Japan International Cooperation Agency (JICA)
Metropolitan Manila Development Authority (MMDA)
Philippine Institute of Volcanology and Seismology (PHIVOLCS)

Earthquake Impact Reduction Study for Metropolitan Manila, Republic of the Philippines

Final Report
Volume 4
Main Report 3

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Formation of the Final Report

The Final Report is comprised of the following volumes:

Volume 1: Executive Summary
Volume 2: Main Report 1
Volume 3: Main Report 2
Volume 4: Main Report 3
Volume 5: Supporting Report
Volume 6: Data Book

Volume 1, Executive Summary, contains the background information of this MMEIRS study, brief information of earthquake damage scenario for Metropolitan Manila, and summary of the master plan for a safer Metropolitan Manila for earthquake impact.

Volume 2, Main Report 1, contains the information of overall study and its results; that is the background information of this study, earthquake damage scenario, and master plan and action plans for safer Metropolitan Manila.

Volume 3, Main Report 2, defines problem of the present condition of Metropolitan Manila, and represents damage estimation results together with its assumptions and methodologies.

Volume 4, Main Report 3, contains supportive components related to master plan to help understanding the development of master plan.

Volume 5, Supporting Report, contains information on GIS Development and Topographic Map Compilation. It also includes other important out puts of the study, such as city ordinance of earthquake disaster management, earthquake disaster mitigation handbook, and earthquake mitigation and response checklists. Those outputs will be utilized when implementing the master plan.

Volume 6, Data Book, contains various data used for analysis in this Study. In addition, data related to earthquake hazard analysis and damage analysis are stored in CD-ROM.

The following foreign exchange rate is applied on this study report;

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Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transportation Official
ABC	Associate of Barangay Captains
ACP	Advance Command Post
ADB	Asian Development Bank
ADOC	Advance Disaster Operations Center
AMMS	Administrative & Manpower Management Service
AMP	Advanced Medical Post
ASEP	Association of Structural Engineers of the Philippines
ATC	Applied Technical Council
ATI	Asia Terminal Incorporated
BAC	Bids and Awards Committee
BDCC	Barangay Disaster Coordination Council
BFP	Bureau of Fire Protection
BOC	Bureau of Construction
BOD	Bureau of Design
BOE	Bureau of Equipment
BOM	Bureau of maintenance
BRS	Bureau of Research and Standards
C/GP	Clean/Green Personnel
CAR	Cordillera Administrative Region
CBD	Central Business District
CBDM	Community-Based Disaster Management
CBO	Community Based Organization
CDCC	City Disaster Coordination Council
CDMC	Core Disaster Medical Center
CDPP	Calamities & Disaster Preparedness Plan
CFMS	Comptrollership & Financial Management Service
CFS	City Fire Station
CH	City Hall
CHB	Concrete Hollow Brick
CHED	Commission on Higher Education
CHO	City Health Officers
CLUP	Comprehensive Land Use Plan
CMP	Community Mortgage Plan
COA	Commission on Audit
CSSR	Collapsed Structure Search and Rescue
DAO	Disaster Action Officer
DBM	Department of Budget & Management
DCC	Disaster Coordination Council
DECS	Department of Education, Culture & Sports
DENR	Department of Environment and Natural Resources
DEO	District Engineering Office
DIG	Disaster Imagination Game
DILG	Department of Interior and Local Government
DMCC	Disaster Management Coordinating Council
DMH	Disaster Medical Hospitals
DND	Department of National Defense
DOC	Disaster Operations Center
DOCCP	Disaster Center Command Post
DOH	Department of Health
DOTC	Department of Transportation and Communications
DPD	Division of Preventable Disease
DPOS	Department of Public Order and Safety
DPWH	Department of Public Works and Highways

DSO	Directorate for Special Operation
DSWD	Department of Social Welfare and Development
DepEd	Department of Education
ED	Engineering Department
EDM	Earthquake Disaster Management
EMB	Environmental Management Bureau
EMI	Earthquake and Megacities Initiative
EMIP	Emergency Management Institute of the Philippines
EMS	Emergency Medical Service (or System)
EMSA	Emergency Medical Services Authority
EMT	Emergency Medical Treatment
ESC	Environmental Sanitation Center
EVF	East Valley Fault
FD	Fire Department
FEMA	Federal Emergency Management Agency; The United States of America
FS	Fire station
FT	Fire Truck
GDP	Gross Domestic Product
GESI	Global Earthquake Safety Initiative
GIS	Geographic Information System
GMR	Greater Manila Region
GOJ	Government of Japan
GOP	Government of Republic of the Philippines
GPS	Global Positioning System
HEMS	Health Emergency Management Staff
HLURB	Housing and Land use Regulatory Board
HUDCC	Housing and Urban Development Coordination Council
ICS	Incident Command System
ICTSI	International Container Terminal Services, Inc
ICU	Intensive Care Unit
IEC	Information and Education Campaign
IRA	Internal Revenue Allotment
JICA	Japan International Cooperation Agency
JMAI	Japan Methodological Agency Intensity
KI	Key Informants
LCE	Local Chief Executives
LDCC	Local Disaster Coordinating Committee
LGC	Local Government Code
LGU	Local Government Unit
LHP	Local Health Personnel
LLO	Legislative Liaison Office
LPG	Liquefied Petroleum Gas
LRT	Light Rail Transit
LWUA	Local Water Utilities Administration
MAYERT	Makati Youth Emergency Rescue Unit
MCDCC	Makati City Disaster Coordinating Council
MDCC	Municipal Disaster Coordination Council
MEC	Ministry of Education and Culture
MERALCO	Manila Electric Company
MERG	Manila Emergency Response Group
MFS	Municipality Fire Station
MICT	Manila International Container Terminal
MIS	Monitoring and Information
MMA	Metro Manila Authority
MMDA	Metropolitan Manila Development Authority
MMDCC	Metropolitan Manila Disaster Coordinating Council
MMDOC	Metro Manila Disaster Operations Center
MMEIRS	Metropolitan Manila Earthquake Impact Reduction Study

MMI	Modified Mercalli Intensity
MMUTIS	Metropolitan Manila Urban Transportation Integration Study (JICA)
MOA	Memorandum of Agreement
MRT	Metro Rail Transit
MRTC	Metropolitan Manila Transit Corporation
MSSD	Ministry of Social Services and Development
MSW	Marine Slipway
MWSS	Manila Waterworks and Sewerage System
NAIA	Ninoy Aquino International Airport
NAMRIA	National Mapping and Resource Information NAMRIA
NAPOCOR	National Power Corporation
NBCP	National Building Code of the Philippines
NCDA	National Civil Defense Administration
NCR	National Capital Region
NCRPO	National Capital Regional Police Office
NDCC	National Disaster Coordinating Council
NDMC	National Disaster Management Center
NEMA	National Emergency Management Association
NGO	Non-Governmental Organization
NHA	National Housing Authority
NHMFC	National Home Mortgage Finance Corporation
NPC	National Power Corporation
NS	Nurse Supervisor
NSCB	National Structure Code for Buildings
NSCP	National Structural Code of Philippines
NSO	National Statistics Office
NTC	National Telecommunications Commission
OCD	Office of Civil Defense
OPCEN	Operation center
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration
PAHO	Pan American Health Organization
PD	Presidential Decree
PEAC	Pre-Qualification, Evaluation and Awards Committee for Consultancy
PEIS	PHIVOLCS Earthquake Intensity Scale
PERR	Philippine Earthquake Reconnaissance Report
PFZ	Philippine Fault Zone
PGA	Peak Ground Acceleration
PGV	Peak Ground Velocity
PHA	Philippine Hospital Association
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PICE	Philippine Institute of Civil Engineering
PIO	Public Information Officer
PLDT	Philippine Long Distance Telephone Company
PNCC	Philippine National Construction Corporation
PNP	Philippine National Police
PNRC	Philippine National Red Cross
PPA	Philippine Ports Authority
PTSD	Post-traumatic Stress Disorder
RA	Republic Act
RB	Road Board
RC	Reinforced Concrete
RCDG	Reinforced Concrete Deck Girder
RES	Regional Equipment Services
ROD	Regional Operations Division
RQD	Rock Quality Designation
RROZ	Rescue & Relief Operation Zones
RS	Resident Survey
RVS	Rapid Visual Screening

S.W.M.O	Solid Waste Management Office
SARS	Severe Acute Respiratory Syndrome
SEAOC	Structural Engineers Association of California
SFS	Sub Fire Stations
SO	Surveillance Officer and RSI
SOP	Standard Operating Procedure
SPT	Standard Penetration Tests
SS	Strike Slip
SUMA	Supply Management Methodology
SWD	Solid Waste Department
TOT	Training of Trainers
UBC	Uniform Building Code
UHLP	Unified Home Lending Pregram
UNHCR	United Nations High Commissioner for Refugees
UN-OCHA	United Nations Office for the Coordination of Humanitarian Affairs
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator Projection
VCA	Vulnerability and Capacity Assessment
VFS	Valley Fault System
WB	World Bank
WHO	World Health Organization
WVF	West Valley Fault
WVFS	West Valley Fault System

Main Report 3

Part IV Understandings for Master Plan

-Systems and Planning related Components-

Chapter 16. Legal and Institutional Arrangements for Disaster Management

CHAPTER 16. LEGAL AND INSTITUTIONAL ARRANGEMENTS FOR DISASTER MANAGEMENT

16.1 Evaluation of the Current Disaster Management System

16.1.1 General Framework and Methodology

In reviewing the current disaster management system in Metropolitan Manila, MMEIRS gathered information through interviews with representatives of key organizations, questionnaires, major workshops, and review of documents including:

1) Existing and proposed legislation, regulations, and implementing memoranda at the national, regional, and city/municipal levels
2) All available disaster management plans at each level
3) Documentation and lessons learned from various exercises, workshops, and the 1990 Luzon earthquake
4) Previous published and unpublished academic studies and other assessments including the Global Earthquake Safety Initiative (GESI).

This information has been summarized in Chapter 10 of this report.

In addition to this review, the existing institutional and organizational capabilities of the MMDCC member agencies, LGUs, and their inter-institutional arrangements were assessed, employing two primary methods:

1) Conducting structured interviews with MMDCC agency representatives and LGU key officials, using a questionnaire
2) Analyzing the information and perceptions gathered through the structured interviews and feeding those insights into the design of a tabletop exercise.

16.1.2 The Capability Assessment

Assessing existing capability is a key step in the process of planning for the reduction of disaster impacts in Metropolitan Manila. The planning process is organized in such steps as:

- Studying the physical, social, political, economic environment (establishing the context)
- Hazard and vulnerability analysis (risk assessment)
- Capability assessment
- Plan development
- Plan adoption and implementation
- (Continuous) monitoring and evaluation and
- (Continuous) communicating and consulting

Capability assessment reviews the ability and capacity of governmental or other organizations to address hazards, i.e. to reduce, through mitigation and preparedness actions, the potential impacts of a hazard event. A comprehensive assessment reviews such factors as:

- Technical ability
- Financial resources
- Legal and institutional frameworks
- Political will[16-1]

The capability assessment has two basic components: inventory and analysis:

1) an inventory of an organization's mission, programs, and policies, and
2) an analysis of its capacity to carry them out.[16-2]

A comprehensive assessment can reveal constraints in regard to financial, material, and personnel resources; training needs; and the desirability of structural, institutional, and policy changes. In the context of the disaster management planning process, the capability assessment makes it easier to identify and evaluate recommendations and actions to strengthen the ability to reduce disaster impacts. It can also reveal barriers that could impede successful implementation of some types or kinds of mitigation actions.

The primary aim of the capability assessment component of the Study was to serve as a tool to reveal gaps in existing preparedness, response, and control mechanisms for dealing with hazard events. Research completed by the Study Team revealed some key issues or factors for coping with disaster impacts in Metropolitan Manila, as shown previously and in the following table.

[1] Adapted from Stickter, Steven, "The Caribbean Disaster Mitigation Project: Supporting Sustainable Responses to Natural Hazards," Organization of American States, undated.

[2] Federal Emergency Management Agency (FEMA), How-To Guide #3: Developing The Mitigation Plan; Identifying Mitigation Actions and Implementing Strategies, Version 1, April 2003.

Table 16.1.1 Assessment Matrix

	Key Factor	Criteria / Indicators
1	Legal Framework	Laws, implementing regulations, and enforcement mechanisms in place for risk reduction and preparedness
2	Institutional Framework	Degree of organizational development Clear roles and responsibilities of entities and recognition of those roles Recognition and respect for disaster management organizations Active inter-institutional mechanisms in place, e.g. committees
3	Emergency Planning	Existence and quality of emergency response plans and SOPs at every level and in each institution Up-to-date; periodically tested through drills and exercises Sets priorities and procedures for key functions, etc.
4	Decision-Making and Incident Command	Systems for situation assessment and command and control are functional Clarity regarding who is in charge
5	Inter-Institutional Coordination	Mechanisms are in place and actively coordinate among sectors and organizations Functional disaster operations centers Inter-organizational communications systems
6	Response and Recovery Capability	Capabilities of key institutions at all levels for response and relief Resilience of local communities and LGUs
7	Training and Capacity Building	Training programs in place for LGU disaster action officers, DCCs at various levels, national government institutions, etc.
8	Political Will	Incorporation of disaster risk management in the political value system Official statements, policies Formal decisions on risk reduction and planning High level programs for promoting risk management, preparedness, etc.
9	Leadership	Individual “champions” for disaster risk management influence others Actions to promote disaster risk management Active participation in studies, workshops, etc.
10	Policy Impact	Incorporation of risk assessments and disaster prevention measures in development plans Consideration of disaster risk in development and construction projects and land use plans
11	Public Education and Information	Partnerships with the media for public information campaigns Protocols for conveying emergency public information
12	Community Action and Participation	Community-based disaster management and mitigation programs active in the area Workshops or meetings promoting community action
13	Private Sector and NGO Participation	Presence of NGOs active in disaster management activities e.g. training and public education Participation of private sector entities in emergency planning, drills, etc.
14	Implementation of Risk Reduction and Prevention Measures	Evidence of mitigation actions, e.g. enforcement of building and fire codes, seismic-resistant construction, non-structural mitigation measures, back-up power for critical facilities, etc.

Therefore, the assessment was designed to provide the Study Team with further insights in regard to these factors.

16.1.3 The Interviews

The structured interviews were designed to elicit perceptions as well as factual information and, to some degree, to trigger self-assessment by the participants.

The interviews were guided by use of a questionnaire prepared in two versions, one for the member agencies of the MMDCC and another for the LGUs. Both covered internal organizational preparedness and capabilities as well as mechanisms for inter-agency coordination. The questions were intended to reveal information and perceptions relating to several key factors.

Upon completion of the interviews, the findings were analyzed and major points used as input into the design of a major tabletop exercise. The findings also served as the basis for the initial steps in development of several tools to strengthen disaster mitigation.

16.1.4 The Tabletop Exercise

A tabletop exercise was developed as the highlighted activity for the MMEIRS Second Workshop held on August 26, 2003. Jointly organized by MMDA, PHIVOLCS, and the Study Team, the Workshop was designed to help:

- Assess the impacts of a large earthquake in Metropolitan Manila and the capacity to respond
- Identify major problem areas and issues that will arise, and workable solutions, so we can take action to reduce these impacts before the real earthquake actually occurs

The following key factors from the Assessment Matrix were identified as primary areas of direct focus in the tabletop exercise, in order to complement the results of the interviews:

Decision-Making and Incident Command	- Systems for situation assessment and command and control are functional - Clarity regarding who is in charge
Inter-Institutional Coordination	- Mechanisms are in place and actively coordinate among sectors and organizations - Functional disaster operations centers - Inter-organizational communications systems
Emergency Public Information	- Partnerships with the media for public information dissemination - Protocols for conveying emergency public information

The tabletop exercise also offered insights into other key factors such as institutional framework, emergency planning, response capability, and leadership.

Participants were asked to participate actively, remain fully engaged throughout the exercise play, accept the situation described as real, and share information and solve problems as a team.

Group discussions of specific issues built up to developing group recommendations on mitigation and preparedness actions to be taken, based on the new earthquake scenario developed by MMEIRS. Participants were asked to develop recommendations in accordance with the following criteria:

- Be workable and realistic
- Recognize resource constraints
- Be based on each group's discussion of its assigned issues
- Be as clear and precise as possible, especially in regard to who should undertake them

These recommendations will serve as the primary input for developing the framework for the disaster management plan for Metropolitan Manila.

16.1.5 Capacity Building and Awareness Raising at the Second MMEIRS Workshop

The Second MMEIRS Workshop, held on August 26, 2003, from 8:00 a.m. until past 5:00 p.m. at the EDSA Shangri-La Hotel, attracted 192 participants. Centered on the theme "Earthquake Strikes Metropolitan Manila!" the program was designed as a highly participatory and interactive event, carried out largely in eight working groups. The event highlighted the general results of the technical studies completed to date through the project, with emphasis on the participants reaching a vivid understanding of the projected earthquake impacts. First, the earthquake damage scenario was presented both through GIS maps and through recitation of a narrative script. Then, participants completed a questionnaire on "Identification of earthquake risk for every participant" by noting their home and work locations and route on a base map then studying each of the hazard and risk maps and determining their personal level of risk given various risk factors by geographic area. This exercise was followed by the tabletop exercise described above.

A workshop evaluation form, completed by the majority of participants, indicated that the workshop contributed significantly to their level of awareness and understanding of earthquake risk. Participation in the group discussions provided an opportunity to learn of the plans, resources, and capabilities of other organizations and levels of government. The evaluations also indicated that the workshop strongly motivated most participants to engage more actively in home and family preparedness actions and also to become involved in earthquake disaster mitigation in their jobs. In addition to these general findings, the results of the participant evaluation have been compiled to reveal more detailed information regarding planned follow-up actions and activities at personal and organizational levels.

16.1.6 The Workshop on Earthquake Mitigation Checklist (Makati City)

In addition to the above activities and major workshop, two workshops were held with Makati City concerning the city's earthquake mitigation and emergency response preparedness. The first was a two-day workshop on September 25-26, 2003 at Makati City Hall. The workshop objectives were to:

- Identify the basic essentials necessary in earthquake disaster mitigation including inventory of resources
- Develop a systematic procedure how these essential requirements can be complied and implemented
- Utilize the exercise as a tool for participants to internalize the need to prepare for an earthquake disaster
- Develop a model workshop methodology applicable for other cities in Metro Manila

The workshop format involved self-evaluation by the participants of the City's status in regard to the following list of some basic requirements in preparation for an earthquake disaster:

1) Legal Framework
2) Local Policy on Earthquake Mitigation
3) Organization and Personnel
4) Definition of Roles and Responsibilities of offices and officials
5) Plans and Programs
6) Earthquake Disaster alert program
7) Earthquake Disaster Evacuation Plan
8) Earthquake Disaster Recovery Plan
9) Earthquake Disaster Management Reporting System
10) Earthquake Disaster Management and Information Technology
11) Earthquake Disaster Management Training Programs and Policies
12) Public Education and community awareness program on Earthquake
13) Manual on Earthquake Mitigation
14) Budget for Disaster Management
15) Earthquake Disaster Management Performance Audit
16) Community based Disaster Mitigation
17) Inter Local Disaster Cooperation agreement
18) Inventory of Disaster Tools
19) Inventory of City Resources

Following were the lessons learned from the workshop:

- It was the consensus expressed by the participants that the workshop was a functional experience for all of them.
- The workshop has high educational value to all concerned in disaster mitigation.
- The workshop exercise allowed the City of Makati to inventory what were the mitigation requirements that were already placed as well as those to be acted upon by the city government.
- Workshop exercise and the output produced will serve as a framework for the Master Plan of Makati City in Earthquake Mitigation.
- The workshop exercise is highly replicable in other cities in the National Capital Region which can be initiated by the mayors and the Disaster Coordinating Officers.
- Finally, it is important to note that the participants in the workshop were given instructions by the Mayor of Makati to continue the workshop until such time that a full blown framework for disaster mitigation of the city will be formulated.

16.1.7 Seminar-Workshop on Emergency Response

The second workshop with Makati City, held on November 13-14, 2003 at Makati City Hall, focused the City's continuing planning efforts initiated in the September workshop on the immediate concerns faced by the City regarding preparedness for response to sudden earthquake or other major disaster. The workshop purpose was to create a handy guide for local public officials on priority actions to be taken when an earthquake or other major emergency occurs.

The concept is that such a guide would fit in one's pocket and include such elements as:

- Key contact information
- Responsibilities of key officials
- Checklists of what to do
- Reporting instructions and formats

It would emphasize preparedness and immediate response operations presented in a simple-to-use format.

