitals in NCR. And assessment must be extended to major private hospitals at tertiary level with the government technical and financial assistance. Following the assessment, DOH and LGUs need to set up a joint program to execute the retrofitting works consisting of structural reinforcement and equipment installations adjustment.
- 2) Stop DEATH Program in NCR is a good base to develop the ongoing EMS up to a new Disaster Hospital Network. New network must be extended to involve major private hospitals, and needs to set up a new hospital category of 'Disaster Medical Hospitals (DMHs)', which will take charge of covering certain area and receive victims through surrounding hospitals and health centers. Disaster Medical Centers will be qualified with having essential facilities such as earthquake-resistance buildings, sufficient stockpile of necessities, accommodation to receive mass casualties, helicopter port for patient's transportation and ICU and trauma and/or burn unit, etc.

- 3) It may be a good idea to appoint one of major DOH hospitals in NCR, for example East Avenue Medical Center, as the Core Disaster Medical Center (CDMC), which will become a center of disaster medicine for education, training and research in the country. This hospital must be improved physically prior to other hospitals and will be a model of other DMSs by demonstrating what the earthquake-resistance hospital is.
- 2) **To establish the GIS for Disasters to Deploy the Limited Health Resources Effectively**
 - 1) Now Geographic Information System (GIS) is recognized to be one of essential tools to manage the disaster effectively and smoothly. The study team is manned to set up the GIS for earthquake disasters with fundamental information, which is to be installed and maintained by MMDA and PHIVOLCS after the study. DOH and CHOs need to utilize this newly designed GIS for disaster management, including following main purposes:
 - a) To estimate the extent of human damages as quick as possible right after the impact to make various decisions effectively.
 - b) To deploy a lot of teams for rescue, medical, fire fighting and relief activities effectively by entering data/information collected aftermath into the available GIS. This is the only possible way to input health resources into the most needed places and to avoid leaving many victims untouched.
 - 2) To expand and improve the integrated radio communication system with centering MMDA in member agencies of MMDCC is the top priority among many issues to be improved. In addition to this member agency network, another network to link LGU's operating centers with MMDA must be developed.
 - 3) Information system needs to be developed not only within MM but to nearby Regions in order to establish the wide area network to transfer the patients/victims from MM to the hospitals in other Regions
 - 3) **To Build the Capacity of Communities for Rescue and Relief Activities**
 - 1) It is said that most people in the distressed areas cannot expect to receive full-fledged rescue and relief services by the government during a couple of days after the occurrence of the earthquake. It means how important role the community can play to reduce and mitigate the sufferings of victims at the disaster initial stage, through the activities of fire distinguishing, rescue, first aid and transportation of the injured, coordination and distribution of relief goods, etc.
 - 2) To formulate Barangay Disaster Coordination Council at every barangay is stimulated in the national plan, however no barangay has set it up until now. Consequently no community has ever seen the community-based disaster management plan, which will be a guide to lead people to actions. The study team is manned to prepare the master plan for the

community-based disaster management plan in the course the study, and it will become a model of it. It will contain the role and action by the community and local health personnel.

4) To Involve the External Humanitarian Aids Positively and Systematically in the Management Plan

- 1) International Humanitarian Aids System has been developing rapidly over the world in the past years. Once the earthquake disaster in MM makes the headlines around the world, great amount of unsolicited relief goods including medical supplies will be piled up on the airport in a couple of days and medical aid teams will surely rush to the affected area. It is well known this has caused another problem to the country before. On the other hand, it is true that stockpile of relief goods and medical necessities like drugs and consumables are prepared insufficiently both in central and local government agencies.
- 2) It is strongly recommended to take advantage of these international humanitarian aids to supplement the serious shortage of stocks. DOH will be able to make the inventory of the types and quantities of medical necessities based on the damage estimation by the study team, then can develop it to be involved in the health emergency management plan. Furthermore, it is suggested to learn the system on logistics and management skill to handle the relief goods, which is called as Humanitarian Supply Management Methodology (SUMA) have been developed by PAHO/WHO.

Part III-2

***Earthquake Impact Characteristics
in Metropolitan Manila***

***Chapter 12. Consideration of Scenario Earthquakes
and Hazards***

CHAPTER 12. CONSIDERATION OF SCENARIO EARTHQUAKES AND HAZARDS

12.1 Geomorphological and Geological Features of the Study Area

12.1.1 Fault in the Philippines

Philippines locate in latitude 5 to 19 °45' N. and longitude 116 to 128° E. Metropolitan Manila locates in center of Luzon Island, between Manila bay, which reach to South China See, and Laguna de Bay. Many faults distribute all over the country as shown in Figure 12.1.1. Major ones are Manila Trench, Negros Trench, Sulu Trench in South China Sea, Philippine Trench in Philippine Sea and Philippine Fault Zone (PFZ) crossing the Philippine Islands.



Figure 12.1.1 Geographical Fault in the Philippines

Source : PHIVOLCS

12.1.2 Geomorphological and Geological Features of the Study Area

1) General Geomorphological unit in Metropolitan Manila

Latest geomorphological map was provided by PHIVOLCS as shown in Figure 12.1.2. Metropolitan Manila is divided into three major parts: Central Plateau, Coastal Lowland and Marikina Valley.

The Central Plateau is a residential and includes the highly dwelling town area of Metropolitan Manila namely San Juan, Makati and Quezon cities. The ground elevation ranges almost 20m to 40m and it gradually becomes lower at the west side and the area becomes narrower along Pasig River. However, in the northwest area the ground elevation ranges from 70m to over 100m.

The Coastal Lowland is a flat and low plain facing Manila Bay. It is also where the urban area of the city of Manila and suburbs are located. The ground elevation ranges from zero on Manila Bay to five meters at the west side of Mandaluyong and Makati. The Coastal Lowland can be subdivided into sand bar, backmarsh including tidal flat, Pasig River delta and reclaimed land.

The Marikina Valley is surrounded by the Central Plateau and mountains, and consists of flood plain along Marikina River and delta along the Laguna de Bay. The elevation of this area ranges from 2m on the Laguna de Bay side to 30m on the north side at Montalban.

There is an active fault system called the Valley Fault System (VFS) located in the study area. The VFS consists of two sub-parallel faults, namely the West Valley Fault (WVF) which lies between Marikina Valley and Central Plateau, and another is the East Valley Fault (EVF) which lies between Marikina Valley and the mountains. The West Valley Fault runs from Montalban in the north, passes through east of Metropolitan Manila and west of the Laguna de Bay and extends southwards possibly as far as Tagaytay Ridge. On the east side of the Marikina Valley, the East Valley Fault, extends from San Rafael, down to Montalban south to Pasig area, but it becomes a subtle tonal contrast southward.