The primary intended users and beneficiaries of the pocket guide are:

- Mayors
- Disaster action officers
- City and barangay level Disaster Coordinating Council members

A "response operations manual or pocket guide" was identified by the respondents to a questionnaire at the MMEIRS Second Workshop (August 2003) as their top priority tool to enhance emergency preparedness and response.

The process to develop the guide was designed as follows. The pocket guide would be developed through interaction with the LGU officials who will use it, i.e. Makati City. The steps are:

1) Outline the key elements for the pocket guide.
2) Hold planning meeting to organize the workshop.
3) Hold the workshop (to be chaired by local officials) and make assignments to working groups.
4) The draft is compiled and reviewed, revisions are completed, and the guide is approved.
5) The City accepts and prints copies for its own needs.
6) MMDA/Study Team copies and circulates the guide to other key stakeholders and cities to adapt to their own needs.
7) Study Team includes the model guide as a component in its final report and website.

The contents of the Emergency Response Pocket Guide include the following elements, although it is recommended that users adapt the contents, adding and deleting sections as appropriate, to meet their own needs.

1) Table of contents
2) Emergency telephone information
3) Introduction
4) Operational priorities in case of emergency
5) Local organization for disaster management
6) Incident Command System (ICS) and command structure
7) Communications, alert and warning
8) Checklists of responsibilities and actions during disaster
9) Information checklist for decision-making during disaster
10) Situation and needs assessment
11) Disaster Operations Center (DOC)
12) Multi-agency coordination and mutual aid
13) Evacuation procedures
14) Medical aid and assistance
15) Emergency public information
16) Recovery
17) Employee emergency responsibilities
18) Employee preparedness
19) Public officials' emergency kit
20) Key provisions of the local ordinance or executive order

16.1.8 Development of Disaster Management Tools

Through its investigations of institutional and organizational capabilities of the MMDCC member agencies and LGUs, the Study Team identified a number of recommendations for improving the overall capabilities of disaster coordinating councils in Metropolitan Manila and for making them more functional. Among these recommendations were proposals for the development of several disaster management tools for the use of local governments and organizations. These tools include:

- Model city ordinance on disaster management
- Earthquake Mitigation Handbook
- Zonification proposal for the cities and municipalities
- Guide for Managing Information concerning Disasters
- Pocket Guide for Emergency Response
- Earthquake Mitigation and Response Checklists – Local Planning Guide

These tools have been discussed with many local stakeholders who have been quite supportive. The first three tools were presented at the Second MMEIRS Workshop, input was requested, and the participants' input was quite positive. The second two tools were developed specifically in response to recommendations made by the participants at the Second MMEIRS Workshop, and the last one was formulated to facilitate each local government's self-assessment in terms of mitigation and emergency preparedness checklists.

16.2 Legal Basis for Disaster Management

16.2.1 Existing Laws

As noted in Chapter 10, the overarching legal and policy framework for disaster management in the Philippines was established by Presidential Decree No. 1566, signed on June 11, 1978. This Presidential Decree has provided, ever since 1978, the operative legal basis and guidelines for the organizations and functions of all Disaster Coordinating Councils at each level of government: national, regional, provincial, city and municipal levels including the barangays.

Section 1 of PD 1566 defines that the state policy or the guidelines and principles in organizing the various levels of disaster councils in the country which are:

1) Self-reliance shall be developed by promoting and encouraging the spirit of self help and mutual assistance among the local officials and their constituents;
2) Each political and administrative subdivision of the country shall utilize all available resources in the area before asking for assistance from neighboring entities or high authority;

3) The primary responsibility rests on the government agencies in the affected areas in coordination with the people themselves;
4) It shall be the responsibility of all government departments, bureaus, agencies and instrumentalities to have documented plans of their emergency functions and activities;
5) Planning and operation shall also be done on the barangay level in an interagency, multi-sectoral basis to optimize the utilization of resources;
6) On the absence of duly constituted regional government, national government offices at the regional level shall be led and operationally controlled by the Regional Commissioner or the official so designated by the President;
7) Responsibility for leadership rests on the Provincial Governors, City Mayors, and Municipal Mayors, (and Barangay Chairmen), each according to his area of responsibility;
8) When an emergency affects an area covering several towns and cities, the city mayors and their personnel and facilities shall be placed under the operational control of the Provincial Governor for the duration of the emergency;
9) The national government exists to support the local governments. In time of emergencies and according to their level of assignment, all national government offices in the field shall support the operations of the local government; and
10) To ensure that operational activities become automatic and second nature to all concerned, exercises and periodic drills shall conducted to all levels, principally at the Barangays.

While PD No. 1566 is still in effect, the management of disasters as a function or responsibility of local governments was strengthened with the passage of the Local Government Code (RA 7160) in 1991. Specific provisions in the Code, particularly in the City, Municipal and Barangay Laws, actually empowered local governments to create or organize themselves into institutional mechanisms that will effectively counter disasters.

The cities under Section 558 (iv), are empowered to organize themselves for countering disasters. It states that cities shall:

"Adopt measures to protect the inhabitants of the city from the harmful effects of man-made or natural disasters and calamities, and to provide relief services and assistance for victims during and in the aftermath of said disasters or calamities and in their return to productive livelihood following said events;"

The municipalities likewise are empowered to do the same in Section 447 (iv).

"Adopt measures to protect the inhabitants of the municipality from the harmful effects of man-made or natural disasters and calamities, and to provide relief services and assistance for

victims during and in the aftermath of said disasters or calamities and in their return to productive livelihood following said events;"

The barangays at the same time also are authorized to organize themselves effectively as provided for under Section 389 (6) of the Local Government Code. It provides that Barangays shall:

"Organize and lead an emergency group whenever the same may be necessary for the maintenance of peace and order or on occasions of emergency or calamity within the barangay."

All these sections of the Local Government Code are operative in the National Capital Region as well as in all parts of the Philippines.

To strengthen further the overall capabilities of local governments to counter effectively disasters, RA 8185 was approved by Congress strengthening further the capabilities of local governments in disaster management.

16.2.2 Proposed Legislation

A number of proposed measures have been introduced in Congress. Some of these propose restructuring, others aim to strengthen community awareness and/or the capabilities of government and other agencies to prepare, respond, and reduce the impacts of disasters.

Proposed Measure	Date of Introduction	Title	Focus	Remarks	Status of Bill
Senate Bill No. 251	12th Congress First Regular Session	An Act Requiring the teaching of disaster awareness and disaster mitigation	An Act Requiring the teaching of disaster awareness and disaster mitigation as part of the curriculum of al primary and secondary schools in the country, and for other purposes	Integration of public administration and the science of disaster as recommended in Beijing China Conference in January 1997	First Reading Stage as of March, 2003. Referred to several standing committees in the Senate.
Senate Bill No. 1511	12th Congress First Regular Session	Comprehensive Disaster Management Act	An Act Creating the National Disaster Management Commission, defining its powers and functions, providing funds therefore and for other purposes	The Commission is empowered to formulate policy regarding disaster management, etc.	First Reading Stage as of March, 2003. Referred to several standing committees in the Senate.

Proposed Measure	Date of Introduction	Title	Focus	Remarks	Current Status of Bill
House Bill No. 221	12th Congress First Regular Session	The Philippine Disaster Preparedness and Prevention Act of 2001	An Act Streamlining and strengthening the Philippine disaster preparedness and prevention capability, appropriating funds therefore and for other purposes	Proposed Section 5 will rename the NDCC (Section 2, P.D. 1566) to NDMC.	First Reading Stage as of March, 2003. Referred to several standing committees in the House.
House Bill No, 680	12th Congress First Regular Session	An Act establishing a Disaster and Emergency Auxiliary Board	An Act establishing a Disaster and Emergency Auxiliary Board in every Barangay and appropriating funds therefore.	Board to ensure delay of service delivery emergency. Conduct training, etc.	First Reading Stage as of March, 2003. Referred to several standing committees in the House.
House Bill No. 886	12th Congress First Regular Session	Good Samaritan Act of 2001	An Act to promote and encourage the formation and operation of private nonprofit emergency rescue units	Improve mobility of rescuers in time of emergency	First Reading Stage as of March, 2003. Referred to several standing committees in the House.
House Bill No. 889	12th Congress First Regular Session	Act amending certain provisions of P.D. 1566	Amendment of Section 2, 5 and 6 all of P.D. 1566	See Sections 1, 2, and 3 of House Bill No. 889	First Reading Stage as of March, 2003. Referred to several standing committees in the House.
House Bill No. 1130	12th Congress	An Act requiring all telephone companies to install a hot line system	An Act requiring all telephone companies to install a hot line system for the use of law enforcement agencies and fire stations in the event of emergency and calamity	Installation of hot lines for use in disaster	First Reading Stage as of March, 2003. Referred to several standing committees in the House.

A bill once introduced in Congress undergoes several stages. The first stage is First Reading which merely introduces the bill on the floor by reading the title. The second stage is Second Reading, wherein the appropriate committee submits to the Floor the proposed bill for

debate/revisions. During Third Reading, the proposed Bill is submitted to the floor for legislative approval.

It may be surmised that generally speaking, Congress does not consider these bills as high priorities. All these bills will remain on First Reading stage unless the concerned agencies and other interested parties lobby for immediate congressional action. A certification by the President that these bills are urgent will trigger action on both chambers of Congress.

It must be noted that some of these proposed bills in both houses of Congress largely duplicate existing disaster agencies and their present functions. An example in this regard is Senate Bill No. 1511 which proposes to create a National Disaster Management Commission yet does not indicate what would be done with the existing National Disaster Coordinating Council (NDCC). However, several of the proposed bills aim to improve disaster preparedness and mitigation, such as Senate Bill No. 251 which aims to increase the consciousness of communities regarding disasters and their destructive consequences. Other such examples are House Bills No. 680, 886 and 1130, which propose to improve the overall capabilities of government and other agencies to respond much more effectively to disaster.

Perhaps most importantly, there is currently a significant effort on the part of the National Disaster Coordinating Council (NDCC) and its operational arm the Office of Civil Defense to develop an integrated, comprehensive disaster management act that would strengthen the Philippine disaster management capability at all levels of government and society. As presently conceived, this consensus-based proposal (titled An Act Strengthening the Philippine Disaster Management Capability, appropriating funds therefore and other purposes) would restructure and strengthen disaster management institutional structures, incorporating community-based, local, regional, and national entities. It would integrate disaster management in physical, social, economic, and environmental planning and development and tie disaster management to poverty alleviation and environmental protection. It would create local disaster management offices, a funding mechanism, and a system for accrediting community disaster volunteers. This effort to develop a consensus bill that reflects both local conditions and international thinking is most promising.

16.3 Review of Institutional Arrangements

16.3.1 General

The term “institutional arrangements” incorporates the networks of entities and organizations involved in planning and/or implementing disaster management programs and the linkages between organizations. These networks are generally supported by a staff entity that provides coordination. In the case of Metro Manila, the DCCs provide the mechanism for

inter-institutional networking among agencies of one city, municipality, or barangay, and the disaster action officers carry out day-to-day coordination. These institutional arrangements for disaster management in the Metropolitan Manila Area or the National Capital Region are multi-tiered organizations. These organizations are primarily characterized by the vertical functional relationships of each tier, i.e. regional, city, municipal and barangay levels.

The inter-regional or inter-local institutional arrangements of disaster coordinating councils in the county are still basically governed by the provisions of Presidential Decree 1566. The Presidential Decree, however, when necessary is now and then reinforced by the relevant laws in the Local Government Code which empower local authorities to make modifications of disaster coordinating councils if it serves a better purpose or even allow local authorities to create inter-regional institutional arrangements as authorized by the 1987 Constitution and the Local Government Code or Republic Act 7160. Nevertheless, the institutional arrangements or the structures of the local disaster councils were initiated some twenty years ago and no substantive changes have been made since then.

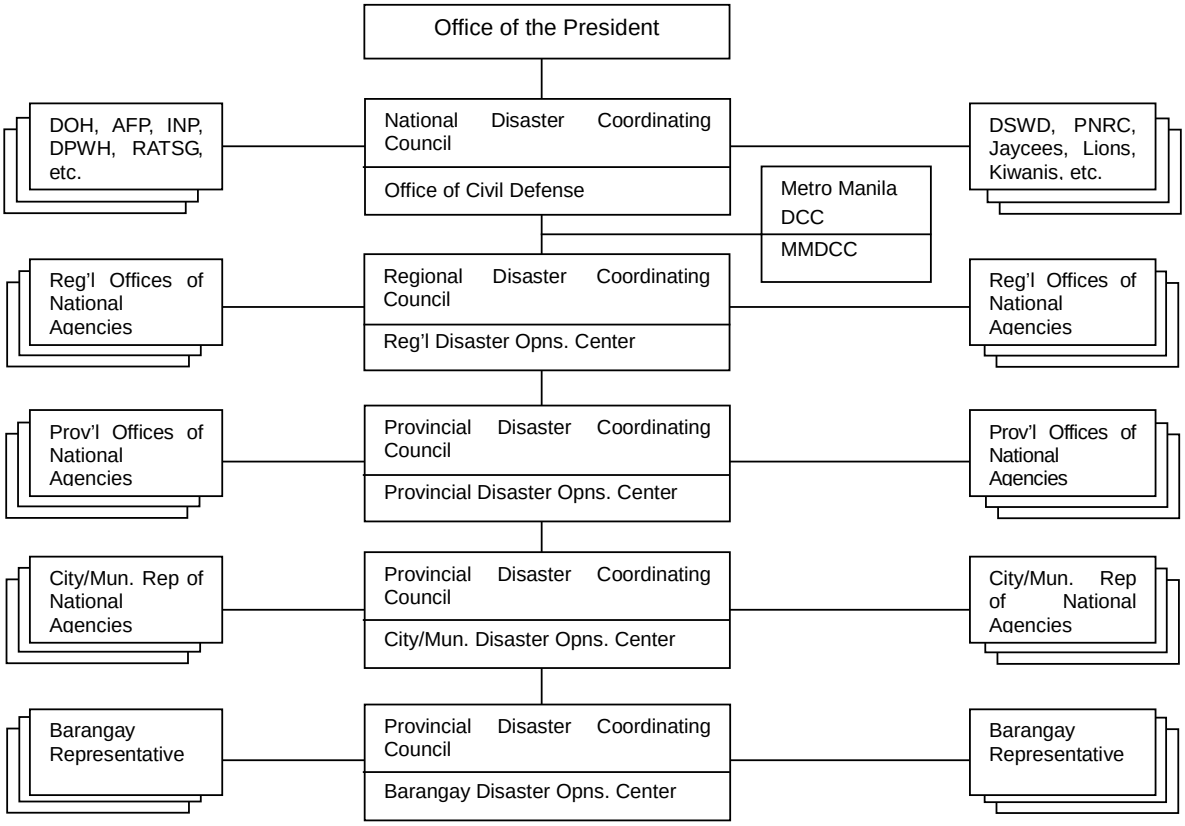


Figure 16.3.1 Organizational Chart of Institutional Arrangements

16.3.2 Disaster Coordinating Councils in Metropolitan Manila

Visits to the thirteen (13) cities and four (4) municipalities and selected Barangay Disaster Coordinating Councils in the National Capital Region showed that the existing simplistic council structures are still based on the 25-year-old legal framework provided by PD 1566. It would appear that most of the disaster councils do not have comprehensive and well-planned documents that spell out their holistic mandate.

Table 16.3.1 Institutional Strengths and Weaknesses

Sector	Strengths	Weaknesses	Remarks
1. Organizational Structure	Flexible enough to be reorganized for efficient operation	Obsolete structure – presently non-responsive to modern day problems	Internal rules and procedures of council operations absent – non-existing – should be formulated
2. Council Staff	Very trainable and can be professionalized	Lacking adequate orientation and training opportunities	Increase opportunities for participation in training courses on disaster management
3. Council funds for disasters	City Council can easily appropriate funds in case of emergencies	Calamity declaration was a precondition to actual expenditure of disaster funds	New law to clearly allow the pre-disaster expenditure is advisable

It is noted in the study that there is little or no regular communication between disaster coordinating councils and the legislative councils of cities and municipalities. Lateral consultations only occur during or immediately after an emergency situation. In like manner, the external communications of city disaster coordinating councils / municipal disaster coordinating councils with their lateral counterparts in neighboring or nearby cities and municipalities is seldom practiced. The only functional communications in many instances is vertical. That is upwards to Metro Manila Disaster Coordinating Council or downwards from Metro Manila Disaster Coordinating Council to the City Disaster Coordinating Councils and to Barangay Disaster Coordinating Councils.

The Metropolitan Manila Disaster Coordinating Council (MMDCC), like the city and municipal DCCs in Metro Manila, has no regular schedule of meetings and meets very irregularly. The most likely reason for this is their reactive character. Disasters that are really metro-wide like major fires or floods seldom occur, although floods are annual occurrences in several districts of Metro Manila. Moreover, DCC members are primarily engaged in the regular, ongoing activities of their

agencies, to which disaster-related activities are generally secondary. Also, in general, council members are designated by position rather than on the basis of their individual professional competence or interest in disaster mitigation or risk management.

Also, while the functions and responsibilities of the member agencies of the City/Municipal Disaster Coordinating Councils are defined on paper, there are few if any examples of detailed manuals or Standard Operating Procedures (SOPs) to guide staff in effectively carrying out specific disaster-related responsibilities. Nevertheless, it has been reported that three (Caloocan, Marikina and Muntinlupa) of the 13 cities in Metro Manila has been evaluated by the DILG-NCR Office as highly performing in disaster preparedness. See Organization Chart (Figure 16.3.2 and Figure 16.3.3) for representative local DCC organizations.

Several variables can trigger some DCCs to take initiatives to improve their overall capacities to respond to disasters. DILG-NCR surmised that among these are:

- Leadership of the Mayor

  If the Local Chief Executive takes the lead, the Disaster Coordinating Council can be made more functional and active, with funding for DCC operations coming from the budget of the Mayor.
- Availability of funds

  Some cities, like Makati or Manila, may more easily provide funds for DCC plans and programs as compared to some other towns with fewer resources.
- Opportunities for cooperation with academic or technical institutions

  The City of Muntinlupa through its initiative has ongoing cooperation with the Tokyo Institute of Technology through which the city has compiled a database on hazards and potential vulnerabilities.
- Awareness of local hazardousness

  The city's awareness as to its position in relation to an earthquake fault like the Valley (formerly identified as Marikina) fault system can trigger more concern on the part of city officials to prepare for disasters.
- Instructions from higher authorities

  At times certain cities or provinces are instructed by the President to prepare contingency plans in anticipation of a crisis or disaster. This is usually done after a crisis or emergency happened in nearby localities.

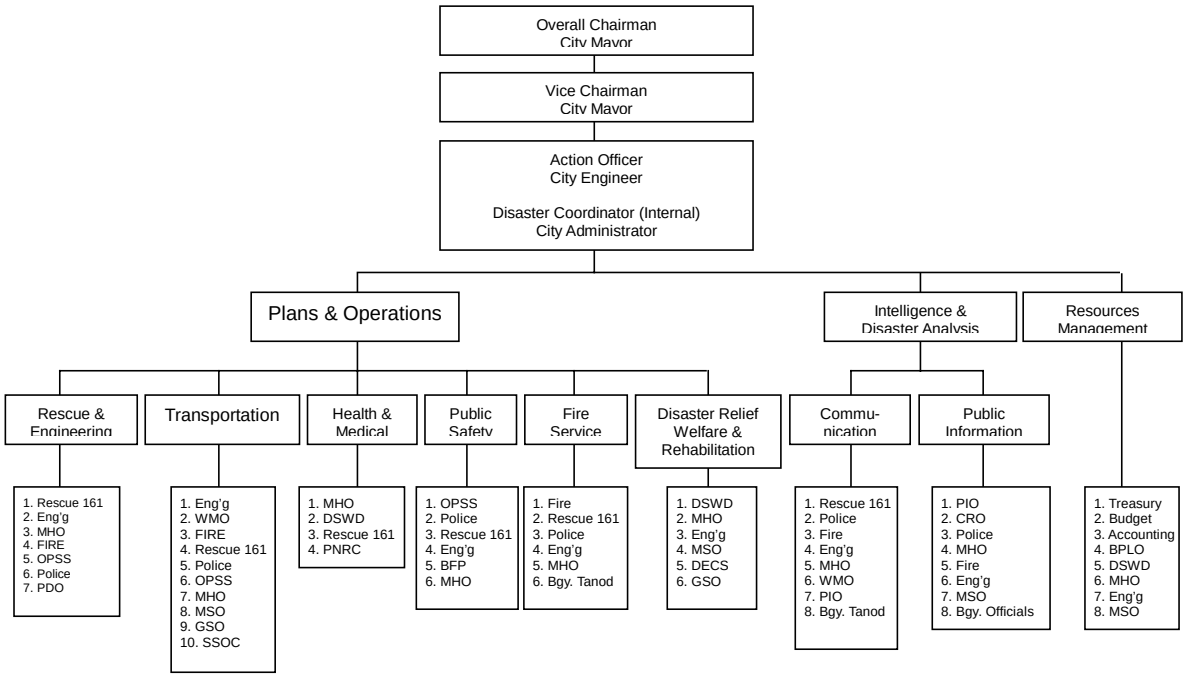


Figure 16.3.2 Organizational Chart of a City Disaster Coordinating Council, Marikina Disaster Coordinating Council

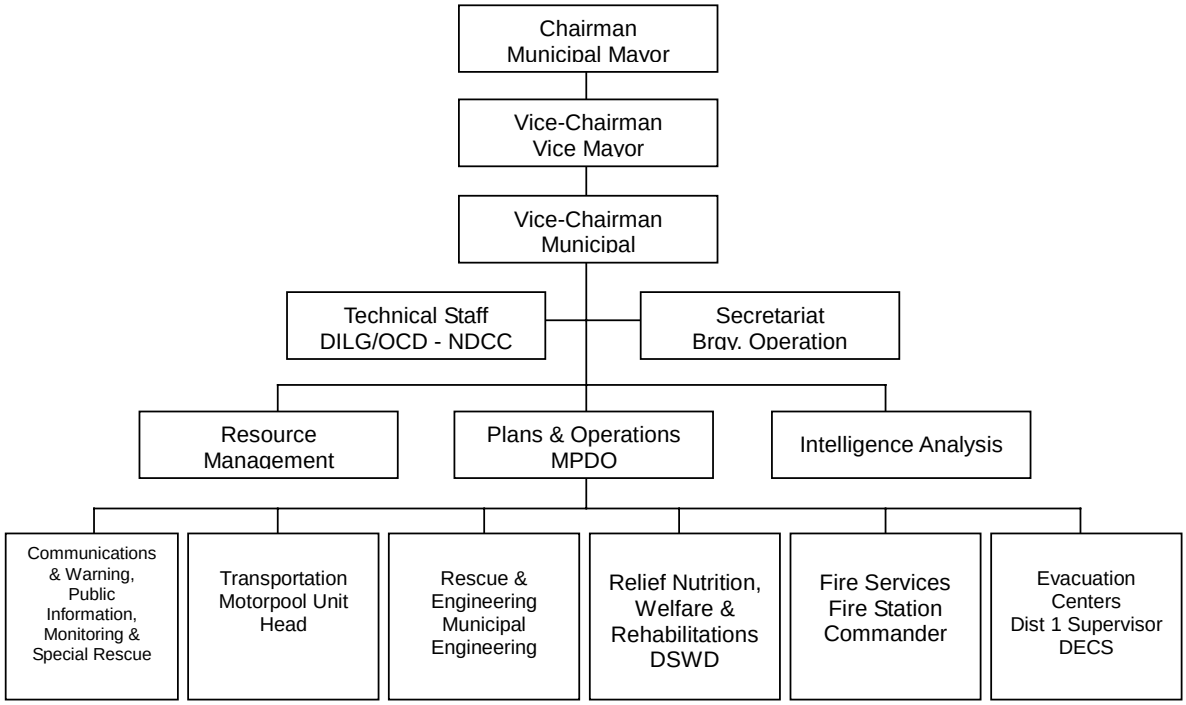


Figure 16.3.3 Organizational Chart of a Municipal Disaster Coordinating Council, Navotas Disaster Coordinating Council

16.4 An Analysis of the Metropolitan Manila Disaster Coordinating Council

Interviews with key members of the Metropolitan Manila Disaster Coordinating Council revealed the following impressions and views regarding their agencies as resource institutions for the MMDCC and the functionality of the MMDCC.

Table 16.4.1 Member Agencies as Resource Institutions for Disaster Management and their impressions of the Functionality of the MMDCC (Department of Budget and Management--DBM)

MMDCC Member agencies	Resource Center for: (functions related to disaster mitigation)	Agency Directors Impressions of the Functionality of the MMDCC	Agency Functions	Recommended Measures to improve overall capability of MMDCC	Agency Directors Position on Zonification Plan	Remarks
D B M	Authority for the use of calamity fund prior to disaster under joint DBM-DILG Memorandum Circular No. 2003-1 Release of Internal Revenue Allotment (IRA) to Metropolitan Manila local governments	Not very clear of its existence nor purpose MMDCC called a meeting only once	Release of IRA to local governments in Metropolitan Manila Review of the budgets of local governments	Advise its members of its major functions Provide guidelines of its overall program	Open to the proposal of zonification	Regional office currently involved in the Rationalization Program or Institutional Strengthening. There is the amount of P700 Million as countrywide calamity fund provided for in the General Appropriations Act of 2003.

Table 16.4.2 MMDCC Member Agencies as Resource Institutions for Disaster Management and their impressions of the Functionality of the MMDCC (Department of Education, Culture & Sports -- DECS)

MMDCC Member agencies	Resource Center for: (functions related to disaster mitigation)	Agency Directors Impressions of the Functionality of the MMDCC	Agency Functions	Recommended Measures to improve overall capability of MMDCC	Agency Directors Position on Zonification Plan	Remarks
D E C S	Public education and information dissemination on disaster mitigation Uses of public schools as evacuation centers Public school teachers as disaster mitigation workers	MMDCC non-functional MMDCC members seldom meet More socializing than discussion of serious subjects MMDCC duplication of DECS work in disaster mitigation	Provision of public education Management of schools and its facilities Supervise public school teachers Develop curricula on education Develop sports consciousness among students	Revitalize council and task member agencies with specific roles Develop program of action Chairman of MMDCC should be dynamic, who shows genuine interest in disaster mitigation	Non committal	The DECS easily has the most number of employees in the NCR compared with the other MMDCC member agencies. However, the public school teachers complain of constantly being over worked due to their many extra curricular activities.

Table 16.4.3 MMDCC Member Agencies as Resource Institutions for Disaster Management and their impressions of the Functionality of the MMDCC (Department of Interior and Local Government -- DILG)

MMDCC Member agencies	Resource Center for: (functions related to disaster mitigation)	Agency Directors Impressions of the Functionality of the MMDCC	Agency Functions	Recommended Measures to improve overall capability of MMDCC	Agency Directors Position on Zonification Plan	Remarks
D I L G	Capability to mobilize local governments in case of disaster, including mobilization of barangays Maintains some 250 field personnel in all local governments in NCR Exert influence and supervise local governments Has control over the fire and police services	MMDCC seldom convenes meetings MMDCC lacks concrete agenda of action in the area of disaster mitigation Overall capabilities weak	Monitor performance of local governments Provide information resource to the local government and public Provide protective services for fire and police Perform developmental roles at local level	MMDCC should meet regularly Formulate a program of action indicating sectoral roles of member agencies Upgrade overall capabilities	Open to the proposal	There is actually turf issue between DILG Regional Office in NCR and MMDA which causes friction prejudicing the participation of DILG in the MMDCC

Table 16.4.4 MDCC Member Agencies as Resource Institutions for Disaster Management and their impressions of the Functionality of the MMDCC (Department of Health -- DOH)

MMDCC Member agencies	Resource Center for: (functions related to disaster mitigation)	Agency Directors Impressions of the Functionality of the MMDCC	Agency Functions	Recommended Measures to improve overall capability of MMDCC	Agency Directors Position on Zonification Plan	Remarks
D O H	Issues warning to public on health hazards during an emergency Directly provides health services to the community Organizes, reaction teams to counter disaster Organize disaster control groups providing various health services Activate the Health Emergency Management Service (HEMS) during emergency Coordinate and monitor health facilities in the four districts of Metropolitan Manila during a disaster or emergency	DOH (NCR) deals more with NDCC and local governments rather than MMDCC MMDCC do not regularly meet It has no clout, it is non-functional council Council not visible	Organize disaster control groups Provide health services to support disaster coordinating councils during emergencies Organize reaction teams i.e. medical-sanitary personnel Provide DOH Alert System for public notice Dispatch Rapid Assessment Teams to disaster sites	Define MMDCC functional relationship with NDCC Meet its members regularly Formulate an action plan for the MMDCC to implement with the participation of its members	Open to the proposal	Because of the MMEIRS, the HEMS is now strengthening its institutional networking with all government and private agencies in MMA which are involved in disaster mitigation. Networking continues. MMA is divided into four sub-districts which has a total of 47 hospitals in the NCR

Table 16.4.5 MMDCC Member Agencies as Resource Institutions for Disaster Management and their impressions of the Functionality of the MMDCC (Department of Public Works and Highways -- DPWH)

MMDCC Member agencies	Resource Center for: (functions related to disaster mitigation)	Agency Directors Impressions of the Functionality of the MMDCC	Agency Functions	Recommended Measures to improve overall capability of MMDCC	Agency Directors Position on Zonification Plan	Remarks
DPWH	Planning/identification of alternative roads in case of disaster and emergency Provide equipment where/when necessary Some 3,000 field personnel available – works 24 hours a day during calamities	MMDCC functions needs to be reviewed MMDCC should have regular meetings Vertical/lateral coordination among MMDCC members/local governments necessary	Construction and maintenance of national roads in NCR including the maintenance of 12 vital bridges that connects Northern Manila to Southern Manila across the Pasig River	Update functions in the light of increasing needs to respond effectively to disaster Train more personnel on disaster mitigation/involve the communities in planning for disaster Inventory of available resources i.e. equipment, funds and personnel Mobilize public/private resources for disaster mitigation	Open to the proposal	The maintenance and modernization of equipment very limited due to budgetary limitations. Next year (2004) maintenance of DPWH equipment is planned to be privatized.

Table 16.4.6 MDCC Member Agencies as Resource Institutions for Disaster Management and their impressions of the Functionality of the MMDCC (Department of Social Welfare and Development -- DSWD)

MMDCC Member agencies	Resource Center for: (functions related to disaster mitigation)	Agency Directors Impressions of the Functionality of the MMDCC	Agency Functions	Recommended Measures to improve overall capability of MMDCC	Agency Directors Position on Zonification Plan	Remarks
DSWD	Organize a Daily Disaster Team of five (5) Health Specialists (Monday to Sunday) Organize a Crisis Intervention Unit operating 24 hours a day Maintain stand by fund of P300,000 for disaster stockpile of 1,000 food pack every month for emergencies	MMDCC should reconstitute its membership Members are nominal since they have no power to vote	Provide relief goods during an emergency Activate regional office emergency teams for disasters Train community workers under the supervision of DSWD	Review legal framework of MMDCC Reconstitute council members Reactivate council with an annual action plan	Open to zonification proposal	DSWD (NCR) is continuously developing its overall capabilities for disaster. It is improving its anticipatory capabilities to counter disaster It is interested to know the results of MMEIRS and use it for more intensive disaster planning. Regional office fully decentralized with 580 personnel Local government is focal point of DSWD coordination with other sectoral agencies

Table 16.4.7 MMDCC Member Agencies as Resource institutions for Disaster Management and their impressions of the Functionality of the MMDCC (Office of Civil Defense -- OCD)

MMDCC Member agencies	Resource Center for: (functions related to disaster mitigation)	Agency Directors Impressions of the Functionality of the MMDCC	Agency Functions	Recommended Measures to improve overall capability of MMDCC	Agency Directors Position on Zonification Plan	Remarks
OCD	Central coordination of disaster mitigation plans/activities in MMDA Provide policy guidance for disaster mitigation planning. Formulate and disseminate manual and other information materials	MMDCC overshadowed by OCD due to proximity of the latter in the Metropolitan Manila Area. Operating with difficulties within the framework of PD 1566 which needs to be revised Power to coordinate very weak	Central coordination of disaster mitigation plans/activities in MMDA Provide policy guidance for disaster mitigation planning. Formulate and disseminate manual and other information materials	Congress should approve H.B. 889 MMDCC to formulate an annual plans and programs MMDCC should meet regularly Improve its information based power and data bank	Open to the proposal	OCD is working closely with Emergency Management Institute of the Philippine (EMIP) in the conduct of regular training courses on disaster management OCD is the focal agency of the National Government in the coordination of countrywide disaster mitigation strategies and their implementation

Table 16.4.8 MMDCC Member Agencies as Resource institutions for Disaster Management and their impressions of the Functionality of the MMDCC (Philippine National Red Cross -- PNRC)

MMDCC Member agencies	Resource Center for: (functions related to disaster mitigation)	Agency Directors Impressions of the Functionality of the MMDCC	Agency Functions	Recommended Measures to improve overall capability of MMDCC	Agency Directors Position on Zonification Plan	Remarks
PNRC (created under R.A. 95)	Blood banking Community health and nursing services Safety services Social services Volunteer services	Interviewee did not volunteer his impression of the functionality of MMDCC	Blood bank facilities Disaster mitigation community health, safety and social services Red Cross Youth Program Volunteer Program	Improve the rescue and evacuation capabilities of MMDCC Expand its capability to mobilize resources Provide training opportunities for disaster workers/ volunteers	Open to the proposal	PNRC is the only NGO member of the MMDCC In addition to its six regular services, it also constructs small infrastructure, i.e. water supply, foot path, bridges, health and education facilities, all are foreign funded. PNRC is 58 years old.

16.4.1 Key Informants' Impressions of the MMDCC

Key information from the eight critically sensitive member agencies of the MMDCC whose directors were interviewed as to their impressions and personal evaluation of the functionality of the MMDCC is herewith capsulized and summarized in seven items, which are as follows:

1) There is a consensus among those interviewed that the MMDCC has not had, for some time, regular meetings of its members, and it was likewise a common observation that in one or two times that they met, there was no specific agenda item concerning how the regional council can improve its capabilities to counter disaster effectively.
2) It was articulated that the responsibilities of the members need to be redefined in order to determine accountability as to who will do what and under what circumstances in the event that disaster will occur.
3) Some member agencies articulated the need to be empowered since they feel that they are minimal members without even the power to vote as the MMDCC continues to make decisions on disaster management in the NCR.
4) It is the impression of the majority of those interviewed that the Office of Civil Defense, because of its proximity to the venue of MMDCC, continues to overshadow the regional councils for disaster in the Metropolitan Manila Area. Because the OCD highly towers over the MMDCC, the visibility of the latter is minimal not only to the member agencies of the regional council but to the "publics" of NCR.
5) This situation, however, has some political tone insofar as the central government is concerned as they made decisions for the NCR during a disaster or an emergency.
6) Directors expressed the need to review the functionality of the MMDCC in its downward or vertical relationships with the lower disaster coordinating councils such as those of the cities and municipalities in the Metropolitan Manila Area.
7) The functionality of the MMDCC is likewise perceived as being greatly affected by inadequate funds at its command or the non availability of the necessary equipment or management tools that can give this regional institution a highly credible rating as to its potential performance in the event of disasters.

16.5 Evaluation of the City Disaster Coordinating Councils and the Municipal Disaster Coordinating Councils

A study of the overall capabilities of the city and municipal disaster coordinating councils shows an extreme of high and very low level of capabilities among CDCCs and MDCCs. In large cities where the city budgets are high, the overall capabilities of disaster councils to respond to disasters or emergencies are highly visible. This is manifested in the equipment that these cities have, the regularity of training courses on disaster mitigation conducted and some publications on disaster

mitigation the cities have published as well as the impressionistic evaluation of the disaster coordinating officers' ability to articulate their programs and activities as well as their perceptions of their work in disaster mitigation.

In low income municipalities, which are at the other end of the spectrum, the municipalities have very limited capacities to respond to disasters since their resources are very limited. It will be noted that one of the variables to consider in evaluating the overall effectiveness of disaster council is the level of resources available to local governments. Please find in Table I the Operating Budget of the 13 cities and 4 municipalities in NCR for the year 2003 including the 5% Calamity Funds for the same year.

Another factor in the evaluation of the effectiveness of the local disaster councils in the NCR is the political leadership, specifically the mayors. Their individual perceptions insofar as response to disaster is concerned are critical. Several mayors in the NCR are proactive in their stance towards mitigating disasters, including earthquakes. It is observed that most political leaders in the NCR are not inclined to make investments for projects which are "invisible" in character such as preparing for a disaster that has yet to occur.

The other factor which influences strongly the local officials' position towards a proactive position or outlook to disaster mitigation is the environmental or the physical factor. Areas in the NCR which are flood prone are the municipalities of Pateros-Taguig area, the Caloocan-Malabon-Navotas sector in the north of NCR as well as other barangays located in the isolated parts of Quezon City and in the low laying areas of Manila and Mandaluyong Cities. And yet in this matter, the internalization by local officials of proactive policies to mitigate disaster in these areas mentioned is still at the minimal level.

Most cities as well as municipalities do not have substantive ordinances on disaster mitigation which should function as the legal framework that will motivate cities and municipalities to prepare proactively for emergencies. The existing executive orders and resolutions supporting disaster mitigation are at least four years old and need updating and revision. While the relationships of CDCCs and MDCCs with their respective barangay disaster councils or disaster committees are well established, there is still a strong need to strengthen the functional and vertical relationship between CDCCs and MDCCs on one hand and the BDCCs on the other.

16.5.1 City and Municipality Funding

The marginal financial viability of the Disaster Coordinating Councils is a major handicap in attaining overall disaster management capability. Their funding hinges primarily on two sources:

1) The 5% calamity fund from local budgets
2) P800 Million provided as national calamity fund in the General Appropriations Act of 2003

which is designed to augment local funds for disaster from the national coffers.

By law there is a 5% calamity fund made available for disasters from out of the total city budget appropriations. Based on their city/municipal annual budgets for fiscal year 2003 the 5% calamity fund amounts in cities and municipalities in the National Capital Region were:

Table 16.5.1 2003 Total Budget of NCR Cities and Municipalities

Cities/Municipalities	2003 Total Budget	5% of the Total Budget Representing the Calamity Funds of Cities and Municipalities
1. Manila	5,835,000,000.00	291,750,000.00
2. Quezon City	5,200,000,000.00	260,000,000.00
3. Makati City	4,735,584,330.00	236,779,216.50
4. Pasig City	3,000,000,000.00	150,000,000.00
5. Calookan City	1,970,039,746.00	98,501,987.30
6. Parañaque City	1,656,565,000.00	82,828,250.00
7. Mandaluyong City	1,563,179,812.00	78,158,990.60
8. Pasay City	1,370,506,948.00	68,525,347.40
9. Muntinlupa City	1,119,037,738.00	55,951,886.90
10. Valenzuela	1,003,379,573.00	50,168,978.65
11. Marikina City	907,933,587.00	45,396,679.35
12. Las Piñas City	903,831,164.20	45,191,558.21
13. San Juan	788,848,810.52	39,442,440.53
14. Taguig	695,943,000.00	34,797,150.00
15. Malabon City	460,445,169.00	23,022,258.45
16. Navotas	310,523,050.00	15,526,152.50
17. Pateros	78,295,112.00	3,914,755.60
TOTAL	**31,599,113,039.72**	**1,579,955,651.99**

Amounts - information sourced from Department of Budget and Management (DBM) Regional Office, National Capital Region (NCR).

In addition, in the General Appropriations Act of 2003 (Special Purpose Fund), an amount of 800 Million Pesos is provided as calamity fund for the whole country which includes the Metro Manila area.

16.6 The Barangay Disaster Coordinating Councils: From Paper Tiger to Working Kittens

There are 1,693 barangays in Metropolitan Manila. Manila has 897 of this total number of barangays or 52.98% while Caloocan has 11.10% or 188 barangays. Quezon City ranks third in the number of barangays - 142 or 8.38%. All the other remaining barangays are distributed in the four municipalities and the other ten cities in the National Capital Region.

A comparative study was made of selected barangays in three large cities of Manila, Makati and Quezon, and in the small municipalities of Navotas and Taguig. Barangays in Pasig were

likewise studied, Pasig representing a medium size city in Metropolitan Manila.
The study has led to the conclusion that still a majority of the BDCCs in Metropolitan Manila are "paper" organizations. While there are persons staffing the BDCCs, they urgently need basic training on disaster mitigation. BDCC members have to be "educated" of their responsibilities and tasks and need to be properly equipped to counter disasters effectively. It must be borne in mind that these general barangay profiles more or less reflect the strengths and weaknesses of the BDCCs in Metropolitan Manila. Any significant differences or deviations in the barangay profiles are more the exceptions rather than the rule.

Transforming the BDCCs into capable and functional community based disaster mitigating organizations will require not only the initiatives of CDCCs and MDCCs, but the sustained efforts of the BDCC chairmen as well.