Study Team compiled elevation map and slope gradient map. Average elevation in coastal plain and Marikina plain is 0 to 5m. Average elevation in central plateau is 20 to 100m. Slopes are prevailing especially northeastern part of the Study area, east boundary of central plateau area and southern part of the Study area. Slope gradient shows 10 to 40% generally.

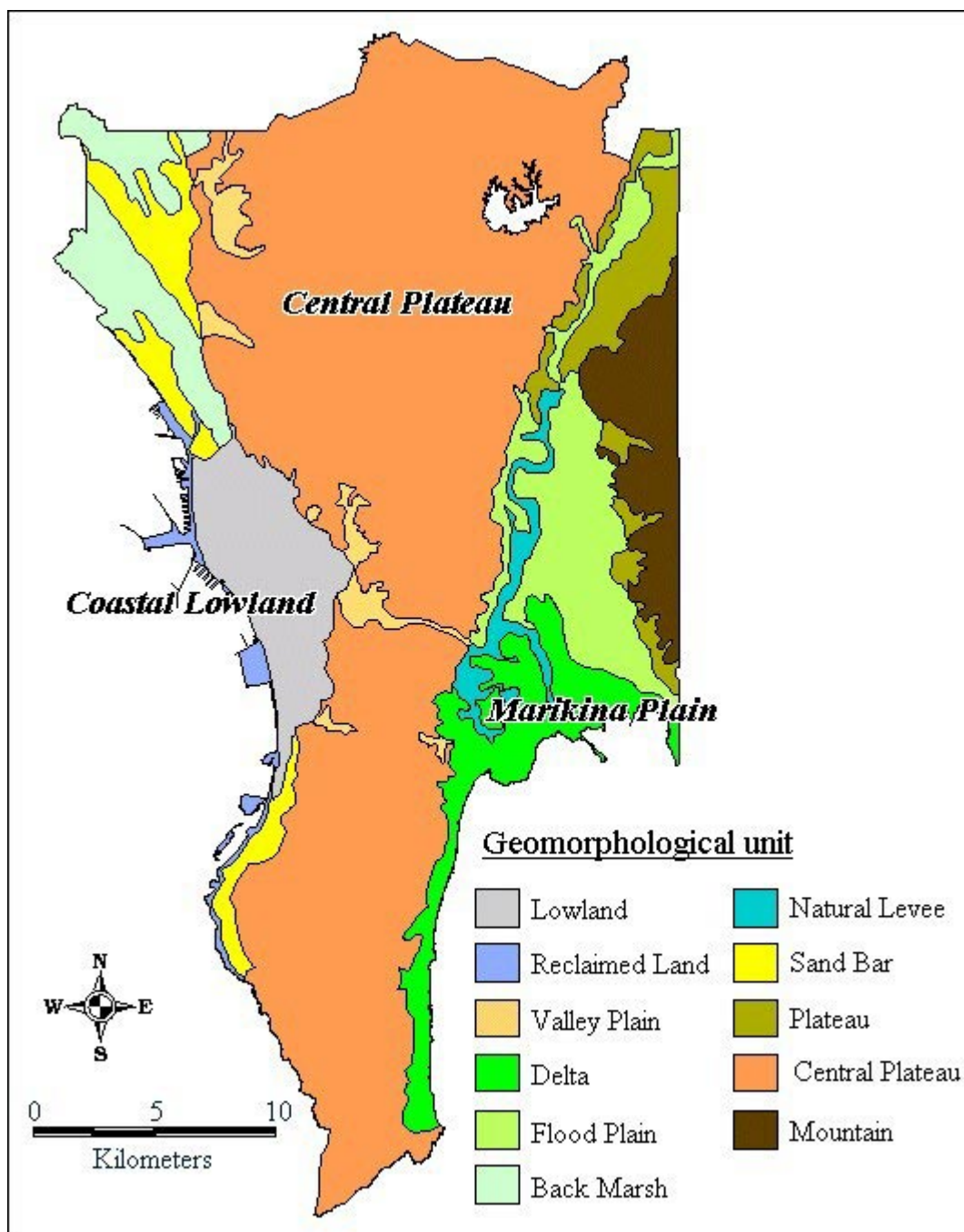


Figure 12.1.2 Geomorphological Map of the Study Area

Source: PHIVOLCS

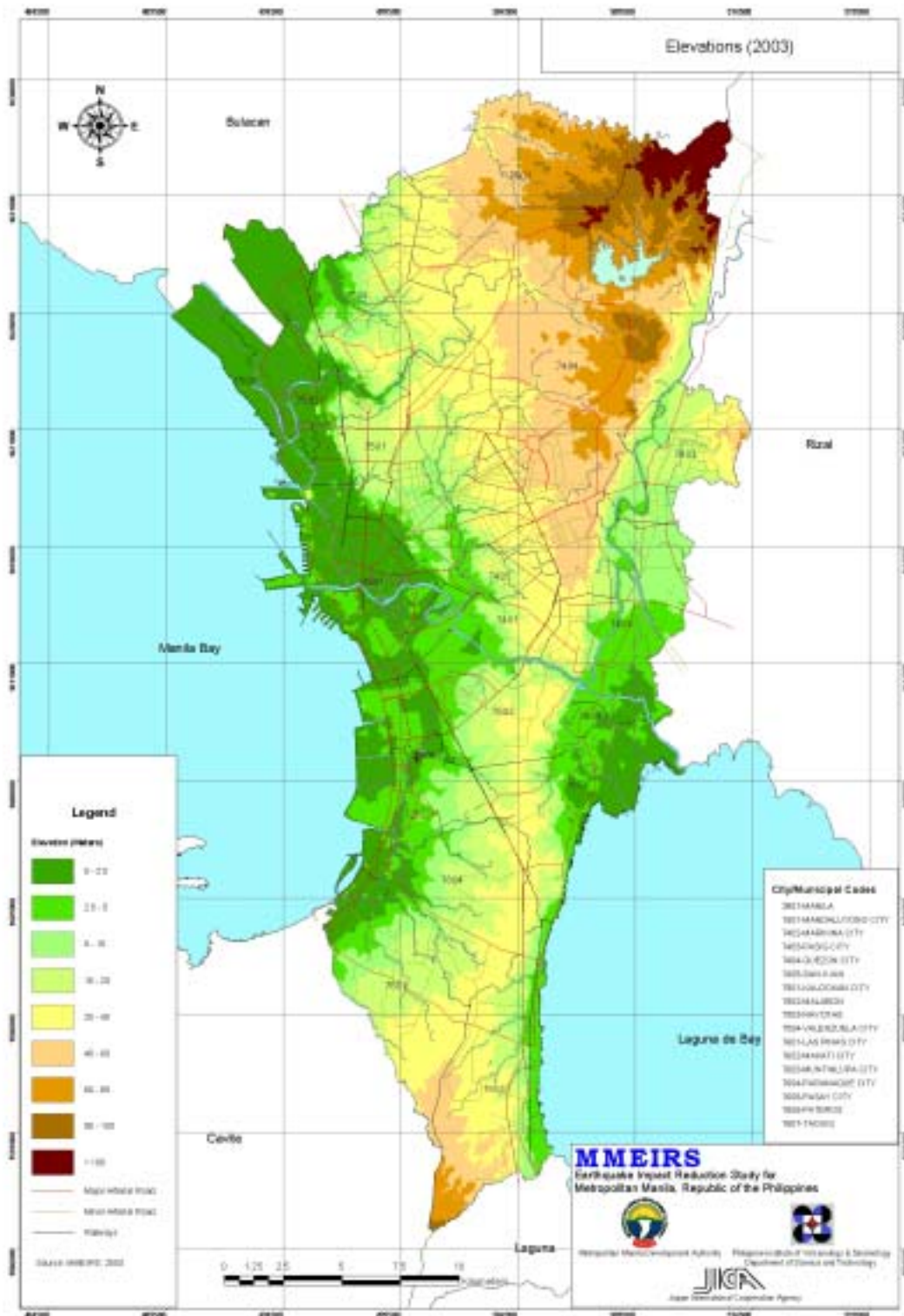


Figure 12.1.3 Elevation Map of the Study Area

Source: Compiled by Study Team



Figure 12.1.4 Slope Gradient Map of the Study Area

Source: Compiled by Study Team

2) **General Geology in Metropolitan Manila**

Latest surface geological map was provided by PHIVOLCS as shown in Figure 12.1.5.

Metropolitan Manila is generally underlain by the following lithologic types: (a) Quaternary alluvial deposits, (b) pyroclastic flow deposits or ignimbrites, and (c) tuff and tuffaceous deposits. Based on stratigraphic studies, there are several units of pyroclastic flow deposits observed in Metropolitan Manila, but these do not necessarily come from a single source and from the same event.

Other lithologic units were also mapped in areas adjacent to Manila such as the (a) pyroclastic deposits from Taal Caldera which underlies the southern border of Metropolitan Manila, (b) conglomerate units that have been observed north of Quezon City in Novaliches, (c) old lava flows that were observed outcropping in Rodriguez (formerly Montalban), Rizal northeast of Quezon City, and (d) old basement complex east of Quezon City in Rodriguez, Rizal.

(1) **Quaternary Alluvium**

Unconsolidated sediments underlie most part of the cities of Manila, Caloocan, Pasig, Pasay and Taguig. From the borehole data, interbeds of sandstone-siltstone-mudstone/claystone and channel-fill conglomerates with or without shell fragments are the dominant lithology. Marikina City which is situated within the Marikina Valley east of Quezon City is underlain by unconsolidated alluvial deposits composed of clay, silt and sand.

(2) **Tuff and Tuffaceous Sediments**

There are three types of true volcanic tuff in the UP Balara area, Quezon City. The first two tuffs consist of light gray colored fine grained materials. They overlie the third tuff which is a coarse grained volcanic breccia or the pyroclastic flow deposit. The first tuff layer is well lithified, fine grained and in places dark prismatic minerals and pumice may be seen. The second tuff layer is finer grained and is composed mostly of volcanic ash. But its main characteristic is the presence of accretionary lapilli. In some places planar laminations and concentrations of sand-size scoria and pumice can be seen in this type of volcanic tuff.

Reworked deposits of primary tuff and pyroclastic flow deposits are widely distributed within and around Metropolitan Manila. An example of this is seen along C-5 in Pasig City, where the pumice-scoria pyroclastic flow deposit laterally changes to laharic facies. Tuffaceous reworked deposits can also be found beneath pyroclastic flow units such as in the excavation for Valerio Towers in Makati that shows the pyroclastic flow unit to overlie a sequence of epiclastic sediments that are part marine.