Financial resources of cities and municipalities will have to be mobilized and utilized in this effort. Personnel development of BDCC members should be a priority. Where appropriate and necessary legal measures such as adopting an ordinance on disaster mitigation requiring the training of BDCC members to be mandatory can be an alternative to fast track the BDCC capability building requirements.

Modernizing the BDCCs as community-based institutions is an imperative in solving present day problems. Moreover, modernization will push up the BDCCs from being "paper tigers" to the level of "working kittens" [16-3] to say the least.

All these recommended measures as to how to capacitate BDCCs will most likely succeed and work if these measures are packaged into an integrated capability building strategy. However, in capacitating BDCCs, all concerned in these efforts should also be guided by the philosophy advocated in Section 1(a) of PD 1566, which reads:

"Self-reliance shall be developed by promoting and encouraging the spirit of self-help and mutual assistance among the local officials and their constituents."

[16-3] BDCCs as paper tigers are nonfunctional. "Working kittens" is used as a figure of speech referring that at least a kitten can catch a mouse.

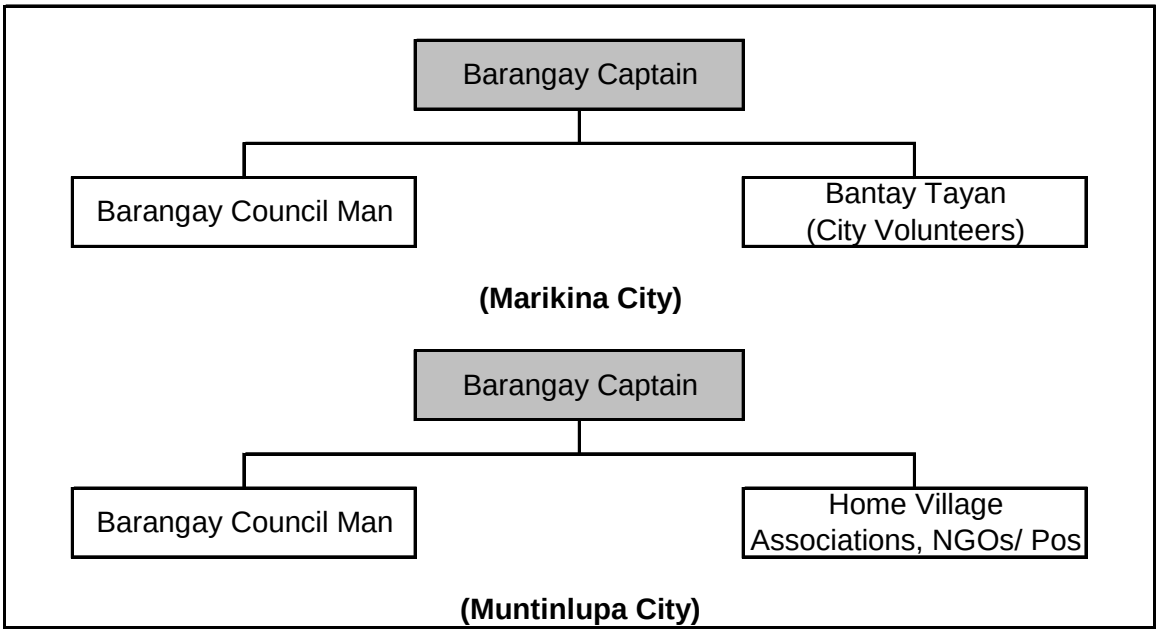


Figure 16.6.1 Organizational Charts of Two Typical Barangay Disaster Coordinating Councils

16.7 Current Disaster Management Program Initiatives

16.7.1 NDCC's National Committees

In adopting a comprehensive emergency management framework comprised of pre-event mitigation and preparedness and post-event response and rehabilitation, in July 2002 the NDCC established four National Committees with several Subcommittees to undertake various duties and responsibilities aimed at enhancing the national disaster management system. Committee assignments cover taskings in the following broad areas:

Name of Committee	Committee Chaired By	Focus
National Committee on Disaster Mitigation	Department of Environment and Natural Resources (DENR)	Legislation Codes and Regulations Insurance Structural Measures
National Committee on Disaster Preparedness	Department of Interior and Local Government (DILG)	Plans Information Resources Education and Training
National Committee on Disaster Response	Department of Social Welfare and Development (DSWD)	Alerts Notification Consequence Management
National Committee on Disaster Rehabilitation	Department of Public Works and Housing (DPWH)	Funding Loans and Grants Emergency Assistance

These committees are engaged in significant tasks, the outputs of which can result in major improvements to the disaster management system of the Philippines. For instance, the Mitigation Committee is tasked with the formulation of a disaster mitigation program and preparation of a draft bill to amend existing laws and implement the new policy and disaster mitigation program. The Preparedness Committee is to develop national contingency plans for various hazards including earthquake and fire, and to formulate or update planning guidelines and SOPs.

16.7.2 Other Initiatives

Additional NDCC initiatives are the development of the NDCC Incident Command System to provide the means for command, control, and coordination of multi-agency response operations, and the development of the NDCC Preparedness Center for housing disaster response equipment, stockpiling goods, and development of a proposed Collapsed Structure Search and Rescue (CSSR) Training Facility.

16.8 Training and Capacity Building Programs

In Metro Manila, as in other urban areas of the world, the prevalent cultural and psychological frame of mind in both government and civil society does not force people to give priority to internalizing earthquake as an immediate possibility. More typically earthquakes are viewed as a remote possibility now or in the near future. In view of this, public awareness and education including periodic drills and training on what to do during an earthquake are necessary to provide some degree of earthquake protection. Such drills and exercises involving schools, students and others have been undertaken by cities like Caloocan, Marikina, Muntinlupa and Navotas.

Coordination with the private sector and the utilization of external technology are other strategies for disaster coordinating councils to improve overall capacity to respond to crises or emergencies.

Various other public information and education programs have been implemented, particularly by PHIVOLCS, NDCC/OCD, and NGOs active in the Metro Manila area. A public awareness campaign has been active since 1988, when President Corazon C. Aquino, through Proclamation No. 296 dated July 29, 1988, declared the first week of July of every year as Natural Disaster Consciousness Week to be observed by schools and communities throughout the country, under the lead of the NDCC and regional and local DCCs.

The responsibility for conducting training for members of DCCs is shared by DILG with OCD, the Ministry of Social Services and Development (MSSD), the Philippine National Red Cross (PNRC), and other appropriate agencies. Additionally, the Ministry of Education and Culture (MEC) is to integrate hazard and disaster information into school curricula, and the Ministry of Trade and Industry is responsible for training disaster control groups or reaction teams in large

commercial buildings. All agencies are responsible for conducting drills and exercises of their own disaster control groups, with the assistance of OCD.

The Emergency Management Institute of the Philippines has a critical role to play in capacity building. This institute is the research and training arm of the National Disaster Coordinating Council. While the Emergency Management Institute has not provided so far training opportunities to the MMDA staff and Disaster Coordinating Councils for the NCR, it is considering providing training opportunities for NCR Disaster Coordinating Council members and staff in the current year.

Training modules of one week period each for participants from the Metro Manila are the Basic Disaster Management Course and the Advanced Disaster Management Course. The basic course consists of theories on crisis management and the integrated approach to disaster management and impact assessment. The advanced course is based more on the case study approach. However, most case studies used so far are British case studies.

These courses are jointly managed by the Emergency Management Institute staff with National Disaster Coordinating Council on one hand and the Disaster Management Center of Cranfield University in the United Kingdom. These are ongoing courses which are being coordinated by the British Embassy in Manila.

A similar course which can also be useful for Metro Manila Disaster Coordinating Councils is the course on cyber terrorism, postal chemical and biological incidents. These courses are part of a country anti-terrorism assistance program of the United States State Department.

Representatives from Metro Manila Disaster Coordinating Council and the Disaster Coordinating Councils of cities and municipalities have not participated in the two training courses offered by United States and United Kingdom. However, the participation of Metro Manila Disaster Coordinating Councils and selected member of the Disaster Coordinating Councils in the National Capital Region was programmed by the Emergency Management Institute during 2003 after the study team made representations in the National Defense College of the Philippines to include Metro Manila participants.

16.9 Strengthening Disaster Management Systems, Institutions, and Capabilities

16.9.1 Enhancing Institutional Arrangements

International experience has shown that inter-institutional arrangements are increasingly being based on a total risk management approach rather than an earlier model built primarily to provide response and relief services. Committees and councils that are active year-round, instead of only

when disaster threatens or arrives, function better when faced with crises. And participation by various sectors within and outside the government leads to decisions based on combined wisdom and an interactive process.

Because DCC functions and structures are based on an obsolete decree not responsive to the needs and requirements of present day disaster management and planning, there is a need to review the organization of the councils in order to identify ways to improve their predictive or proactive capabilities.

New legislation may also be needed to revitalize as well as professionalize the local disaster coordinating councils thereby allow them to formulate their respective disaster management plans and programs which are holistic, current and proactive in character.

The membership of the local disaster coordinating councils as defined in Presidential Decree 1566 should be reconsidered. Analysis of government agencies represented in the councils does not predict the full development of competent staff in disaster management and planning for the simple reason that most members in the councils consider their Disaster Coordinating Council's responsibilities an additional burden to their core work in their respective offices. Moreover, the prevailing view toward disasters may tend to be reactive rather than proactive, and there are limited opportunities for training and education to enhance their professionalization as disaster mitigation officers.

Initial studies and interviews indicate a general consensus on the need for training and other resources to upgrade the capacities and competencies of Disaster Coordinating Councils at the barangay, municipal and city levels in order to ensure the most effective performance of their tasks in times of crisis and emergency. Ongoing vertical coordination between the sub-regional Disaster Coordinating Councils and the Metro Manila Disaster Coordinating Council can also be strengthened, as well as the lateral relationships between Disaster Coordinating Councils and inter-city disaster planning cooperation.

16.9.2 Institutionalizing Disaster Risk Management

Cities are the key level in earthquake response. And in a major earthquake, the national level will step in and play an active role, in addition to the inter-city coordination role of the MMDCC. The MMDA is currently building emergency response capability through the training of staff recently transferred from DPWH to the Public Safety component of MMDA. The MMDA Chair has asked these operational forces, who previously focused on flood, to focus on roadside emergencies. The intent is to develop the capability of the MMDA rescue teams to respond to roadside emergencies, and then develop the capabilities of the LGUs to be the key for other forms of emergency, with MMDA forces acting as second line, not first responders. Therefore, the plans, procedures, and

capabilities of other agencies and LGUs must be fortified. MMDA and the MMDCC would play a coordinating role through their Metro Base as their Disaster Operations Center.

MMDA would like to see LGUs and agencies develop implementation plans for preparedness and response. This could begin by bringing all agencies and LGUS together to identify what skills and processes are needed so that LGUs can prepare their respective plans, with focus on earthquakes, and with support from MMDA and PHIVOLCS. The second element is to ensure sustainability of the planning effort through a model planning process and a template for imparting planning skills. These tools and guidance would incorporate local and regional experience and be used by MMDA, working with LGUs, to institutionalize disaster management.

16.9.3 Developing Capabilities for Planning and Response

Basic steps in a LGU emergency planning process include:

1) Prepare methodology including draft plan template and process and coordinate with the city, MMDA, PHIVOLCS and OCD.
2) Develop a diagnostic questionnaire for city entities and compile the information.
3) Organize and hold a workshop/tabletop exercise with the city to introduce the planning process and to organize functional working groups to develop procedures for specific functions.
4) Encourage working groups to meet regularly and monitor progress.
5) Hold second workshop to share working group results.
6) Conduct tabletop exercise to test the results and determine action plan of next steps to be taken by working groups.
7) Monitor working group progress.
8) Hold a follow-up activity.
9) Continuously document the process.

In addition, a mechanism should be identified for incorporating barangay level planning for situation and needs assessment, communications, and coordination into the city level planning.

Based on the city level planning process and documentation, guidelines could be developed for cities on earthquake emergency planning / disaster management planning. The guidance should cover how to use the risk information generated by MMEIRS as the basis for determining solutions to risk problems.

Involving MMDA personnel in the city level planning process builds MMDA's capacity to upgrade its own plans and procedures and to assist LGUs on an ongoing basis with their emergency planning.

Also, it is recommended to develop suggested procedures and protocols for one or more key functions, e.g. inter-institutional coordination, DOC operations, and communications, to cover every level from barangay to national level, as appropriate.

16.9.4 Developing the Framework for Earthquake Risk Reduction

The current situation, as previously described, is that the legal basis for the NDCC and its counterparts at the regional, provincial, city, municipal and barangay levels is Presidential Decree 1566 (1978). Plans are based on the Calamities and Disaster Preparedness Plan of 1988. With the law 25 years old and the plan 15 years old, both should be re-conceptualized in light of current concepts and best practices, e.g. a proactive, holistic risk management approach taking decentralization and community-based concepts into account.

The MMDCC could play a more active role in promoting mitigation and providing guidelines to cities, and act as mechanism for exchange of information between cities and setting up mutual aid agreements. Also, some local disaster management offices/organizations exist on the basis of executive orders, so they don't have regular department status or receive a regular budget. They need a stronger legal basis and standing.

16.9.5 Strengthening Institutions and Capabilities

In order to enhance the overall capabilities of the disaster coordinating councils in the Metro Manila area, the following suggestions have been developed and discussed with many local stakeholders:

1) Adoption and approval of a city ordinance on disaster management
2) Formulation of an Operations Manual or Response Plan for the Disaster Coordinating Councils
3) Reorganization of the Disaster Coordinating Councils
4) Encourage inter-local and public-private cooperation
5) Identify needed disaster management tools and equipment
6) Institutionalize long term capability building measures
7) Initiate basic training courses on disaster management
8) Establish functional Disaster Operations Centers
9) Strengthen community based participation in disaster management
10) Disseminate information to the public on what to do if an earthquake occurs
11) Management of emergency public information
12) Improve financial viability of Disaster Coordinating Councils
13) Zonification of cities and municipalities in Metropolitan Manila
14) Establish policies, institutional arrangements, plans, and procedures for recovery

These ideas have been developed into recommendations that are elaborated in Sections 16.10 through 16.12, which follow.

16.10 Recommendations to Enhance Institutional Capabilities

To improve the overall capabilities of disaster coordinating councils in Metropolitan Manila and make such bodies much more functional, several recommendations by level are herein made which are as follows:

16.10.1 Metropolitan Manila Disaster Coordinating Council (MMDCC)

1) MMDCC Reorganization

The MMDCC should be reorganized to make it more manageable. The MMDCC should undertake an evaluation and review of its capabilities and limitations, the result of which will be the basis for its reorganization and the formulation of a master plan for earthquake mitigation in Metropolitan Manila.

2) Minimum Membership with Agencies of Priority and Highly Critical in Disaster Mitigation

Present membership should be reduced to a minimum and should include only agencies that are priority and highly critical in disaster mitigation. The other current member agencies can form as core auxiliary group.

There are at present some 33 members of the MMDCC. A review of the present member agencies suggests that easily 11 member agencies can be considered secondary in terms of disaster mitigation. Therefore, these agencies can be "collapsed" and thereafter designed as an auxiliary core, which can perform critical functions in post earthquake period. A reorganization will make the MMDCC much more manageable.

3) MMDCC being Policy Formulation Body and Metro-wide Coordinating Council

The MMDCC should be a policy formulating body for disaster management and at the same time a metro wide coordinating council in the provision of services to cities and municipalities during disaster in the NCR.

4) Develop MMDA Metro Base capabilities for Disaster Operations Center (DOC) operations

The MMDA/MMDCC will play an important role in coordinating and managing response to major disasters. During disaster operations, MMDA will receive and disseminate emergency alerts and warnings and coordinate emergency information flow and response activities among agencies, cities and municipalities, keeping OCD informed of situation and resource updates. It also will coordinate and act on mutual aid requests that go beyond the boundaries of any mutual aid zone.

For the MMDCC to effectively coordinate disaster situation and response operations information, it must be equipped and its staff prepared to act as a Disaster Operations Center with back-up communications capabilities vis-à-vis the LGUs, NCR agencies, and NDCC/OCD.

5) MMDCC Provision on Policy Guidance to the CDCCs and MDCCs

The MMDCC should provide policy guidance to the CDCCs and MDCCs in the optimal use of the 5% Calamity Fund. The MMDCC policy guidance in this regard should be based on the MMDCC regional master plan on disaster mitigation and on the need basis of specific local authorities.

6) MMDCC Undertaking Periodic Consultations

The MMDCC should undertake periodic consultations and dialogues with CDCCs and the MDCCs together with their component barangays. These horizontal and vertical consultations should be "regularized" to create and sustain awareness of the need for a proactive disaster preparedness strategy.

7) MMDCC Organizing Executive Committee

The MMDCC should organize an Executive Committee of three to five members, which shall be responsible for the day-to-day activities of the regional council in coordination with the appropriate office of the MMDA.

8) MMDCC Chairman Issuing ad Memorandum Circular

The MMDCC Chairman should issue a Memorandum Circular to member agencies indicating the following:

- Formulation of a Regional Master Plan on Disaster Mitigation specifically on earthquake as stipulated in No. 1 above.
- Whether MMDCC should meet quarterly or on a semestral basis besides meeting on the need basis.
- Provide instructions to the Executive Committee as to its mandates and tasks in support of the MMDCC activities and programs.

9) MMDCC Chairman Sourcing Funds for MMDCC

The MMDCC Chairman should source funds for MMDCC from various sources both governmental and non-governmental. Funds are necessary in order for the Executive Committee and the MMDCC to function effectively and well.

10) MMDCC Working Closely with OCD and International Organizations

The MMDCC should work closely with OCD and international organizations e.g. the Earthquakes and Megacities Initiative (EMI). A close working arrangement with these agencies will improve the knowledge base of the MMDCC.

11) MMDCC Lobbying for the Approval in Congress of Important Bills on Disaster Mitigation

The MMDCC should lobby for the approval in Congress of important bills on disaster mitigation now pending legislative approval, e.g. H.B. No. 221.

16.10.2 City/Municipal Disaster Coordinating Councils (CDCC/MDCC)

1) Adoption and Approval of City Ordinance on Disaster Management

Many cities and municipalities have not adopted or approved city or municipal ordinances on disaster management. A city or municipal ordinance on disaster management will provide local authorities the legal framework to undertake a comprehensive disaster management program that will protect their communities and the residents therein. A city or municipal ordinance can provide the necessary policies and resources to counter disasters at the local levels. Also, city/municipal authorities can strengthen their Disaster Coordinating Council's effectiveness by the local legislative councils enacting a comprehensive ordinance on disaster or emergency management. Such an ordinance has been drafted and circulated among various stakeholders in Metropolitan Manila (see copy in Appendix). The primary contents of the model ordinance which the Study Team has developed include the following sections:

Section 1-- Purpose

This section would define and express the objectives and purposes of this ordinance. It would indicate the clear purpose and direction of the whole legal document.

Section 2 -- Definition of Disaster

This section should define what constitutes a disaster, e.g. in the case of .flood, fire, earthquake, terrorism, etc.

Section 3-- City Policies on Disaster Management

This section should express the goals and programs of the city in the management of disaster and the official policies of the city government preferably those formulated by the local legislative council.

Section 4 -- Local Disaster Management Organizations

This section should define national, regional and local organizations including their respective functions and powers in relation to disaster management, and include provisions on how integration of effort will be achieved.

Section 5-- Disaster Management Plans and Programs

This section would contain a perspective or comprehensive overview of the Disaster Management Plans and Programs of the city government concerned, which may contain several emergency situations such as flood, fire, earthquake, terrorism, or the management of hazardous materials or biochemical or radiological emergency preparedness.

Section 6-- Duties and Powers of the Mayor in Disaster Management

This section would clearly define the duties and powers of the mayor as head of the city government and what the specific roles and responsibilities the city mayor will assume in case of emergency or disaster.

Section 7-- Duties and Powers of Disaster Program Director

This section would clearly define the duties and responsibilities of the most senior official of the city government who is directly concern with the management of emergency or disaster plans and programs

Section 8-- Duties and Powers of Department Heads and Employees

This section would clearly define the respective roles of each city departments and their employees in managing or assisting in a disaster or emergency, as their efforts are going to be coordinated by the appropriate emergency management organization or the emergency management program officer.

Section 9-- Disaster Management Training Programs and Policies

This section would define categories or types of training interventions necessary to professionalize disaster council staff and other persons needed in the implementation of emergency management plans and programs

Section 10 -- Disaster Alert Program

This section would define the methodology and procedures established to provide warning to local residents before an actual emergency will occur.

Section 11-- Disaster Evacuation Plan

This section would provide evacuation plans and programs of the city during the post disaster period and would contain such provisions as food plan, medical services and or hospitalization requirements of emergency teams.