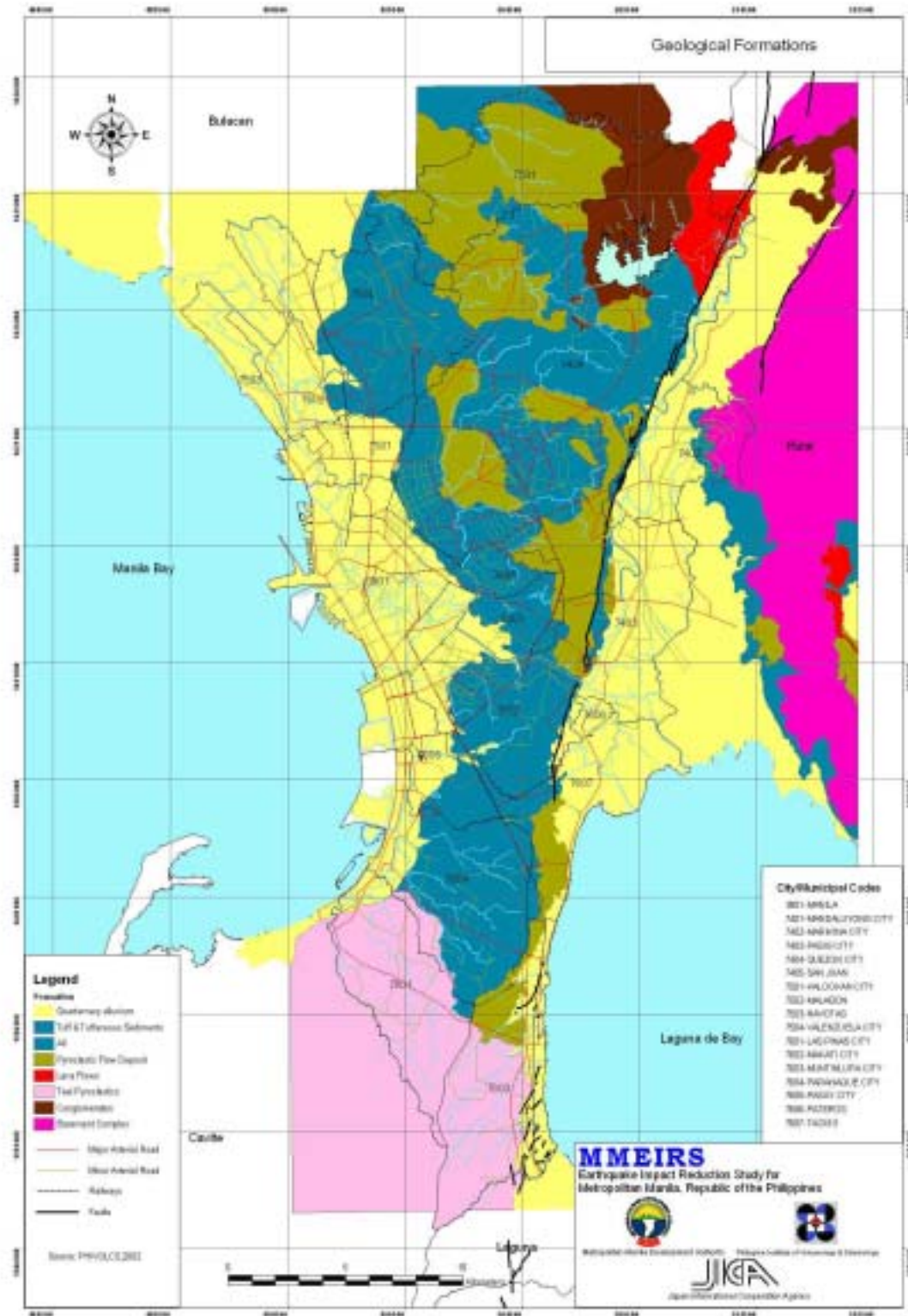


Figure 12.1.5 Geological Map of the Study Area

Source: PHIVOLCS

(3) Pyroclastic Flow Deposits

A pyroclastic flow deposit is a type of volcanic rock unit deposited by turbulent mixture of flowing mass of fragmental materials and hot gases that cascade down the slope of a volcano at high speed during an explosive eruption. There are at least two types of pyroclastic flow deposits underlying Metropolitan Manila, the mixed scoria-pumice pyroclastic flow and the dominantly fine-grained pumice-rich pyroclastic flow. These pyroclastic flow deposits are associated with calderagenic eruptions of either Taal Caldera or Laguna Caldera, which are the nearest calderas to Metropolitan Manila. Based on stratigraphic analysis of outcrops, there are several units of pyroclastic flow deposits underlying Metropolitan Manila, which could come from either these sources during several different events.

(4) Lava Flows

The northeastern portion of Metropolitan Manila is underlain by metamorphosed volcanics classified as porphyritic andesite and basalt. The andesitic unit is thoroughly weathered, brecciated and faulted while the basaltic unit is epidotized and crisscrossed by numerous striations and veinlets of calcite. These old volcanics have been observed outcropping in Rodriguez, Rizal north of Quezon City.

(5) Taal Pyroclastics

The southern edge of Metropolitan Manila is underlain by pyroclastic materials from Taal Caldera. The extent of Taal Caldera deposits were delineated based on geomorphologic expression on the topographic map. Topographic face shows gentle slopes to northwards starting from Tagaytay Ridge. Very few descriptions regarding these deposits are available.

(6) Conglomerates

Conglomerates in Metropolitan Manila are usually channel-fill deposits such as those found in an outcrop along Commonwealth Avenue. The lens-shaped channel-fill conglomerates are interbedded with finer tuffaceous sediments. This deposit ranges from being matrix-supported to clast-supported and consists of pebble to cobble clasts of basaltic and andesitic rocks. Its matrix usually consists of sand-size particles with minor pumice fragments. Thicker deposits can be found farther north and they are most extensive in Caloocan City and Novaliches, Lagro and Fairview area in Quezon City.

(7) Basement Complex

The sequence of pillow basalts, pillow basalt breccias, reworked pillow basalts transitional to hyaloclastic sediments interbedded with laminated reddish brown radiolarian cherts and mudstones that underlie the Sierra Madre Range are lumped altogether as the Basement Complex. These rock types are considered older than the oldest overlying sedimentary unit in the region.

The Basement Complex is found in the area of Cainta, Taytay and Montalban all in the Province of Rizal, east of Metropolitan Manila.

References to section 12.1.2

Daligdig, Jessie A., Raymundo S. Punongbayan, Glenda M. Besana and Norman M. Tuñgol, The Marikina Valley Fault System, Active Faulting in Eastern Metropolitan Manila,. PHIVOLCS Professional Paper 01, 1997.

Metropolitan Manila: In Search of a Sustainable Future, University of the Philippines Press 2002.

Arpa, M.C.B., M.D.Panol, M.L.Martinez-Villegas, R.U.Solidum and M.A.V.Bornas, Surface Geology of Metropolitan Manila and Adjacent Areas, 2002.

Solidum, R.U., 2002, unpublished data.

12.1.3 Existing Probabilistic Estimation of Ground Motion

In this study, one of the final outputs is the damage/event scenario with the march of time after earthquake. The seismic motion distribution of study area if the earthquake may occur at the certain seismic source is necessary to make the realistic damage/event scenario. The estimation of seismic motion distribution with the specified seismic source is called “Deterministic Approach”. This type of approach can estimate the maximum damage distribution within imaginable situation. The deterministic approach is oriented by the occurrence of earthquake at certain fault and the probability of the event is not considered.

There is another way to estimate the seismic motion distribution, which is called “Probabilistic Approach”. This type of approach takes the all probable seismic source into consideration and calculates the expected seismic motion based on the statistical probability of each seismic source and the effect of each seismic source. The result by the probabilistic analysis is expressed as, for example, the seismic motion distribution with 10% probability of exceedance in 50 year exposure time. In this approach, the seismic source is not specified. This approach is often used to evaluate the design seismic coefficient.

These two approaches should be used properly depending on the purpose of the analysis. The users of the maps of seismic motion distribution have to clearly understand the difference of these two approaches.

For Metro Manila, B. C. Bautista (2002) has studied the expected seismic motion distribution in probabilistic approach considering the faults including PFZ, VFS and plate boundary sources including Manila Trench, East Luzon trench and Philippine Trench. The PGA distribution with

10% probability of exceedance in 50 year, 100 year and 250 year exposure time are shown in Figure 12.1.6. The maximum PGA in these maps shows 0.21g, 0.35g and 0.64g respectively.

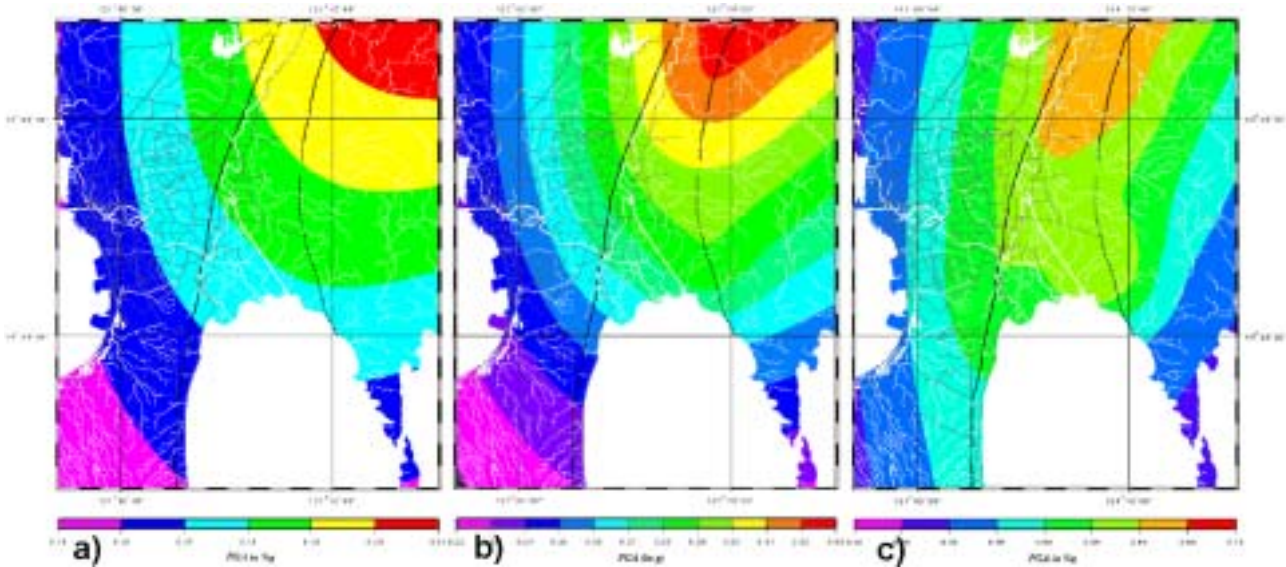


Figure 12.1.6 PGA maps with 10% Probability of Exceedance in a) 50 year, b) 100 year and c) 250 year exposure time.

Source: B. C. Bautista (2002)

References to Section 12.1.3

Bautista, B. C., M. L. P. Bautista, I. C. Narag and R. S. Punongbayan, 2002, Probabilistic Estimation of Ground Motion Hazard in Metro Manila, Philippines: Preliminary Results, NDCC-PHIVOLCS Earthquake Risk Mitigation Project for Metro Manila (to be published).

12.2 Scenario Earthquakes

12.2.1 Faults Condition

The Eurasian Plate (or South China Plate) subducts eastward beneath Luzon Island along the Manila Trench, and the Philippine Sea Plate subducts westward along the East Luzon Trench together as shown in Figure 12.2.1. Because of this complex tectonic setting, Luzon Island shows high seismic activity. The Philippine Islands are sandwiched between two opposite subduction zones. A long, inland Philippine Fault Zone (PFZ) lies parallel to the subduction trenches. The PFZ is assumed to release the shear stress by the oblique subduction of the ocean plates. Many faults are identified around Metropolitan Manila, and the WVF and EVF, which run north to south

along the west and east edge of the Marikina Valley, are thought to pose the greatest threat to Metropolitan Manila due to its proximity.

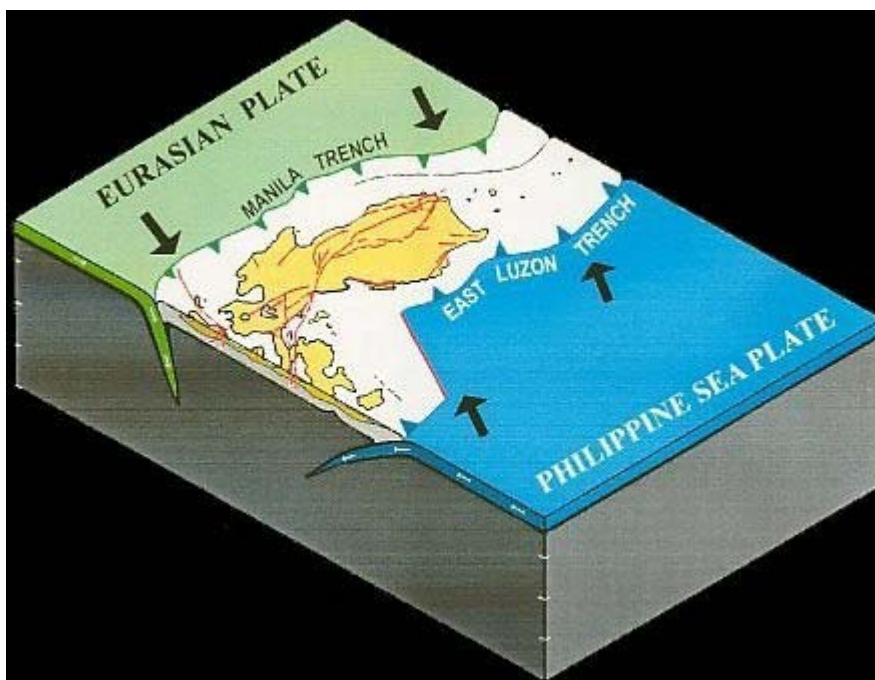


Figure 12.2.1 Subducting Plates under Luzon Island

Source: PHIVOLCS

Following maps of inland faults in Philippine Islands and trenches of surrounding area are collected from PHIVOLCS.