Section 12 -- Disaster Management Reporting System

This section should spell out the administrative procedures established for providing a reporting system upwards and downwards affecting all departments of the city government, the purpose of which is to update all concern what actions has been taken, what has been accomplished and what actions are required.

Section 13 -- Public Education and Community Awareness

This section would define the programs of the city which will promote higher consciousness or awareness by resident, how to react during a disaster, whom to approach, where to go and what they can do as individuals or as a group for the safety of the citizens or the community.

Section 14 -- Disaster Management and Information Technology

This section would define emergency management tools such as computers, digital equipment, modern fire trucks, modern ambulances, bulldozers and other earthquake relevant equipment

Section 15 -- Manual on Disaster Management

This section would make it mandatory for all city departments and offices to formulate a Manual on Disaster Management.

Section 16 -- Disaster Recovery Plan

This section would define how to rehabilitate the city or municipality during a post earthquake situation indicating thereof, where necessary, a redevelopment plan of the whole city in general.

Section 17 -- Budget for Disaster Management

This section would set forth a provision making it mandatory for the city government to provide a regular annual budget for disaster management or for emergencies.

Section 18 -- Disaster Management Performance Audit

This section would require the local government to establish its own standard of managing emergency situations and how plans and programs are implemented in order to be able to measure their actual performance in mitigating emergencies.

Section 19 -- Private Liability

This section would define fines and fees against individuals who may trigger emergency situations due to ignorance of city laws and ordinances related to disaster mitigation.

Section 20 -- Penalty

This section would provide a provision penalizing individual citizens, juridical organizations, or institutions that violate the provisions of this ordinance.

Section 21 -- Mandatory Review

This section would mandate a review of this ordinance every five years by the city council, the purpose of which is to make always current the same ordinance responsive to the requirements of a changing environment.

Section 22 -- Miscellaneous Provision

This section would provide miscellaneous provisions which the city council may impose which are not within the province of any section of this ordinance.

Section 23 -- Separability Clause

This section would declare that any provisions of this ordinance which are unconstitutional or illegal may be considered null and void but those provisions which can stand on their own legally shall be retained in full force and effect.

Section 24 -- Effectivity Clause

This Section would state the effective date of the ordinance, which is usually 30 days after its passage by the local legislative council.

2) Formulation of Operations Manual (or Response Plan) for City/Municipal Disaster Coordinating Councils

City Disaster Coordinating Councils (CDCCs) or Municipal Disaster Coordinating Councils (MDCCs) where operations manuals or response plans are in place can perform more effectively their tasks than if they do not have written guidelines as to how to operate in an emergency situation.

Some cities have what is called a Disaster Preparedness Plan. However, many of these plans can still stand much improvement. Others have little in the way of preparedness plans or operating procedures for emergency response. The internal efficiency of the Disaster Coordinating Councils could be improved if a manual of operations would be formulated. This would mean that internal rules and regulations of council operations would be properly defined in a written and working document.

The Emergency Response Pocket Guide described in an earlier section of this Report has been developed as a model product which can be adopted by cities and municipalities in response to this need.

3) Reorganization of the Disaster Coordinating Councils

The Study proposes a reorganization of the disaster coordinating councils. Because the membership of the disaster coordinating councils is not really based on the professional competence of their members but more on their institutional affiliations, it will be useful to revisit the membership possibly dividing the members into a core group consisting of highly professionalized members in disaster preparedness and disaster mitigation and an auxiliary or support group that may be tasked to undertake post disaster actions such as the rehabilitation or reconstruction of destroyed infrastructures and other physical facilities.

In this regard, it might also be advisable to strengthen the authority of the disaster coordinating councils through appropriate congressional legislation where disasters may not only be given adequate resources like allowing pre-disaster expenses (see DBM-DILG Joint Memorandum Circular No. 1, March 2003) but including as well adequate powers to carry our their multifaceted responsibilities effectively. (Please see Sections 558 (iv), 447 (iv) and 389 of the Local Government Code). Also, adopting a city or municipal ordinance on disaster mitigation can provide more adequate powers to the CDCC/MDCC.

Three approaches or options are possible to undertake the reorganization of the disaster coordinating councils:

1) Request that Congress approve a legislative measure to amend Presidential Decree 1566
2) Request that a Presidential Executive Order be issued increasing the members of the council
3) Encourage the city/municipal mayor to issue an executive order, or the city/municipal council to enact an ordinance increasing council membership.

4) Encourage Inter-Local and Public-Private Cooperation

A very important element of some municipal plans and programs are the inter-local arrangements in case of disaster. The constitutional basis for inter-local cooperation is Section 13 of Article 10 of the 1987 Constitution as well as the provision of Section 33, Article 3 of the Local Government Code or Republic Act of 7160.

Caloocan has standing cooperative agreements with the cities of Malabon and Valenzuela. Marikina with Taguig and Montalban, Manila with Pasay City, etc. There are likewise increasingly emerging similar cooperative arrangements by most Metropolitan Manila cities with

the private sector. The Chinese community in Manila and Pasay along with other civic organizations is very active in this public private partnership cooperation in disaster cases.

A significant findings of the field visits is that there is a continuing reorganization of the Barangay Disaster Coordinating Councils as a result of the Barangay election last May 2002, as well as the desire of Disaster Coordinating Council action officers to update their plans and programs in disaster preparedness which will indicate the roles of the Barangay Disaster Coordinating Councils.

One concept that can be introduced in regard to both city/municipality level authorities and baragay level authorities is the Mutual Aid Agreement between and among local authorities (see a subsequent section of this Chapter).

5) Identify Needed Disaster Management Tools and Equipment

The Earthquake Study provides the cities in Metropolitan Manila more knowledge and technology on earthquake preparedness. To capitalize on this knowledge, it is recommended that agencies, institutions, and local governments inventory both their available resources and their needs for additional disaster management tools and equipment. This inventory, which will support the capacity building effort for cities to respond effectively to disaster, may include such considerations as:

1) Inventory of necessary equipment essential to disaster mitigation, which will upgrade city and municipal disaster coordinating council capabilities.
2) Identification of available local resources and how they may be mobilized in the event of crisis or disaster.
3) Development of countermeasures or strategies to minimize overall destruction as a consequence of a crisis or emergency situation.

This inventory should be based on the knowledge of potential disaster impacts, particularly earthquakes and their destructive implications to the community. These considerations may be identified based on this Study's earthquake scenario, which provides essential information about a major earthquake's destructive implications to the community.

This particular enhancing measure if implemented may allow the disaster councils to acquire modern equipment to detect or counter earthquakes and its destructive force.

The need to identify tools and equipment for disaster should also include the capabilities and limitations of BDCCs in this regard.

6) Institute Long Term Capability Building Measures

This effort should consist of such important elements as:

1) Establishing a database as a benchmark of the potential hazards of a particular city or municipality and their vulnerabilities to disaster such as earthquakes.
2) Establishing a computerized information base as well as establish sharing system of disaster preparedness related information between and among cities in NCR in order to optimize their planning capabilities to respond in time of crises.
3) Requiring cities and municipalities to internalize and institutionalize their disaster research capabilities
4) Establishing the functional interconnectivity of these recommendations packaging them as subjects of a comprehensive and integrated training intervention that should be sustained.

7) Initiate Basic Training Courses on Disaster Management

The MMEIRS Study has created earthquake scenarios that will help the members of the CDCC/MDCC internalize their respective responsibilities, anticipate countermeasures to minimize overall destruction, as well as share important information with the community to increase their ability to protect their own lives and properties.

The earthquake scenario provides the basis for development of realistic training, drills, and exercises to assist agencies, public officials, and the public in preparing for and reducing the damaging impacts of earthquakes and other disasters. These scenarios can be fully utilized through the following:

1) The application of Disaster Imagining Games (DIGS) in schools, as well as other community organizations that can assist in case of earthquake and other emergencies.
2) The using the Delphi method, using the knowledge of the experts to enrich the results of the study by validating which crisis will be the most likely to occur. This step will aim to improve the pre-disaster capabilities of the cities.

In addition to these training interventions proposed to upgrade the overall capacities of city staff involved in disaster or emergency management, all available training opportunities should be optimized, including those emanating from the Emergency Management Institute of the Philippines.

In addition, all existing training opportunities should be optimized, including those emanating from the Emergency Management Institute of the Philippines.

In order to enhance the capacity for training emergency response personnel in critical response and relief functions and meet the constant demand for building local capacity, it is also proposed to constitute a permanent cadre for training and exercise coordination.

8) Establish functional Disaster Operations Centers

Disaster Operations Centers (DOCs) at city/municipal and barangay levels should serve as the focal point for coordination of preparedness, response, and relief activities during a disaster as well as receipt, compilation, and dissemination through the Public Information Officer of information to the public. Standard Operating Procedures need to be developed to guide DOC operations; equipment needs to be procured, and staff need to be trained.

An effective local government Disaster Operations Center is vital in order to ensure disaster response is timely and relevant in terms of control of local disaster management operations, coordination of local resources, and provision of a communication center for coordination with all other relevant agencies.

9) Strengthen Community Based Participation in Disaster Management

One other critical consideration in the institutional and organizational concept of enhancing institutional arrangements for disaster management is to strengthen community based participation in disaster management before, during, and following an emergency situation or crisis. Of course, this will include strengthening community base organizations such as the Barangay Disaster Coordinating Councils (BDCC), including other primary groups and NGOs, which are operating at the barangay level. This would mean solicitation of the participation of educational, religious, and residential and other civic organizations which can play vital roles in providing assistance and support during a crisis or disaster. The studies have shown that cities like Caloocan, Manila, Marikina or Muntinlupa have already initiated this kind of innovation as part of their long range disaster management strategy.

10) Dissemination of Information to the Public on what to do if an earthquake occurs

Printed guides, pamphlets and other similar materials should be made available to the general public, such as posting these materials in the website, at school libraries and barangay reading halls or reading centers of communities.

Existing radio and other media programs can be used as vehicles where earthquake related materials could be part of some of their public service programs.

Local governments should establish a positive working relationship between public officials, institutions, and the media, and encourage ongoing involvement by the media in educating the public about reducing disaster risk. Cities, municipalities, and institutions should adopt a policy of proactive, ongoing partnership with the media to ensure collaboration for information dissemination during both emergency and non-emergency times.

There are two major aspects of a disaster-related public information program, and the media play a pivotal role in both:

1) Public Information for Prevention and Mitigation -- There is need for a continuous campaign of public information dissemination through the various media including television, radio, and print media. This may include television and radio commercial spots and disaster-oriented dramas or games, pamphlets and brochures, newspaper inserts, etc.
2) Public Information for Response in case of Emergency
   Emergency public information corresponds to agreements, procedures, and protocols designed to evoke an appropriate public response in face of a disaster or the threat of disaster. In a disaster, the media will perform an essential role in providing emergency instructions and up-to-date information to the public. However, due to loss of power, communications capabilities, or broadcasting or transmitting facilities, some media may be off the air for hours or even days after the quake.

11) Management of Emergency Public Information

During the Study, the need for a guide to assist local governments in managing information concerning disasters was identified as a high priority. Therefore, a handbook has been developed to provide guidance to local governments and institutions on appropriate policies and actions they should take to ensure the public receives accurate and timely information concerning how they can protect themselves from earthquake and other disaster impacts. Local governments and agencies can adopt and implement this guide to assist them in managing information concerning disasters.

12) Improve Financial Viability of Disaster Coordinating Councils

One of the weakest links of the Disaster Coordinating Councils in Metro Manila is their limited financial viability. Most of these councils are primarily operating on a shoestring budget augmented by appropriations from the Office of the Mayor whenever a disaster occurs. Of course, DMCCs can get funds from the local budget but the amounts available are really not adequate.

They have practically no funds for expenditures during a pre-disaster period. Therefore, they need financial augmentation from all possible sources to allow the councils to be more ready for disaster or emergency anytime.

In this regard, innovative strategies may have to be formulated:

1) Solicit and manage donations from private sector. – In addition to the public funds made available to the DCCs for expenditures, the councils or city governments may deposit, as a trust fund, donations from the private sector or commercial sector. Usually donations from the private sector for this purpose are tax deductible.

2) Out source domestic and foreign grants intended to improve the overall capability of disaster councils
3) Encourage government agencies, which are members of the councils, to appropriate either in funds or in kind to be used to upgrade the internal administrative or operational requirements of disaster councils such as purchase of computers, digital equipment and earthquake related vehicles, which in the long run will improve the operational effectiveness of disaster councils during a crisis.

In addition to local funds that can be generated among local governments, there is an augmentation or stand by fund in the amount of P800 Million in the General Appropriations Act of 2003.

13) Zonification of Cities and Municipalities in Metropolitan Manila

The 13 cities and 4 municipalities in the National Capital Region could be geographically divided into zones in case of large earthquake, based on the estimated level of urban vulnerability and roads crossing or passing through the high vulnerable areas.

The logic of this concept is premised on the consideration that cities can more effectively cooperate with each other and be coordinated by disaster agencies like the National Disaster Coordinating Council and the Metro Manila Disaster Coordinating Council if cities are organized by the possible dividing zones.

This proposal is further discussed in a later section of this chapter.

16.10.3 Barangay Disaster Coordinating Councils

1) Upgrade the capabilities of the members of the BDCCs by instituting long term capability measures specifically on earthquake mitigation.
2) Require and assist each BDCC to establish a data base that will allow the barangay disaster council to know more about their physical environment, its vulnerability to specific threats, including information of its strong and weak points in countering disasters.
3) Provide the BDCC adequate communication facilities and assist them to establish an effective disaster monitoring system useful in interbarangay aid agreements and other mutually reinforcing arrangements.
4) The CDCCc or MDCCs should establish or recommend a standard package of equipment and tools for disaster mitigation for the BDCCs. Thereafter, they should undertake an inventory and determine which BDCCs are up to the established standard package of equipment and tools. Effort should then be exerted to help BDCCs with substandard equipment.

5) The BDCCs should strengthen their networking with community based organizations in order to assure high community participation in the event of disaster or emergency. The BDCCs should widen their influence in the community. They should undertake regular consultation and dialogue on disasters e.g. earthquakes.
6) The BDCCs should espouse a policy of developing self-reliance in their overall capability building efforts based on and in compliance with Section 1(a) of PD 1566.
7) The BDCCs, as much as practicable, should strictly implement DILG Memorandum Circular 2003-144 dated July 14, 2003 addressed to the chairmen of disaster coordinating councils implementing Presidential Order on Zero Casualty Times of Calamity.

16.11 Proposed Zonification of Cities for More Effective Disaster Management Scheme

16.11.1 The Zonification Concept

The primary purpose of the proposed zonification of local governments in the National Capital Region (NCR) is to allow the MMDCC to manage and coordinate effectively the 13 cities and 4 municipalities in the Metro Manila Area most especially in case of disasters or emergencies.

The 13 cities and 4 municipalities in the National Capital Region can be geographically organized into four zones, based on the estimated level of urban vulnerability and roads crossing or passing through the high vulnerability areas, and common jurisdictional boundaries.

This concept is premised on the consideration that cities can more effectively cooperate with one another and be coordinated by disaster agencies like the National Disaster Coordinating Council and the Metro Manila Disaster Coordinating Council if cities including municipalities are organized by zones. The cities in one zone could agree on executing a long-term inter-city Memorandum of Understanding authorizing inter-city cooperation in such common actions as inter-city earthquake preparedness planning or other disaster mitigation strategies.

Such an arrangement could be agreed upon by a group of cities in a zone. Cities then after this cooperative scheme is finalized, would develop the operational procedures to carry out the agreement, which in turn would have to be institutionalized at the city level as well as internalized by all staff concerned.

The constitutional basis for inter-local cooperation is Section 13 of Article 10 of the 1987 Constitution as well as the provision of Section 33 of the Local Government Code or Republic Act 7160.

Caloocan has standing cooperative agreements with the cities of Malabon and Valenzuela, Marikina with Taguig and Montalban, Manila with Pasay City, etc. There are likewise similar

emerging cooperative arrangements by most Metro Manila cities with the private sector. The Chinese community in Manila and Pasay, along with other civic organizations, is very active in this public-private partnership cooperation in disaster cases.

The proposed zonification is similar in concept to a long-established system of mutual aid agreements among local authorities similar to those existing in California and other parts of the U.S.

16.11.2 Implementation of Zonification through Adoption of Mutual Aid and the Incident Command System

1) Mutual Aid

"Mutual aid" is support rendered by one jurisdiction to another during declared emergencies. The purpose of mutual aid is to provide personnel and logistical support to meet the immediate requirements of an emergency situation when the resources normally available to that jurisdiction or agency are insufficient.

Mutual aid can involve the provision of services and facilities such as fire, law enforcement, medical and health, urban search and rescue, coroner, public works, communications, transportation, and utilities. These "discipline-specific" mutual aid systems each follow specified channels for resource requests and information flow and coordination. Mutual aid is intended to provide adequate resources, facilities, and other support to jurisdictions whenever their own resources prove to be inadequate to cope with a given situation.

2) Application of the Incident Command System in Mutual Aid

The Incident Command System (ICS) was originally developed by the fire services to provide a standard system for managing emergencies through a common organizational framework within which various agencies can work collectively at the scene of an emergency.

There are five primary ICS functions:

- command/management
- operations
- planning/intelligence
- logistics and
- finance/administration.

Use of ICS involves the setting of operational objectives to be achieved in given periods, action planning to achieve the objectives, and organizational flexibility, in that only those functions/elements that are necessary are activated. ICS provides a clear hierarchy of command or management with appropriate limits in span-of-control. Since with ICS there is common

terminology for functions, positions, and resources, it provides a consistent and standard framework for managing activities of diverse agencies under a mutual aid situation.

3) Implementation of a Mutual Aid System in Metro Manila

First, cities and municipalities should have ordinances that establish their emergency organization and local disaster council, provide for disaster management plans, and establish responsibilities for disaster preparations and operations. As part of disaster preparedness, some cities and municipalities have already adopted agreements to share critical skilled personnel and equipment. In the event of a disaster situation, local authorities will immediately put response plans into operation and take actions required to cope with the situation, including forwarding situation reports to the MMDA/MMDCC. As conditions require, local officials in the involved city/municipality will identify resource needs that are beyond the capabilities of their local government and can be filled by surrounding cities/municipalities or regional or other resources. Specific procedures for such mutual aid requests should be developed and followed.

The zonification of Metro Manila's cities and municipalities will allow for development of a formal system and procedures for mutual aid. Each "zone" will provide a focal point for all local disaster management information and the provision of mutual aid, providing improved coordination and an improved capability to share needed resources and speed their mobilization.

The MMDA/MMDCC will play an important role in coordinating and managing response to major disasters. During disaster operations, MMDA will receive and disseminate emergency alerts and warnings and coordinates emergency information flow and response activities among the several zones, keeping OCD informed of situation and resource updates. It also will coordinate and act on mutual aid requests that go beyond the boundaries of any Zone.

Several guidelines or assumptions lie at the foundation of such a system for coordination of emergency response efforts:

- Zonal groupings of cities are encouraged to collaborate with each other in pre-disaster preparedness, training, exercising, and public information activities.
- Emergency response begins locally, at the lowest level of government involved in the incident.
- Mutual Aid is requested when needed and provided as available. It is generally conducted at the request and under the direction of the affected local government.
- Resource requests originate at the local government and are forwarded to other cities in the Zone and the MMDA/MMDCC. Responding resources are sent to the requesting government.

- Local authorities maintain operational control and responsibility for emergency management activities within their boundaries, unless specifically provided otherwise by statute or agreement.

Also, it is recommended that the Incident Command System should be considered as the framework for facilitating emergency response coordination in the development and implementation of Procedures for the Zonification or Mutual Aid System in Metro Manila.

In addition to the guidelines and principles discussed related to the proposed zonification of Metropolitan Manila cities and municipalities, other considerations such as the following were taken into account.