- Distribution of Active Faults and Trenches in the Philippines (2000), Geology & Geophysics R&D Division, PHIVOLCS.
- Distribution of Active Faults in Southern Luzon (2000), Geology & Geophysics R&D Division, PHIVOLCS.
- Map of the Valley Fault System (VFS) in Metropolitan Manila and vicinity (2000), Geology & Geophysics R&D Division, PHIVOLCS.

The faults and trenches around Metropolitan Manila are shown in Figure 12.2.2. The thin blue lines in the figure are the faults based on the seismic activities compiled by PHIVOLCS. The fault traces based on the geological survey (red) are used for the analysis of inland fault and the fault traces based on the seismic activities (blue) are used for the analysis of offshore fault.

The collected inland faults locations are identified by PHIVOLCS based on the geological investigation with aerial photograph reading and on-site survey. There remains a possibility that some missing faults remain undetected under the thick young sediment layers in the plain because it is impossible to find them by geological study from ground surface. The geophysical

prospecting measures are effective to search hidden deep faults but only several case have been carried out in the Philippines.

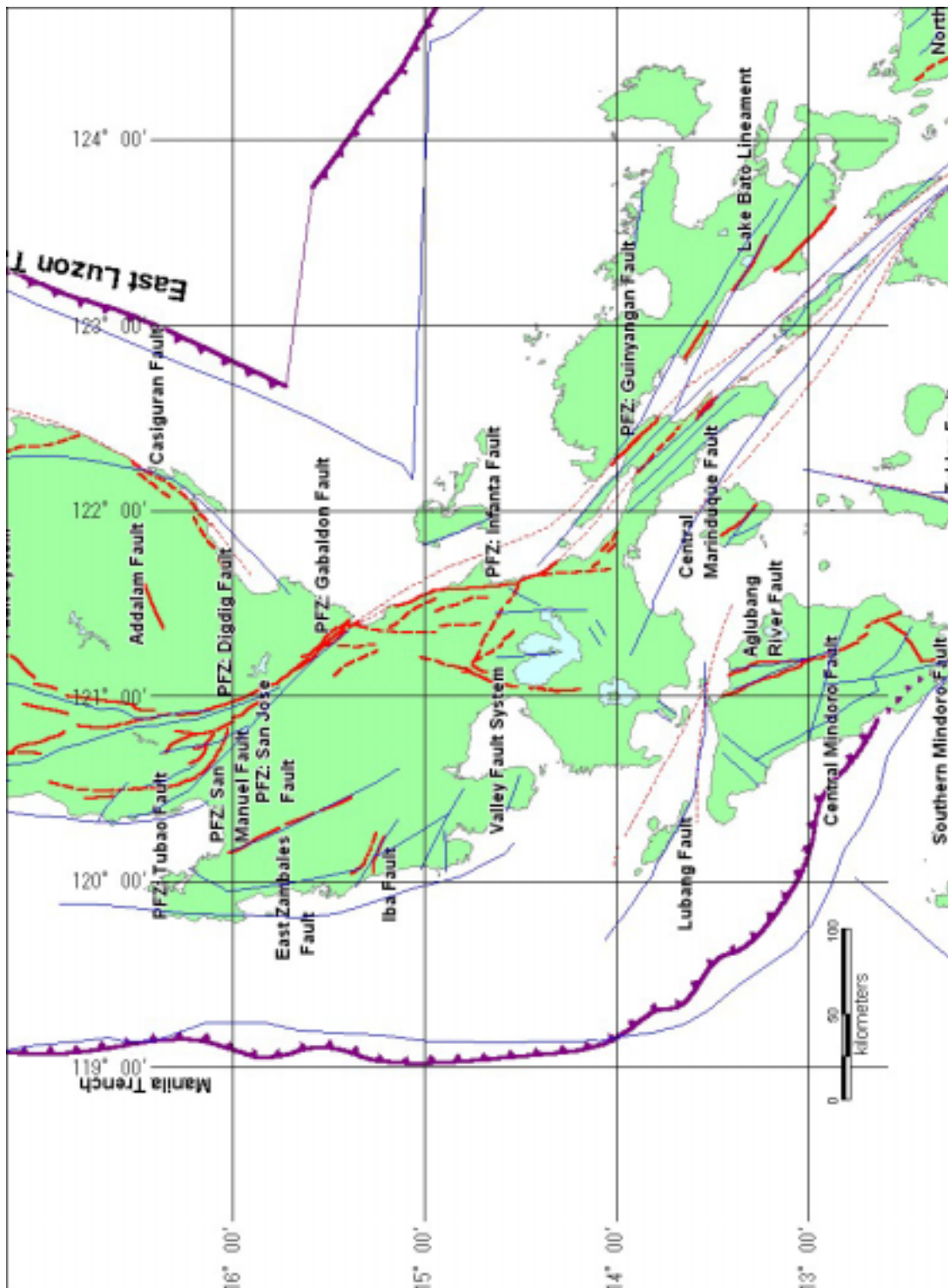


Figure 12.2.2 Distribution of Faults and Trenches around Metropolitan Manila

Source: PHIVOLCS

The trench excavation survey is commonly executed to study the activity, earthquake history, unit displacement and recurrence interval of the faults, which is not popular in the Philippines. The absolute age measurement method like ^{14}C dating is an indispensable, to determine historical earthquakes occurrence along a fault. Dating, however, depends on foreign research organizations in Japan and U.S.A. and could not be carried out continuously.

Several trenching survey have been conducted at WVF and EVF. USGS and PHIVOLCS jointly surveyed at the northern end of WVF and suggested that at least two perhaps four large surface-rupturing events have occurred since A.D. 600. Therefore, the recurrence interval of the earthquakes is less than 500 years (Nelson et al. (2000)). However, the year of most recent event remains unknown. M.L.P. Bautista (2000) has suggested that the 1658 and 1771 earthquakes could be candidate events for the EVF, however, no event along the WVF is known. If no earthquake had occurred at the WVF after the 16th century, then the earthquake occurrence along the WVF becomes a serious threat.

12.2.2 Earthquake Condition

The earthquakes, that occurred before the instrumental seismic observation started, are called historical earthquakes. The catalogue of historical earthquakes is indispensable data to study the seismic activities in the area. It was during the 16th century when the Spanish colonial rule started in the Philippines that earthquake reports began to be maintained in various letters and chronicles.

The instrumental seismic observation started early in 20th century and the parameters of the events and magnitude of the events are decided based on the records. PHIVOLCS has the recent instrumented earthquake catalogue based on the data of other organizations and their original observation data.