- The population factor i.e. whether the city has so much high population concentration or population density is much lower. In the use of this principle, local governments with much higher population density are usually classified as one zone. Cities or municipalities with lower population density can be grouped into one single zone.
- The budgetary consideration- the local governments which have high revenue base can be zonified as one zone or sector while local governments with smaller income may be grouped into one sector for reasons which are obvious if resources are to be reckoned.
- The availability of material resources and or equipment including institutional factors are likewise proposed to be additional criteria or guide in the process of zonifying Metro Manila cities and municipalities

These three factors were considered in proposing four zones lead by one leading city. Proposed zones and its descriptions are as shown in below Table 16.11.1

Table 16.11.1 Proposed Zones for Zonification

Zone	Leading City	Descriptions
Zone 1: MM West	City of Manila	Composed of cities and municipalities of: Manila, Pasay, Kalookan South, Navotas, and Malabon
Zone 2: MM North	Quezon City	Composed of cities and municipalities of: Quezon, Kalookan North, Valenzuela, San Juan, Mandaluyong
Zone 3: MM East	Marikina City	Composed of cities and municipalities of: Marikina, Pasig
Zone 4: MM South	Makati City	Composed of cities and municipalities of: Makati, Pateros, Taguig, Paranaque, Las Pinas, Muntinlupa

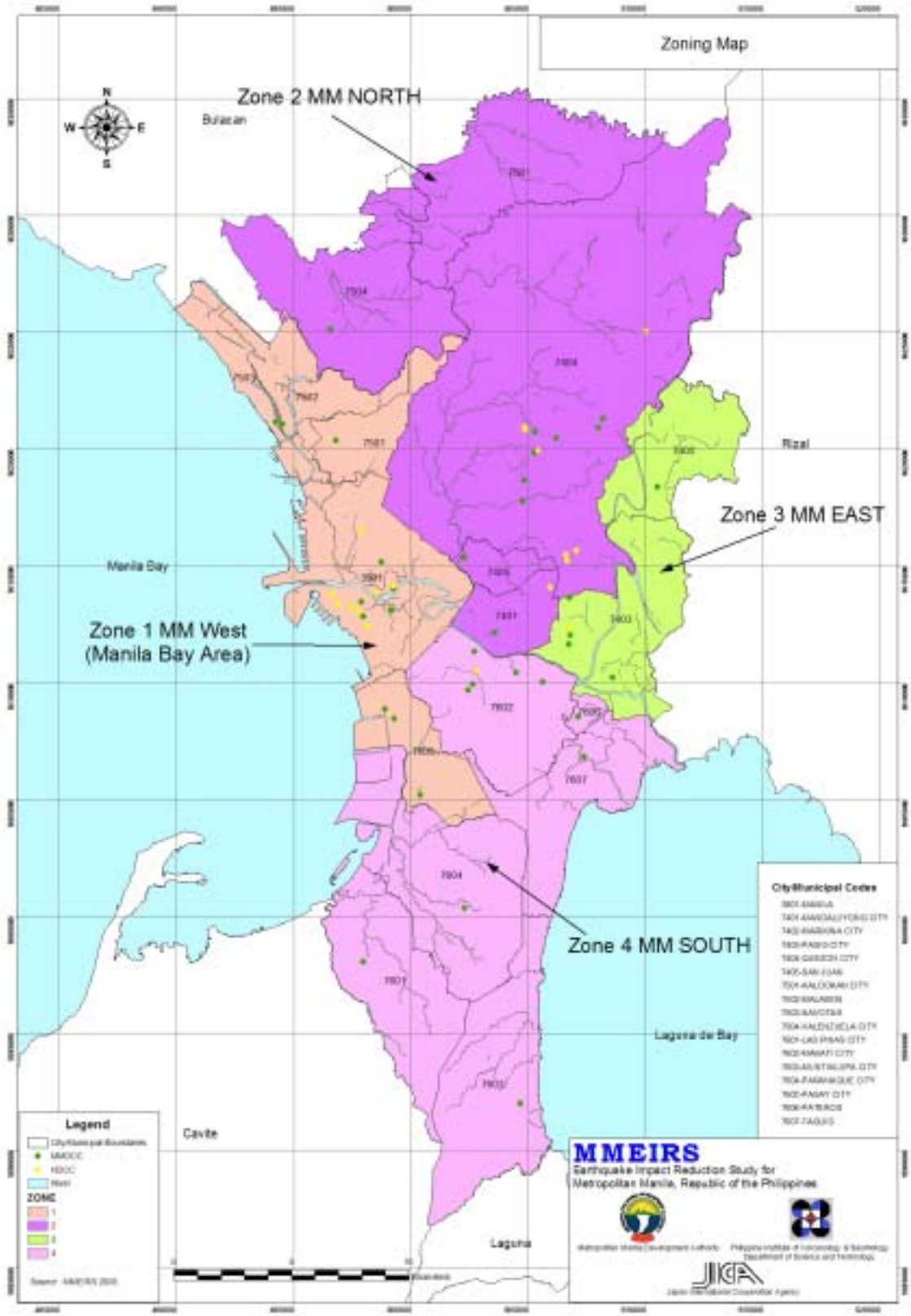


Figure 16.11.1 Proposed Zonification

16.12 Establish policies, institutional arrangements, plans, and procedures for recovery

When a major disaster occurs, everyone – government, businesses, communities and families--must pull together to recover. Regaining normalcy is much easier and quicker if the policies, partnerships, and organizational structures to guide and facilitate recovery are in place before the disaster.

16.12.1 Establish pre-disaster policies and institutional arrangements for post-disaster reconstruction and mitigation

Typically, pre-disaster planning focuses on preparedness for immediate response and relief, and little effort is expended in planning short- and long-term recovery strategies and policies. However, recovery and reconstruction involves decision-making at every level from family to national government; it requires developing linkages and addressing complex, difficult issues. A multitude of decisions must be made about demolitions, repairs, temporary facilities, and reconstruction. Recovery deals with indirect as well as direct effects of disasters, including psychological recovery, community services, commerce, and industrial production. Clear delineation of policies as well as responsibilities and authority over certain activities speeds recovery and provides accountability.

Consideration should be given to establishing a reconstruction authority (or redevelopment authority) with powers such as eminent domain, planning, buying and selling property, and receiving and spending public funds. Institutional arrangements for recovery also should:

- Ensure the ability to promptly restore government functions and facilities
- Ensure the ability to reallocate government funds and reprogram resources for recovery activities
- Provide for managing public finance, e.g. emergency contracting and tax collections.
- Determine types and levels of public assistance to families and businesses that are most in need following the disaster
- Provide for implementation of building regulations and code enforcement during repairs and rebuilding
- Review the land use plan and develop solutions to zoning and land use issues to be implemented during reconstruction
- Identify areas at high risk (e.g. strong earthquake ground motion or liquefaction, high fire or flood risk, etc) and reduce density or require other mitigation actions during reconstruction in those areas
- Establish partnerships for coordination of public and private recovery-focused actions

16.12.2 Prepare recovery plans and procedures to ease post-disaster human and physical recovery and rehabilitation

A recovery plan and procedures should be developed before a major disaster to cover the following short- and long-term recovery functions and many others:

- Establish priorities and coordination systems for restoration of lifelines and other basic services
- Establish procedures to inspect and restrict entry to unsafe buildings; ensure utilities are turned off in unsafe or damaged structures; provide for the use of volunteer engineers and other professionals
- Establish plans and sites for temporary housing and/or resettlements following the termination of sheltering operations
- Establish programs to assist local businesses, especially small businesses, to recover
- Pre-determine disposal sites for debris generated by the disaster and by demolition of damaged buildings and structures; develop plan for coordination of debris removal from streets and public and private properties
- Plan assistance programs for needy disaster victims including the very poor, elderly, infirm, homeless, and children.

Chapter 17. Outline of Earthquake Impact Mitigation Components for Metropolitan Manila

CHAPTER 17. OUTLINE OF EARTHQUAKE IMPACT MITIGATION COMPONENTS FOR METROPOLITAN MANILA

17.1 Introduction

Building collapse and human casualty as direct damage by earthquakes, and fire as secondary disaster, are unevenly distributed. High damage and risk areas lie landing areas of high ground motion, poor soil condition, and high density of wooden housings. Earthquake impact preparedness and mitigation plans must be made based on such area-wise damage and risk characteristics.

The damage estimation and risk analysis reveal that damage differs from one place to another in Metropolitan Manila. For building collapse, the worst case is when the West Valley Fault moves, causing 175,600 buildings to be heavily damaged and 348,100 buildings to be moderately damaged, which altogether accounts for some 40% of the total buildings of Metropolitan Manila. Area-wisely, high damage areas are those near the West Valley Fault such as Pasig city (67.2%), Marikina (63.7%), and Muntinlupa (58.4%), and those of areas near Manila Bay such as Pasay city (50.1%), Navotas (48.4%), and Manila city (46%).

In respect to human casualty by building collapse, Metropolitan Manila would have 34,800 deaths and 118,200 injured in total. Manila city is expected to suffer the most casualty damage of 27,000 deaths and injured, followed by Quezon (25,200), Pasig (15,300), Marikina (11,400), Muntinlupa (9,600) and Taguig (9,400).

Looking at fire outbreak and fire-spreading as secondary disaster, in case of a wind speed of 8 m/s, 1,700 ha of land is estimated to be burned in the whole Metropolitan Manila, and 19,300 people failing to escape would be killed. Manila city where overcrowding wooden residential areas are prevailing would experience 450 ha of burned area, with 7,200 deaths. Following Manila city are Quezon City with 259 ha of burned area and 1,500 deaths, Kalookan with 120 ha, Makati with 116 ha, and Malabon with 114 ha.

Figure 17.1.1 shows the general work flow, which describes the relation of earthquake scenario, damage estimation, and earthquake impact reduction plan, including the components.

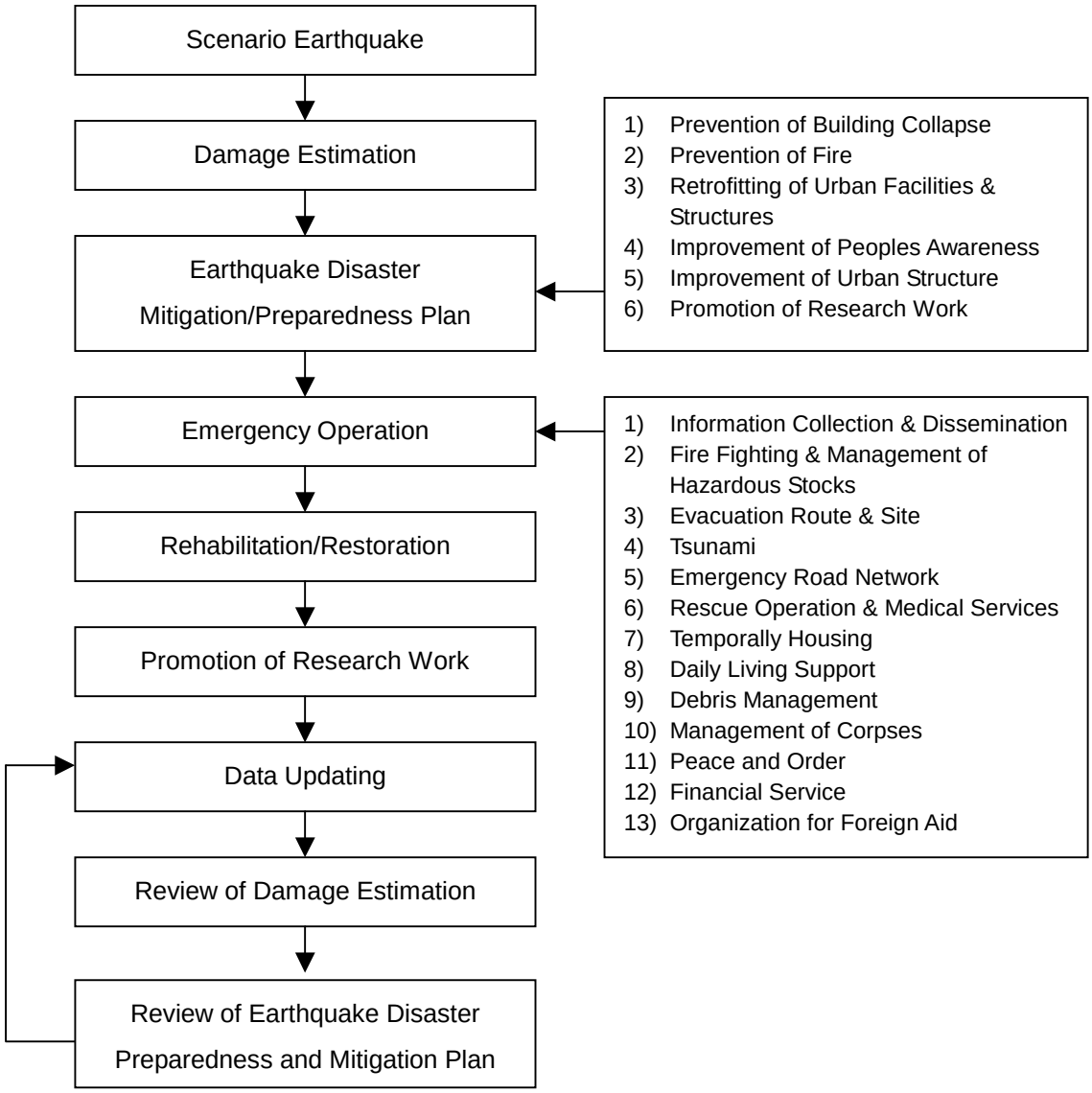


Figure 17.1.1 General Workflow

17.2 Target of Metropolitan Manila Earthquake Preparedness and Mitigation Plan

The ultimate purpose of earthquake preparedness and mitigation plan is to protect human life and property fully from earthquake disaster. This is ideal, but in reality, it is targeted to reduce these damages as much as possible.

As mentioned in section 7.1, Metropolitan Manila, if hit by an earthquake by the West Valley Fault, would undergo a huge loss, i.e. 40 % of the total housing, and there would be 34,800 deaths

and 118,200 injured. Fire, in an 8 m/s-wind case, would burn 1,710 ha of land and thereby kill 19,300 people.

This firstly means that methods to prevent buildings from collapsing is an important issue in earthquake impact preparedness and mitigation. Secondly, fire preparedness and mitigation is a big issue. Thirdly, reduction of damage to public facilities, infrastructure and lifelines such as roads and bridges, power supply, communications, water supply and sewerage system, is an important issue to be addressed.

Disaster preparedness and mitigation plan consists of three parts in chronological order: 1) pre-disaster preparedness and mitigation plan, 2) post-disaster emergency response immediately after the event of disaster, and 3) post-disaster recovery and reconstruction plan. Individual issues of disaster preparedness and mitigation are positioned in these phased plans. Based on analysis of balance between the Metropolitan Manila's existing disaster management capacity and the estimated damage, short, medium, and long-term plans are to be formulated with necessary resources input to implement them.

17.3 Preventive Measures

To take counter measures against earthquake disaster, the following steps are required: grasp lessons from the past experience of earthquake disasters, and based on them, formulate necessary countermeasures to reduce damage, and implement projects according to medium and long term plans. Since the previous chapter treats legal and institutional aspects in earthquake impact reduction, this section focuses more on physical preventive measures.

17.3.1 Measures for Earthquake-resistant Buildings

Major cause of human casualties in the event of earthquake is collapse of buildings. They collapse because of large ground motion of the land on which they stand and their poor earthquake-resistance. Urbanized area along the West Valley Fault is also a negative factor. High damage buildings are old, wooden housing buildings with 57% collapses, and squatter housings with 67% collapses. 20 % of old, concrete buildings are estimated to be destroyed. In addition, other than housing, public facilities and mid to high-rise buildings would incur damage. Schools, hospitals, fire stations, city halls, etc. would also undergo damage and thereby emergency response would be adversely affected.

Preventive measures against building collapse by earthquake are mandatory. Revision of the building code and its enforcement should be ensured by more effective laws. It is required to execute seismic examination of public buildings and preferentially commit anti-earthquake reinforcement to those located on areas estimated to be heavily damaged. It is critical to promote a seismic examination of old, wooden houses and concrete houses, and conduct necessary anti-earthquake reinforcement, or rehabilitation, and to establish a housing financial support

system for them. In addition, enlightenment and dissemination of awareness about importance of building reinforcement to prevent earthquake disaster damage should be undertaken.

It is requisite to improve houses in squatter areas through squatter area improvement program or welfare housing program in mid and long term. Since most squatters build their houses by themselves, it is mandatory to educate and enlighten them through the barangay and community about structure and materials of houses to make their houses more earthquake-resistant. To that end, it is preferable to implement model projects and make educational materials for easier understanding and better dissemination.

17.3.2 Fire Preparedness and Mitigation

The major cause of fire outbreak, which is a secondary disaster arising from an earthquake, is building collapse which leads to leakage of electricity and LPG. High potential places of fire outbreak are ordinary houses, restaurants, hospitals, universities and colleges, factories and plants, etc. It is as important to implement use of tip-resistant measures for domestic LPG cylinders as is the reinforcement of buildings. Tubes and pipes connecting LPG cylinders and cooking stoves possibly can come off and thereby cause gas leakage when the cylinders fall off in case of an earthquake. More appropriate installation of domestic LPG cylinders should be instructed through fire stations. It is necessary to control restaurants using plenty of LPG with regulations on safety management. Small shops called “sari-sari store” sell bottled gasoline and kerosene, usually on storefront shelves. They can easily fall off and get broken, and then cause fire in case of an earthquake. Safety measures such as guidance and regulations should be created for proper treatment of gasoline and kerosene.

In order to prevent fire spreading, fire identification capacity at early stage of fire must be improved. Areas with high building collapse risk and over-dense old wooden houses have high risk of fire outbreak and fire spreading. Such areas are priority areas to devise preventive measures against fire and fire spread. Among all the cities and municipalities of Metropolitan Manila, the over dense wooden residential areas of the cities of Quezon, Malabon, Makati, and Pasay are at high risk of fire in case of earthquake and definitely require countermeasures against fire. As to fire fighting, it is necessary to improve fire fighting capacity by provision of new facilities, modernization of existing fire facilities, and pertinent allocation of fire water supply facilities such as earthquake-resistant cisterns, improvement of barangay fire fighting capacity, and development of fire-related information system. From a city planning viewpoint, the following are required: enhancement of standards of quake-resistance and fire-resistance and fire-proofing, introduction of fire-resistance zoning of areas with hazardous facilities, development of fire-spread blockage, promotion of fire-resistance at roadside areas in fire-prone areas, relocation, zoning regulation, and compulsory green buffer zone at hazardous facilities

such as petroleum and LPG bases. In addition, implementation of urban redevelopments should be facilitated in the high fire risk area to make the area safer.

17.3.3 Earthquake-resistant Infrastructure, Lifeline, and Public Facilities

When an earthquake occurs, above all, a nation's ability to function must be maintained. In this sense, Malacañang Palace is at a rather dangerous place, situated on a rather weak soil and surrounded by fire-prone areas. The legislative buildings that are located near the West Valley Fault and thus prone to potential large earthquake motion, needs a seismic examination and commitment to resultant necessary measures.

Many transportation infrastructures such as bridges, flyovers, LRT, and MRT have been developed since 1990 to cope with traffic congestion generated by rapid urbanization in Metropolitan Manila. Many bridges cross over the rivers of Pasig and Marikina. Although the bridge piers of flyovers have been provided with earthquake-resistant reinforcement, further earthquake resistance reinforcement should be considered for those in the areas of large earthquake motion. The bridges on emergency transportation routes should undergo seismic examination and necessary earthquake-resistance reinforcement or re-bridging work. Although most of LRT and MRT are rather new and have little structural problems, it is better to reconsider stronger earthquake-resistance for those running in areas with potential large earthquake motions.

The existing Manila North Port and Manila South Port are both situated on poor soil condition so that liquefaction is likely to break piers, take down port facilities and equipment like cranes, and thus the ports will be forced to stop functioning. Ports are indispensable in disaster management for receiving emergency relief goods and stockpile commodities. Consequently, to ensure port functions, it is needed to conduct earthquake-resistance reinforcement and soil improvement to designated ports and their hinterland areas, and for earthquake-resistant wharves. In addition, the role and function of Batangas Port and Subic Port, both functioning as complementary ports of Manila Port, should be articulated in disaster management of Metropolitan Manila.

Ninoy Aquino Airport is the only airport in Metropolitan Manila and has to maintain functioning even in case of earthquake disaster. Earthquake resistance of the airstrip, the control tower and the information system should be ensured. To this end, earthquake-resistance reinforcement of the facilities and the development of backup information system must be considered. Clark Air Field and Subic are expected to serve as alternative airports to Ninoy Aquino Airport. The supporting function of the two facilities in case of earthquake disaster should be discussed.

It is also imperative to maintain the economic functions in the capital city. Measures to maintain financial and payment systems of Central Bank and major banks have to be considered. Furthermore, the financial and banking information system needs improvement in earthquake-resistance and development of backup systems.

With respect to lifelines, the water supply system is estimated to incur huge damage. Power supply and communications require stockpile of spares for quick recovery, and also more safety measures.