M.L.P. Bautista and Oike (2000) has determined the parameters of 485 historical earthquakes from 16th to 19th century based on the historical accounts and descriptions. They also decided the origin and magnitude of the events from seismic intensity distribution considering the developed year of the cities. This report is a great scientific material on the historical seismic activity in the Philippines. Study Team has collected this report and added to database.

- - Bautista, Maria Leonila P. and K. Oike, 2000, Estimation of the magnitudes and epicenters of Philippine historical earthquakes, *Tectonophysics*, 317, 137-169.

The instrumented earthquake catalogue since 20th century by PHIVOLCS has been collected also.

The distribution of collected historical earthquakes is shown in Figure 12.2.3 and the earthquakes after 20th century is shown in Figure 12.2.4. M.L.P. Bautista (2000) has selected 36 historical and recent earthquakes that caused some damage to Metropolitan Manila. These 36 events are listed

in Table 12.2.1 and shown the year of occurrence in Figure 12.2.3 and Figure 12.2.4. In the Table 12.2.1, the epicentral distance from the geographical center of Metropolitan Manila (14.5687N, 121.0203E) and the estimated Peak Ground Acceleration (PGA) at Metropolitan Manila center using empirical attenuation formula by Fukushima and Tanaka (1990) are also shown. The ground condition that was supposed by Fukushima and Tanaka (1990) is the average of several ground conditions, therefore the PGA at soft ground may become more than twice of the value in this table.

In the five events at 1658, 1771, 1863, 1880 and 1937 year, shaded by dark gray in Table 12.2.1, Metropolitan Manila has been supposed to have experienced over 100gal PGA on average ground condition. As for the source fault of these earthquakes, M.L.P. Bautista (2000) has supposed EVF as the source fault of 1658 and 1771 event, Infanta Segment of PFZ as the source fault of 1880 event and Lagna-Banahaw Fault that run north to south along the east coast of Lagna Lake as the source fault of 1937 event. Those faults are listed at first as the source faults of the scenario earthquakes. The 1677 event is a hazardous earthquake to Metropolitan Manila that is originated from Manila Trench but no earthquake at Philippine Trench has caused damage to Metropolitan Manila. The 1863 event is supposed to occur in the Manila Bay and any source fault is not related to this earthquake. The events, those year of occurrence are underlined in Table 12.2.1, are the 10 most damaging earthquakes to Metropolitan Manila by M.L.P. Bautista (2000). The estimated PGA of these earthquakes except recent 3 events shows more than 50 gal (shaded by light and dark gray).

In these 36 hazardous earthquakes, only the 1677 event and the 1863 event have the description of tsunami around Metropolitan Manila. A huge damage by tsunami at west coast of Luzon Island is recorded for 1677 event but there is no description of tsunami in Metropolitan Manila. For the 1863 event, it is reported that wave struck the ship in Manila Bay and completely covered the deck but there was no damage in Metropolitan Manila.

Table 12.2.1 Destructive Earthquakes that Affected Metropolitan Manila and Estimated PGA

Year	Month	Day	Ms	Distance (km)	PGA (gal)	Year	Month	Day	Ms	Distance (km)	PGA (gal)
1589						1833	11	7			
1599	6	21		4.1		<u>1852</u>	9	16	7.6	108.7	74.0
1601	1	1				1862	3	4	6.1	113.0	21.2
1603						<u>1863</u>	6	3	6.5	13.1	298.3
1635						<u>1869</u>	10	1	6.6	70.9	66.8
<u>1645</u>	11	30	7.9	116.3	81.0	<u>1880</u>	7	18	7.6	67.8	139.8
1658	8	19	5.7	12.5	202.6	1892	3	16	6.6	214.2	8.2
1664	7	19				<u>1937</u>	8	20	7.5	52.2	174.7
1665	7	19				1942	4	8	7.5	118.9	59.6
1674						<u>1968</u>	8	2	7.3	224.6	13.2
1677	12	7	7.3	163.8	27.9	<u>1970</u>	4	7	7.3	152.2	32.5
1728	11	28		18.9		1970	4	12	7.0	123.8	38.0
1767	11	13		41.1		<u>1972</u>	4	26	7.2	153.8	29.4
1770	12			41.1		1973	3	17	7.3	232.5	12.1
1771	2	1	5.0	14.1	113.2	1974	2	19	6.1	139.0	14.3
1796	11	5	6.9	179.2	16.5	1977	3	19	7.0	282.2	5.3
<u>1824</u>	10	26	7.4	103.2	69.8	1990	7	16	7.8	124.6	67.8
1828	11	9	6.6	190.3	11.1	1994	11	14	7.1	119.1	44.1
1830	1	18	6.3	94.2	34.3	1999	12	12	6.8	203.2	11.2