17.3.4 Improvement of Awareness of Disaster Preparedness and Mitigation

Since earthquakes have many contingencies, investment on preventive measures against earthquake disaster tend to be late. However, when a large earthquake happens in a large city, the damage will be huge. Therefore, in an earthquake prone country, it is an important task to strengthen urban spatial structures and thus make cities more resistant to earthquakes. To this end, it is mandatory to increase people's awareness of the importance of disaster preparedness and mitigation through long-term activities at schools, working places, communities, etc. It is also required to establish disaster preparedness and mitigation centers during peaceful times with the task to run campaigns on disaster preparedness and mitigation awareness improvement, to provide information, to present various exhibitions about earthquake disaster preparedness and mitigation, to support formulating a disaster preparedness and mitigation plan, etc.

At present, "disaster preparedness and mitigation month" has been designated, and there are months of "flood," "fire," "earthquake." During these disaster related months, disaster preparedness and mitigation campaigns and emergency drills and so forth are to be carried out. It is preferable to continue such efforts and run broader public relations activities through mass media like newspaper and television. For better inter-organizational coordination in the event of a severe disaster in Metropolitan Manila, an emergency drill with relevant organizations is also needed.

17.3.5 Urban Spatial Structure

Old city area of Manila Bay area has a high percentage of wooden houses, and thus is at high risk of fire outbreak and fire spreading, and building collapse. The area also has a concentration of petroleum and LPG bases, and factories and plants. Limited open spaces such as parks and green areas and lack of evacuation sites pose a big problem in case of earthquake disaster. Although the road network is relatively developed, there are still many roads narrower than six meters which would hinder fire fighting and rescue activities in an emergency.

Individual anti-disaster measures for hazardous facilities such as petroleum bases, LPG bases, factories and plants, etc. should be promoted and if possible, relocation should also be advanced. The sites that such hazardous facilities leave shall be used to develop parks and open spaces that are lacking presently in order to make the city safer and have more amenities.

Some dense wooden residential areas are not connected to any streets. Such areas are vulnerable to fire spreading and make fire fighting impossible. It is preferable to implement area development including both street construction and redevelopment of dense wooden houses areas

into earthquake-resistant and fire-resistant collective housings. In such areas, fire fighting water supply facilities are also to be developed.

The cities of Marikina, Pasig, Taguig, and Muntinlupa that lie along the West Valley Fault are likely to undergo severe building collapse due to their characteristics. These cities need to reinforce buildings, avoid dense urban developments near the fault, and control land use. And they also have to inform to the public about the high risk of earthquake disaster.

Because roads and bridges near the West Valley Fault have high risk of direct destruction by earthquake, it is imperative to consider alternative routes of major roads and bridges, and also the locations of emergency bridges.

Emergency communications and transportation at the community level are other issues to address. In particular, the efficient and smooth connection of roads within subdivisions and those outside is important in order to avoid isolation of communities and allow effective rescue activities.

Many high-rise buildings over 30 stories have been constructed along the arterial roads of Makati, Ortigas, and Roxas since 1990's. Since windows and glass of these buildings are estimated to fall off by a strong earthquake motion, preventive measures should be taken against such destruction.

17.3.6 Research Work

It is required to start formulation of regional disaster management planning in Metropolitan Manila, and take measures of disaster preparedness and mitigation using the JICA study results as one of the starting points.

At first, it is important to enhance earthquake activity evaluation. At this moment, activity of the West Valley Fault System is not being investigated yet. For the geological time-scale, probabilistic analysis of earthquake activity is to be undertaken. This directly affects improvement of structural seismic design code and also available time for earthquake disaster mitigation measures. Much more comprehensive seismicity evaluation and also trench excavation surveys of active faults should be undertaken.

As Metropolitan Manila continuously grows, counter-disaster measures are to be revised at an appropriate speed. Such revision is to be carried out according to collection and modification of basic data. Particularly, damage estimation and area risk analysis should be revised when basic data are available such as on buildings, daytime and nighttime population, land use, structural standards, and building codes. It is better for the relevant organizations such as NSO and PHIVOLCS, etc. to collectively revise the building classification so that such basic data can be collected during a census survey. The disaster mitigation plan should be revised by promoting researches on building structure and seismology and adopting their outcomes. Each local government articulates the barangay boundaries as census tracts and draws them up on the map of

unified coordinate system. Disaster mitigation plan should be drawn up based upon such basic data arrangement and research works. Also those activities which enable the relevant organizations to collectively respond to formulation of the disaster mitigation plan.

17.4 Emergency Response

This section discusses necessary subsector countermeasures in emergency response immediate after an earthquake disaster occurs, taking into consideration the existing emergency response capacity and resources of Metropolitan Manila.

17.4.1 Information and Communications System

At all levels (from national government, MMDA, cities, municipalities, and barangays), the relevant organizations lack information collection and communication system in an emergency. Military, police and fire services have individual radio communication systems, but it is confirmed that they will work in the event of a large disaster. In particular, in case of earthquake disaster, damage to power supply and communication systems would disable information transmission and communication through ordinary transmission lines for a long time. Therefore, it will probably be difficult to perform basic communication gathering of damage information of the disaster site properly and convey it to the relevant organizations or for issuing a rescue order. For instance, the existing communication system of the information center of OCD consists of only several PCs, fax machines and telephones, which does not have the ability to deal with an emergency situation. The MMDA traffic inspection center, on the other hand, has inspection cameras at about 20 places in Metropolitan Manila. Poor maintenance, however, prevents some of them from operating. Although fire services have equipped fire trucks with radio communication systems, fire stations are not assured to stand in case of a large earthquake and thus the effectiveness of the communication is questionable.

Cities and municipalities rely on ordinary communication systems and will have trouble in collection and transmission of disaster information. This is same with barangays. To solve this problem, it is necessary to establish disaster information centers and to develop a disaster information network using the centers as node that connects the relevant organizations and can operate in the disaster situation.

17.4.2 Fire Services and Countermeasure Against Hazardous Materials

1) Improvement of Water Sources for Fire Extinguish

In case of a large earthquake, hydrants probably will not work because of breakage of water pipes. Also, there is no earthquake-resistant fire cistern in Metropolitan Manila. It is necessary to provide earthquake-resistive cisterns of about 100 - 200 tons in parks, schools, sports facilities, etc. to improve the fire fighting capability. Furthermore, swimming pools of schools, sports

facilities, etc. are to be considered for alternative resources as well as natural water from the sea, rivers and ponds, etc.

2) Strengthening of Fire Stations

There are 124 fire stations and fire sub-stations in Metropolitan Manila, some 37% of which are found to be decrepit and will suffer from collapse in the event of a huge earthquake. Those constructed before 1995 would be damaged even in case of a medium-scale earthquake while the others constructed in 1995 and afterward are found to be sound. Accordingly they must be strengthened to be resistant to earthquake and fire. It is also required to construct new stations in the areas where there is a shortage of fire stations or fire sub-stations.

3) Increase of Fire Service Staff and Equipment

BFP of Metropolitan Manila is understaffed and under-equipped with fire fighting apparatus according to international standard, lacking 3,035 fire personnel and 231 fire trucks. To prepare for a disaster, it should allocate adequate fire service resource to the international standard, so as to respond properly to emergency like fire or earthquake disaster. Also, almost half the existing fire trucks, ladder fire trucks, and ambulances are poorly maintained and non-operational. To improve this situation, repair/maintenance shops should also be constructed.

4) Improvement of Barangay Fire Fighting Capacity

Because BFP's fire service capability is limited, barangays fire fighting capability is crucial. Some barangays use fire extinguishing water pump carts, portable pumps, and rescue first aid tools while only 141 barangays out of 1,694 barangays in Metropolitan Manila have fire trucks and other equipment. For reinforcement of fire fighting capacity of barangays, each barangay is minimally required to have a portable fire pump, a set of rescue equipment, and a set of ambulance equipment.

5) Countermeasures Against Hazardous Facilities

Hazardous materials and facilities like LPG, gasoline stands, gasoline stations, petroleum storage and sales facilities, facilities storing flammable chemicals, etc. have a high chance of causing fire in case of earthquake. To prevent fire outbreak and spreading, such hazardous materials and facilities should be regulated. LPG cylinders in households are to be made full tip-resistant. Gasoline stations should be constructed earthquake resistant. Although large facilities have been prepared according to the safety standard stipulated by the Philippine Fire Code, it is further required to revise the safety standard, provision of equipment, and improvement of management system of hazardous materials including staff training and drills.

6) Promotion of Inter-organization Coordination and Support

In the event of disaster, coordination and cooperation among the relevant organizations are required. For a smoother operation in the real situation, it is required for national and local governments, and the other relevant organizations and citizens to have joint committees, activities, trainings, and drills in peaceful times. In addition, an international assistance system also should be prepared for a larger disaster.

Detailed emergency plan is discussed in the following section.

17.4.3 Evacuation Route and Evacuation sites (Refugee Sites)

It is estimated that in a disaster, two to three million people will lose their houses by building collapse and fire. Therefore, it is indispensable to ensure an temporary evacuation site to accommodate these people. Because facilities such as schools, churches, barangay halls, etc. are preferable, it is better to implement earthquake resistant reinforcement of these facilities. Evacuation sites and routes should be publicly announced so that people know where and how to evacuate in emergency. Particularly, the risky areas near the Manila Bay with little open space need a detailed evacuation plan.

17.4.4 Measures against Tsunami

Tsunami is expected to happen when an earthquake occurs with the Manila trench as epicenter. The preliminary analysis concludes that 2 to 4-meter-high tsunami will possibly happen in the Manila Bay in case of an earthquake of magnitude 7.9. In case of the intermediate height of 3 meters, wide area along the Manila Bay is expected to be inundated. Small wooden housed along the shore have a high risk to be washed away. The tsunami is estimated to go upstream on the Pasig River and cause damage to riverside houses. Thus public announcement of risk and development of warning system should be considered. Moreover, it is also noted that the tsunami caused by the Manila trench would cause damage not only to Manila but also to the wider area of the west coast of northern Luzon.

17.4.5 Emergency Transportation Routes

Currently, no emergency transportation routes are designated. It is crucial to secure safe transportation routes for emergency transportation, rescue, and relief activities in case of a large earthquake disaster. Above all, it is pivotal to discuss the routes that link to organizations making important decisions, public facilities, hospitals, evacuation sites, ports, airports, etc. Bridges on the emergency routes should undergo a seismic examination to confirm safety. Emergency routes are to be decided taking into consideration the relation of fire spreading risk areas and the road network. Necessary measures should be taken so that the emergency routes will function safely.

Furthermore, Metropolitan Manila will need plenty of support and relief both from the other parts of the country and abroad. Accordingly, for that purpose, it requires staff, transportation of commodities, and storage spaces for the commodities and also available airports, ports, and road network.

17.4.6 Medical and Health Emergency Response

1) Institutional improvement

There seems to be less coordination and collaboration among the relevant organizations in medical and health emergency response. For example, MMDCC as well as DSO in MMDA has hardly been working to link inter-sectoral activities of its member agencies. Further institutional base for DOH-NCR to carry out its responsibility is virtually non-existent. The role of DOH-NCR is defined in the Calamities & Disaster Preparedness Plan, but it has little ability to manage the major catastrophe like earthquake in terms of human and physical resources. For a proper response in the emergency situation, the roles and functions, and responsibilities of the relevant organizations should be articulated as well as inter-organizations relations.

2) Strengthening of Physical and Human Resources

Looking at current capacity to respond to the estimated damages, search and rescue, Field Treatment, Hospital Care are severely lacking for the needs in emergency while Advanced Medical Post (AMP) settings for field treatment, and Disease Preparedness and mitigation and Sanitation are not so much lacking. The severely lacking capacities should be strengthen to meet the needs.

3) Zoning System to Facilitate LGU's Mutual Assistance for Response Activity

The existing zoning system of "S.T.O.P. DEATH" program of DOH, based on the location of DOH hospitals, may be totally impractical due to limited usable roads in case of earthquake, since most of the major hospitals are concentrated in the central area like Manila and Quezon. In addition, in the event of earthquake, responsible agencies will have trouble in deploying rescue and relief teams over the whole Metropolitan Manila area because of collapsed buildings and blocked roads. To avoid this situation it is preferable to group Metropolitan Manila area into six new zones for the purposes of rescue and relief activities in a mutually assisting way. The groups are: 1) Navotas, Malabon, Kalookan and Valenzuela, 2) Manila, 3) Quezon, San Juan, and Mandaluyong, 4) Marikina, Pasig, Pateros, and Taguig, 5) Makati and Pasay, and 6) Parañaque, Las Piñas, and Muntinlupa..

4) Establishment of Principle Operation Structure in the Area

In a disaster situation, smooth and proper treatment of victims is essential. To maintain the adequate flow of victims, the standardized flow of victims from rescued places to hospitals

through Advanced Medical Post (AMP) is crucial. The flow involves four vital emergency elements: 1) Community based response activity, 2) AMPs at sites, 3) Hospital care and 4) Logistics.

Community based response activity is carried out by health related players in community, who are of two categories: the one consists of local authorities and personnel and community groups, and the other local health personnel (LHP). AMPs disaster site will play the role of checking station between the communities and hospital to manage patient flow. Since not all the hospitals can provide surgical operations and in-patient care to earthquake victims, patient flow from AMPs to hospitals need to be controlled according to the hospital capability. Stock of medical consumables for at least 3 days is internationally recognized as the desirable preparedness for self-contained operation. While hospitals in MM generally possess medical consumables for a week and more in average, City Health Offices (CHO) and Health Centers do not stock sufficient consumables for surgical treatment. It is required to discuss how to sustain Community Health Activities in the event of earthquake disaster.

5) Environmental Health and Disease Preparedness and Mitigation

Although natural disasters do not always yield outbreak of communicable diseases, Environmental Health intervention needs to be started as soon as possible after the impact in parallel with medical relief activity. Every City Health Office should prepare a response and preparedness plan on Environmental Health and disease preparedness and mitigation activities with involving Health Center and Local Health Personnel. This topic also will be strongly linked with CBDM activities.

Detailed emergency plan is discussed in the following section.

17.4.7 Temporary Refugee Housings

Buildings seriously damaged and moderately damaged altogether account for about 480,000 in the case of the West Valley Fault earthquake, about 95,000 of which are squatter houses. It is assumed that squatters will soon build up their houses by themselves soon, but that 30% of the moderately damaged houses will not be habitable. This shows about 240,000 will not be habitable. In addition to building collapse, fire will destroy around 300,000 houses in the worst case. The total number of refugees, calculated as 7.49 persons per house, is about 2.25 million people. Any shelters like safe buildings, tents, etc. should be used temporarily to accommodate the refugees.

The cities of Manila, Quezon, Marikina, Makati, Muntinlupa, and Pasig, should prepare to accommodate such numerous refugees. Not only those cities but also other cities and municipalities have to prepare for a large number of refugees.

17.4.8 Emergency Assistance for Everyday Life

Measures should be discussed and prepared to support refugee daily life such as food and water supply, medicines, blankets, clothes and so on for their minimum standard of life.

17.4.9 Disposal of Rubble and Debris

According to damage estimation, seriously damaged buildings are calculated at 175,600 units. Moderately damaged buildings are counted at 348,000 units. If half of the damaged buildings are not suitable for living, then 174,000 units will be demolished. Totally, 349,600 damaged buildings will generate huge volume of rubble and debris.

If one building unit has 100 m^2 on average and debris weight is 750 kg per square meter (1 m^2), then one building unit will have 75 metric tons (75,000 kg). Total debris volume for these damaged buildings is calculated at 26.22 million metric tons. For the transportation of the debris, totally 2.622 millions of 10 t dump truck will be required. Disposal site of the debris should be discussed before hand.

17.4.10 Treatment of Corpses

Preliminary plan for the treatment of corpses should be discussed among the related agencies such as municipality government, MMDA, DSWD and religious agencies.

17.4.11 Peace and Order Keeping

Soon after the declaration of national disaster by the government, peace and order keeping activities will start by armed forces and police offices including transportation control, management of social violence and so on. Detailed peace and order keeping plans should be discussed before hand based on the earthquake disaster scenario.

17.4.12 Finances and Credits

Finance and credit services must be maintained at least at main offices of private and public or governmental bank in case of emergency. Safety system of financial services for emergencies should be discussed and necessary measures should be prepared.

17.4.13 Assistance Receiving System

Many countries will offer various types of emergency assistance to support the governmental activities for emergency management. In order to receive such foreign assistance smoothly, a receiving system should be discussed by the relevant agencies.

Chapter 18. Urban Spatial Components

CHAPTER 18. URBAN SPATIAL COMPONENTS

18.1 Identified Issues

18.1.1 Identified Issues from Regional Vulnerability Analysis

1) Marikina city and Pasig city may be isolated from other parts of Metropolitan Manila by building collapses.

2) Inner Manila City may be isolated from other parts of Metropolitan Manila by fire outbreak.

3) Fringe areas, where road network with certain width is not sufficient, will be the area of high evacuation difficulty even with only small number of buildings damaged.

4) Areas with large numbers of seriously damaged buildings, represented by the area along West Valley Fault System and old Manila area, will lose much of their usable roads.

5) Metropolitan Manila has higher comprehensive urban spatial vulnerabilities along West Valley Fault system and Manila Coastal Area when the force of the West Valley Fault System is applied.

6) Metropolitan Manila has possibility of four regional separations to East, West, South and North, taking account of the estimated vulnerabilities.

18.1.2 Identified Issues from Resource and Vulnerability Evaluation

1) North western part of Metropolitan Manila has the largest shortage of fire extinguish service; yet the area is highly distributed with fire prone buildings and industrial facilities with hazardous substances.

2) Areas along West Valley fault system and Manila coast have high evacuation facility shortage; the area will still have high evacuation facility shortage, if public schools are considered as evacuation center in case of calamity.

3) Areas along West Valley fault system and some part of Manila coast have high hospital service shortage; the area will have many injured people but the service coverage of hospitals are low.

4) Areas along West Valley fault system and Northern half portion of Manila coastal area have high shortage of evacuation area. Extra attention has to be paid for Northern half portion of Manila coastal area; the area is also identified as high flammability and thus, emergency evacuation is indispensable.

18.2 Key Directions

18.2.1 Key Directions for High Building Collapse Areas

Areas highlighted in Figure 14.2.4 Building Collapse, especially for cities of Marikina and Pasig need to focus on building resistant retrofitting. Efforts will target urban spatial development, represented by private building retrofitting and area development, together with supportive publication activities.

18.2.2 Key Directions for High Flammability Areas

1) High Flammability Areas

Areas highlighted in Figure 14.2.7 Flammability, especially for the old Manila city area, need to focus on fire control and management. Primary responsible group will be community and its members. Urban spatial development to fireproof structures is another direction to target for the long term.

2) High Fire Extinguishing Service Shortage Areas

The area shown in Figure 14.3.2, Fire Extinguishing Service Shortage Areas, indicating Northwestern part of Metropolitan Manila, is the area where primary fire control activity and effort is to be developed. Secondly, physical urban strengthening fireproofing can be considered.

18.2.3 Key Directions related to Evacuation

1) Evacuation Difficulty Areas

Areas highlighted in Figure 14.2.9, Evacuation Difficulty, indicate Metropolitan Manila fringe areas that need effort on urban spatial development primarily focusing on ways to securing roads for evacuation and accessibility. This will mainly be achieved by reducing the number of buildings seriously damaged, and, increasing the number of roads with certain width.

2) Evacuation Facility Shortage Areas

Area shown in Figure 14.3.4, Evacuation Facility Shortage, indicating areas along west valley fault system, is the area needing further attention on securing evacuation facilities. It is important to ensure alternate facilities other than public schools for this purpose, and also apply reinforcement on buildings for earthquake resistance.

3) Evacuation Area Shortage

Area shown in Figure 14.3.9, Evacuation Area Shortage, indicating areas along west valley fault system, is the area needing parks and open spaces. Since Northern portion of Manila coastal area has high possibility for fire outbreak, higher priority will be placed on development.

18.2.4 Key Directions for Hospital Service Shortage Areas

Area shown in Figure 14.3.6, Hospital Service Shortage, is the area needing promotion of reinforcement for hospitals for earthquake resistance.

18.2.5 Key Directions for Comprehensively Vulnerable Areas

Comprehensive regional vulnerability, shown in Figure 14.2.11, represents the area primarily needing to pay attention to development for disaster mitigation. At the same time, selected areas representing regional vulnerability characteristics, shown in Figure 14.2.10, are important to be understood by policy makers, urban planners, and community members to understand what type of vulnerability is involved in their environment. This may be utilized by the policy makers and urban planners, for development of appropriate projects by the possible type of impact. Advertising the existing possible vulnerabilities to community and its members is another direction to be supported.

18.2.6 Key Directions for Areas Possibly Separated

Figure 14.2.12 indicates that Metropolitan Manila will possibility be separate into four parts: East, West, South, and North. It is important to secure intra, inter and outer accessibility for each region with regard to emergency response. Additionally, each zone will have to reach its own the emergency response capability, both physically and socially.