Source: PHIVOLCS and Study Team

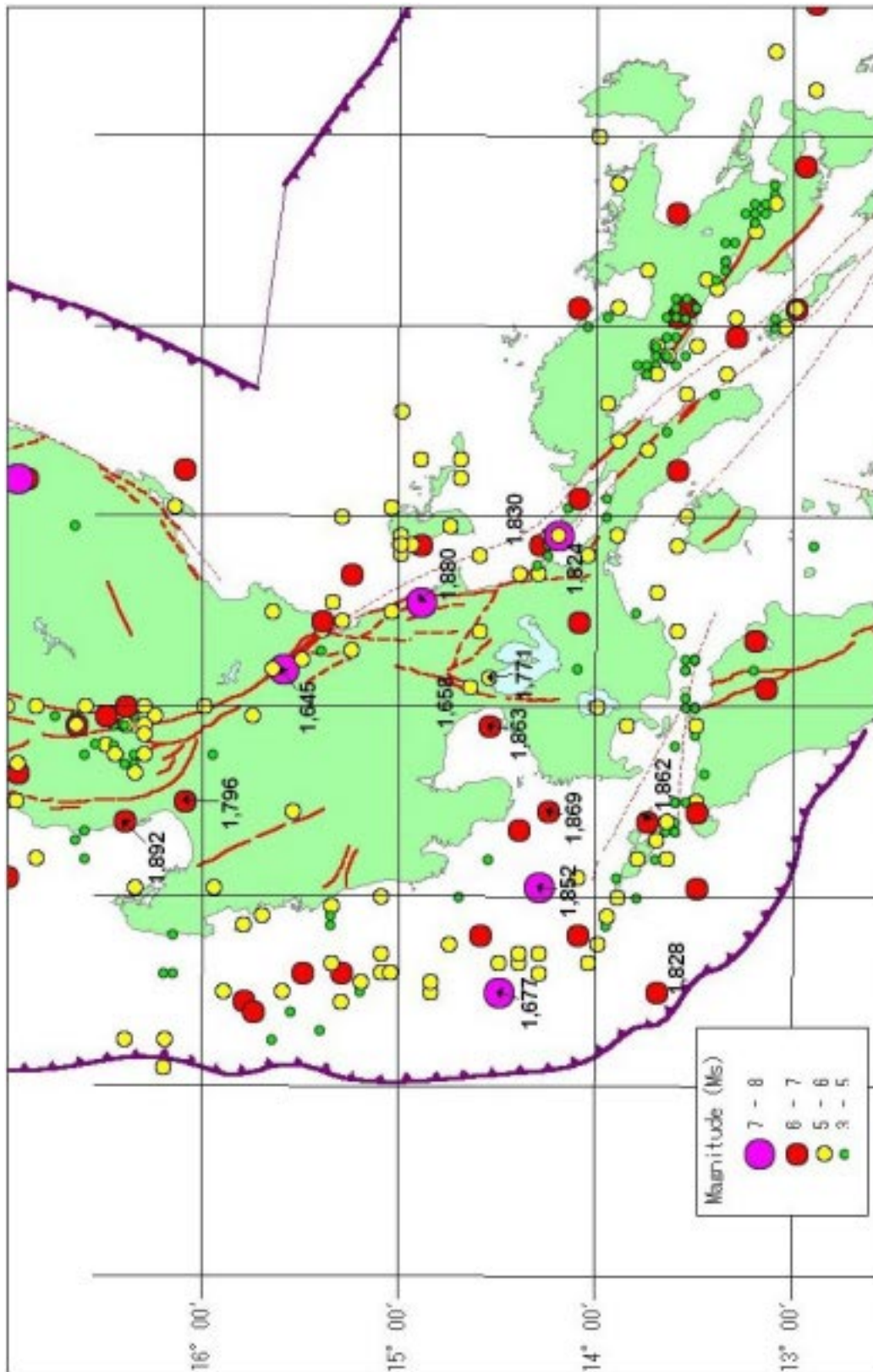


Figure 12.2.3 Distribution of Historical Earthquakes from 1608 to 1895

Source: M. L. P. Bautista and Oike K. (2000)

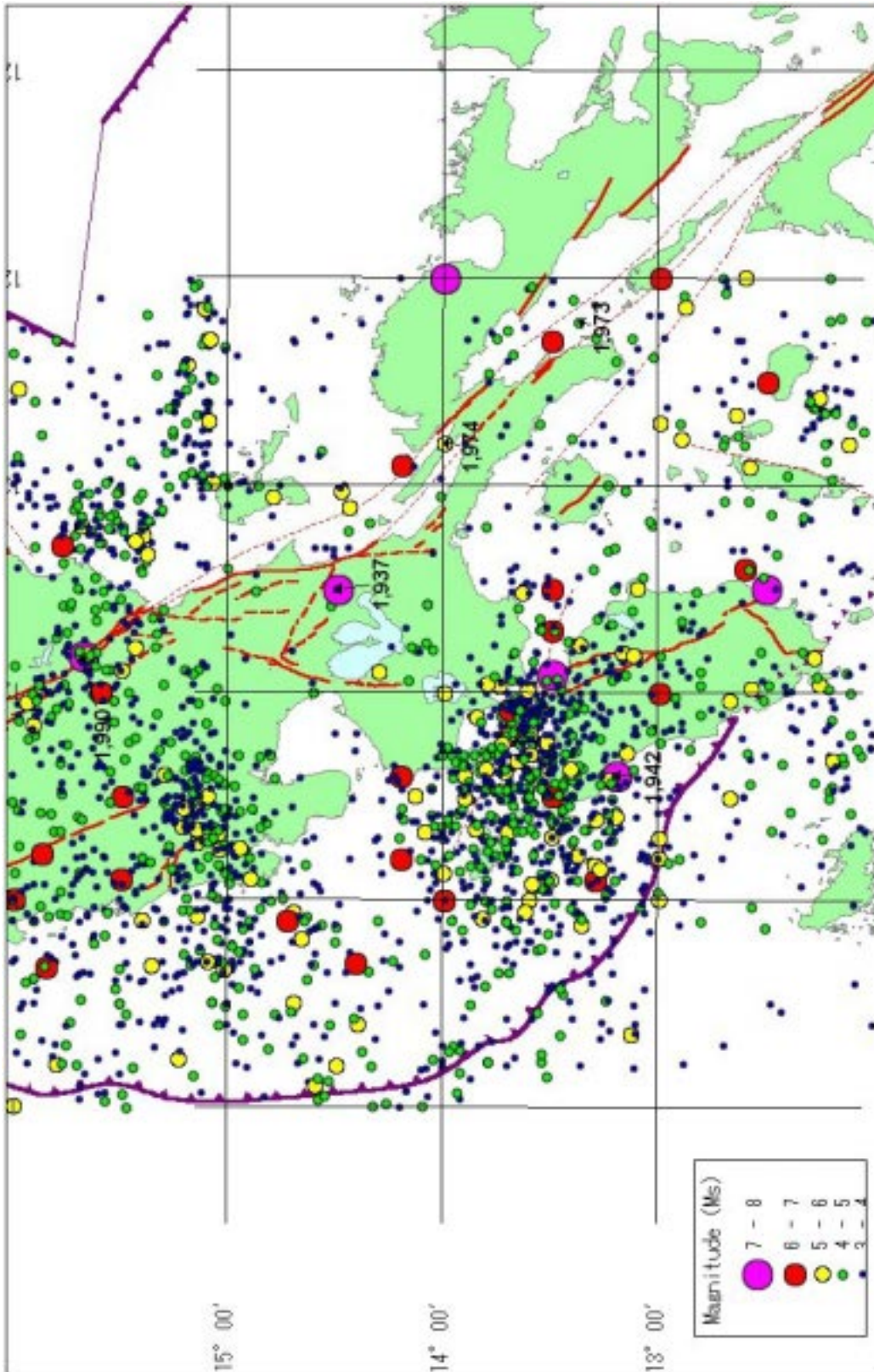


Figure 12.2.4 Distribution of Instrumentally Recorded Earthquakes from 1907 to 2002

Source: PHIVOLCS