18.3 Possible Measures

18.3.1 Measures for High Building Collapse Areas

- Strengthen or retrofit individual buildings to protect a number of buildings from collapse.
- Promote awareness on possibility of building collapse, and disseminate basic methodology to improve seismic resistance for the residents of the community.
- Introduce area redevelopment program to reduce building density and improve quality control, to protect areas with high building collapse possibility.
- Control and regulate further inappropriate development, such as extension of buildings to higher stories, or additional building construction, in the high building collapse areas.

18.3.2 Measures related to Flammability

1) High Flammability Areas

- Promote understanding of community members on the importance to reduce the possibility of fire outbreak by providing safety tips, such as utilizing safety valve for connection of hose and propane gas cylinder, and reducing use of kerosene.
- Develop systems and preparation activities for initial fire extinguishing, such as community network foundation and activity development, and formation of voluntary civil corps.

- Area improvement to reduce vulnerability to fire by developing better urban structures, by including larger open spaces and parks, water spaces, and green belts.

2) Fire Extinguishing Service Shortage Area

(1) Strengthening of fire control and management capabilities of the area

Promote community and its members to strengthen fire control and management activities. The following are possible measures:

- Learn and practice methods to cope when fire outbreaks
- Organize civil defense corps with the roles of public information dissemination, organizing fire drills, and take lead on fire extinguishing in certain circumstances

(2) Establish cooperation agreement with other areas

Establish cooperation agreement with other areas in terms of getting assistance in an emergency situation. Possible tie-up groups and organizations are the following:

- Administrative organizations such as cities or barangays
- Civil volunteer groups for fire fighting

(3) Reinforcement of existing fire extinguishing services

- Secure existing fire extinguishing resources, by reinforcement of fire stations and getting maintenance on equipment.
- Fully utilize the resources available at present, which means to strengthen the facilities and equipment to be used in an earthquake emergency.

(4) Strengthening of urban structures

Improve areas vulnerability to fire. Possible measures are the following:

- Redevelop high wooden and flammable building dense areas to become less flammable vulnerable areas.
- Introduce additional open spaces and parks to act as barriers to fire spreading.
- Develop plan for introducing flora or green belts, to reduce fire spreading possibility.

18.3.3 Measures related to Evacuation

1) High Evacuation Difficulty Areas

- Measures to overcome evacuation difficulty will not be effective in the short term, since the area covered is large and there is no budget to implement the measures. However, to mitigate the impact and reduce the possibility of building collapse and flammability is of primarily importance. Therefore, the priority measures are the components listed in the above section.

- Introduction of flammability measures to the area especially for Northern portion of Manila Coast is important, since this area has high flammability potential; thus, it is indispensable to secure a way to escape from fire to protect lives.
- Improve the spatial structure of the targeted area as the long time goal. This includes measures to strengthen the buildings along the roads, widen existing roads, and, construct new roads.

2) Measures for Evacuation Facility Service Shortage Area

(1) Develop "Bayanihan" or mutual assistance among the community members

Develop understandings and prior investigations on mutual assistance among community members, to accommodate neighbors who lose their homes in an emergency situation, or to introduce possible places to stay.

(2) Establish a cooperation agreement with other areas under the leadership by the administrative organizations, such as LGUs or Barangays

The following are the possible tie-up agencies and organizations:

- Private schools, which offer the use of their buildings.
- LGUs or Barangays in other regions, which offer assistance in accommodating homeless people
- Private entities, which offer assistance in places to accommodate people made homeless.

(3) Strengthen the existing evacuation facilities for being resistant to earthquake

Strengthen public educational facilities and other possible evacuation facilities to be resistant to earthquakes. It is important to minimize the loss of existing resources.

3) Measures for Evacuation Shortage Areas

(1) Plan and develop evacuation area for the region within the high flammable area, such as Old Manila area

Evacuation area is urgently needed for fire escaping purpose. Thus, it is important to develop an evacuation site within the high flammable area. The following are possible measures:

- Administrative bodies, such as LGUs and Barangays, need to investigate the existing available spaces for evacuation and notify residents about them.
- Administrative bodies, such as LGUs and Barangays, need to plan and develop additional parks and open spaces where they are lacking.

(2) Limit further development in open spaces and parks, and promote development of parks and greens for evacuation use in areas where shortage exists

Include limitation on further development in open spaces, and promote development of parks and open spaces in the CLUP prepared by the LGUs.

4) Measures for Hospital Service Shortage Areas

(1) Strengthen existing hospitals to be resistant to earthquake

Since hospitals will be the key actors in saving lives, reinforcement of the hospital resistance to earthquake is a primary measure. It is important to minimize the loss of existing resources.

(2) Develop understanding of community and its members on primal response for the injured

Community members need to develop system of primary response for the injured, by investigating alternate facilities which can act as medical treatment places. Resource and vulnerability analysis now targets only tertiary, secondary, and primary hospitals, but local medical treatment facilities, such as clinics or health centers, are alternatives to consider.

(3) Establish cooperation agreement with other areas under the leadership by the administrative organizations, such as LGUs

Establishment of cooperation agreement with other areas will be the responsibility of the LGUs. Considering the possibility of regional separation, it is important to include the results to find a tie-up area, and a method of transportation of the injured.

18.3.4 Measures for Possible Regional Separating Areas

(1) Securing transportation networks for intra, inter, and outer zones

1) Selection of priority roads for ***intra*** zone network. Selected roads will connect between the transportation hubs and important facilities of the zone.
2) Selection on priority roads for ***inter*** zone network. Selected roads will connect the 4 separated regions.
3) Selection on priority transportation network for ***outer*** zone network. Selected network will secure access from outside of the 4 zones. The following are the possible transportation networks:

- Zone MM North secures connection with Subic or alternate areas in North by road network
- Zone MM East secures connection with Batangas or alternate areas in South by river transportation through Laguna de Bay.
- Zone MM South secures connection with Batangas or alternate areas in South with the road network

- Zone MM West secures connection with outer area by sea transportation

(2) Securing basic emergency response and recovery system and facilities within the zone

Improve, develop, and construct emergency response related facilities within the zones. The following are the examples of important facilities for emergency response:

- Transportation hubs
- Food and supply storage buildings
- Open spaces and parks capable of being sites for temporary shelters and other activities

(3) Developing systems of intra, inter, and outer institutional cooperation system

Develop systems of intra, inter, and outer institutional cooperation system based on zones. It is important to establish cooperation networks together with the roles of key organizations, to manage the emergency situation logistically.

18.4 Damage Mitigation Assessment and Need for Application of Urban Re-development Procedures

18.4.1 Damage Mitigation Estimation on Fire

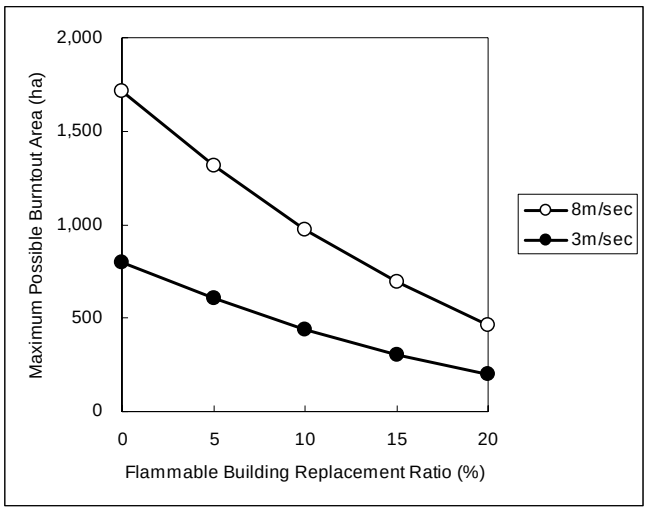
The volume of damage by fire is strongly affected by the distribution of flammable buildings. In this section, the effectiveness of replacement with flameproof buildings was verified by calculating the volume of fire damage with several replacement ratios of buildings.

The ratios used in the verification were 5%, 10%, 15%, and 20%. The building replacement pattern is assumed as homogeneous throughout the areas of Metropolitan Manila.

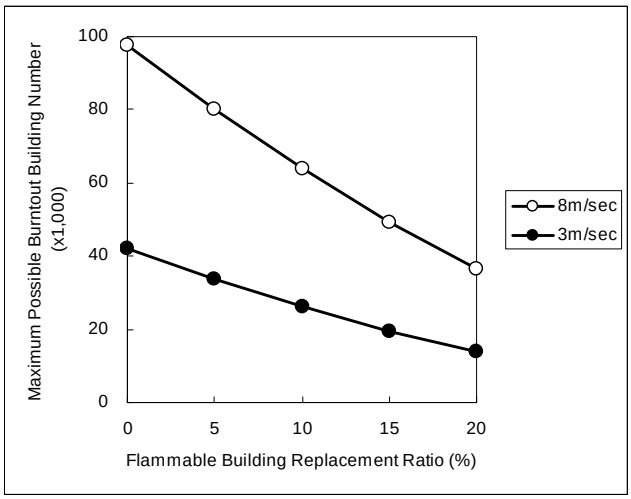
The results of this estimation are shown in Table 18.4.1 and Figure 18.4.1. The table indicates that with 10% replacement, the possible burned area will be one half of the current estimated area. With 15% replacement, burned buildings and the number of deaths will become one half of the current estimated numbers.

Table 18.4.1 Fire Damage Reduction by Flammable Building Replacement

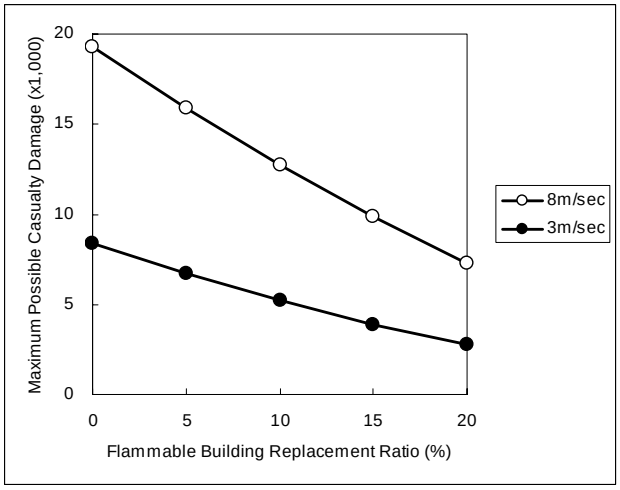
Replacement Ratio (%)	Maximum Possible Burnt Area (ha)		Maximum Possible Burnt Building Number (x1,000)		Maximum Possible Death Toll (x1,000) for Model 08	
	3m/sec	8m/sec	3m/sec	8m/sec	3m/sec	8m/sec
0	798	1,710	42.1	97.8	8.4	19.3
5	605	1,315	33.7	80.2	6.7	15.9
10	436	970	26.1	64.0	5.2	12.7
15	301	690	19.5	49.4	3.9	9.9
20	196	466	13.8	36.6	2.8	7.3



a) Maximum Possible Burned Area



b) Maximum Possible Burned Building Number



c) Maximum Possible Casualty Damage for Model 08

Figure 18.4.1 Fire Damage Mitigation by Flammable Building Replacement

18.4.2 Need for Application of Urban Re-development Procedures

Fire damage mitigation estimation shows the great effective reduction from flameproof renovation of buildings. Since the assessment only focused on converting the buildings to flameproof structure, further reduction of much of its vulnerability to fire and building collapse of the selected area can be achieved if urban re-development procedures are applied to selected areas.

Therefore, applying the urban re-development procedures to the highly vulnerable area in terms of both fire and building collapse is highly recommended for effectiveness. The concept of the urban re-development procedure is shown in Figure 18.4.2.

Figure 18.4.2 A Concept of Urban Re-development

The figure on the left shows the area condition before the urban re-development. Small and vulnerable buildings exist everywhere, with narrow roads. In such conditions, when the large earthquake occurs, buildings will collapse, fire will spread, and people will not be able to escape. Additionally, they will not have a place to evacuate to.

The figure on the right shows the procedure of applying urban re-development. First, the roads will be widened. This will have several effects: first is to act as a belt preventing fire spread, second is to act as a belt mitigating building damage, and third is to act as a passable road in the emergency responding stage. Moreover, the buildings located along the road will be strengthened in terms of fireproof and retrofitting. By applying this method, individual blocks within the area

will have their own increased resistance in earthquake impact. Finally, a disaster management center will be incorporated into the area. This center will act as the emergency responding center in case of urgent need. Under the normal conditions, this center will play an important role to expand the community disaster management activities and raise the community awareness about emergency situations.

Chapter 19. Buildings, Infrastructure and Lifelines Components

CHAPTER 19. BUILDINGS, INFRASTRUCTURE AND LIFELINES COMPONENTS

19.1 Buildings

19.1.1 Recommendations for Building Units

Through the damage estimation of buildings and human casualties, it was found that the ratios of heavily damaged buildings would be as much as 13 % in the Manila metropolitan area causing death tolls exceeding 34,000 people. Many people would be killed by the collapse of the buildings. The most urgent measures to reduce these damages to buildings are: (1) demolishing, (2) rebuilding and (3) strengthening and/or retrofitting existing buildings. Demolishing and rebuilding requires much cost to actually implement. Therefore, the strengthening and/or retrofitting are recommended. For the newly constructing buildings, there are several items that should be taken account. These items are also discussed in this chapter.

1) Strengthening the existing buildings

For Wooden buildings: Ordinary wooden buildings in Manila lack sufficient wall panels and sometimes are composed of independent wooden columns connected to wooden beams. In order to increase the strength of these buildings, it is effective to increase the wall panels and/or add the bracings between columns. Before the strengthening work of columns and walls, the foundation strength should be also improved.

For the fire protection from outside, fire protective materials such as mortar should cover the wall surface of each wooden building. If the roof of these wooden buildings is already equipped with fire protective materials such as Galvanized iron sheet and/or ceramic tiles, fire protection should be solely considered for the wall surface.

Cost of these strengthening works is acceptable in comparison with the construction of new buildings.

For Concrete buildings: Vulnerability of residential concrete buildings is attributed to the lack of strength and ductility of the structure. CHB walls are often used for the partition walls as well as outer walls, both of which cause the early brittle failure of concrete columns when an earthquake hits. In order to increase the strength and ductility of concrete buildings, wrapping of concrete columns by steel plate and sizing-up of concrete columns by reinforcing concrete are very effective methods. Substituting the CHB wall by a concrete wall is another method to increase the strength. It is estimated based on the list of unit cost rates, that the approximate cost of these strengthening works will require approximately 10,000 pesos per cubic meter concrete considering the temporary support and formwork as of 2003, although this varies depending on the conditions of the construction place.

For ordinary residential buildings, which have so many masonry H.C.B walls that it is difficult to substitute RC walls, some techniques proposed by Nepal Society of Earthquake Technology (http://www.nset.org.np/pdfFiles/Flier_retrofit.pdf) shown in the Figure 19.1.1 can be applied to Philippine practice, namely,

A. Very long unsupported walls can collapse out of plane during seismic event. Horizontal bands of steel bar mesh reinforced micro-concrete can resist such failure.

B. There may be virtually no connection between two perpendicular walls due to construction practice. That leads a very weak earthquake resistant system in wall connections. Stitching can be inserted as shown in Figure 19.1.1 to strengthen the wall corners and prevent wall separation.

C. Vertical reinforcement from foundation to roof at corners and T-joints and reinforcement around openings can protect the building by preventing the initiation of cracks from these weak points.

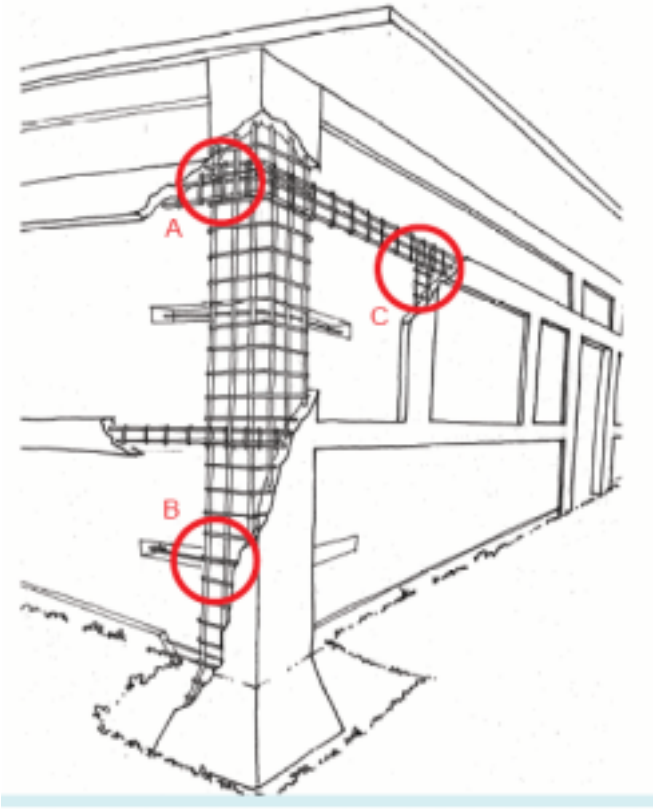


Figure 19.1.1 Proposal for Retrofitting Techniques

2) Designing and constructing the new buildings obeying the law

Lack of Law abidingness: Although the building code (National Building Code of Philippines: NBCP) regulates in detail with reference to the accompanying code of National Structural Code

of Philippines: NSCP) how the design and construction should be done, the owner of the ordinary residential building (especially with small scale) often does not pay full attention to those specified codes. They often lack law abidingness even if they get a building permit from the local government. Also, structural planning expressed in the design drawings may be rather inappropriate. Structural layout is sometimes improper. Size of columns, beams and walls are rather smaller than those specified in the structural code. Sometimes, the structural drawing itself is not issued or ignored.

In the construction stage, the owner rarely hires professional skilled persons for the construction. Therefore, very often the constructed building lacks quality in almost every aspect. For instance, mix of cement, coarse aggregate, fine aggregate and water is not proper. Placement of reinforcing bars is sometimes ignored or decreased. Curing of the fresh concrete is sometimes dependent on the site conditions. These quality control deficiencies result in improper buildings causing damages not only at the time of earthquake but also during the passage of time.

Since examples of ignoring the codes demonstrate lack of law abidingness, it is therefore required to enhance the law-abiding minds of those involved in the construction industry regardless of its scale.

3) Cost of seismic capability enhancement for the building

As of August 2003, construction cost for buildings is described below (Table 19.1.1) after consultation with a private consulting firm.

Table 19.1.1 Construction Costs for Buildings

	Description of Work	Unit	Unit Cost on Average (pesos)
Earthwork	Structural Excavation, Backfilling & Compaction, Gravel Bedding, Disposal of Soil etc	m^3	160
Formwork	Sub-Structure for Footing, Super-Structure for Columns, Beams and Walls	m^2	600
Concrete Work	Lean Concrete, Sub-Structure Concrete, Super Structure Concrete including Labor	m^3	2500-4000
Rebar Work	Reinforcing Steel Bar(Material) and Related Labor	kg	36
Structural Steel Work	Roof Trusses including Accessories	kg	60
	Secondary Ceiling Support	m^2	400
Masonry Work	150mm CHB including Rebar	m^2	560
	100mm CHB including Rebar	m^2	520
Plastering Work	Interior and Exterior Plaster Finish	m^2	240
	Plaster on Columns/Window Opening	m	110

Notes: Above unit rates include overhead expenses. Source: A Private Consulting Firm

Based on the unit costs above, the structural cost of a concrete building with 100 square meters (10m x 10m) is between 350,000 and 500,000 pesos. This construction cost is only for vertical loadings. However, according to the Japanese experience, consideration of horizontal loadings (such as by earthquake) does not result in much larger cost. The necessary cost to withstand earthquake force would be at maximum 10% or more than the cost for the vertical load.

Therefore, it is strongly recommended that the buildings for the residential purpose should be designed and constructed taking account of the importance of the enhancement of seismic capabilities.

19.1.2 Recommendation from Building Engineering Viewpoint for Urban Planning

1) 2-1.Upgrading of public buildings

Figure 19.1.2 conceptually shows various retrofitting methods for building structures. As shown in the schematic figure, the objectives of these methods to improve and upgrade the seismic performance are as follows: (1) to increase the strength of the structural members, (2) to increase the deformability of the structural members, and (3) to change the vibration characteristics of the structure. For instance, adding buttress and/or shear wall is utilized in order to increase the horizontal strength of the whole structure while adding base isolation device is utilized to change the fundamental period of the structure. Photo 1 shows examples of retrofitting works in a building where concrete wall is added between open frames. Figure 19.1.3 schematically shows examples of these retrofitting methods.

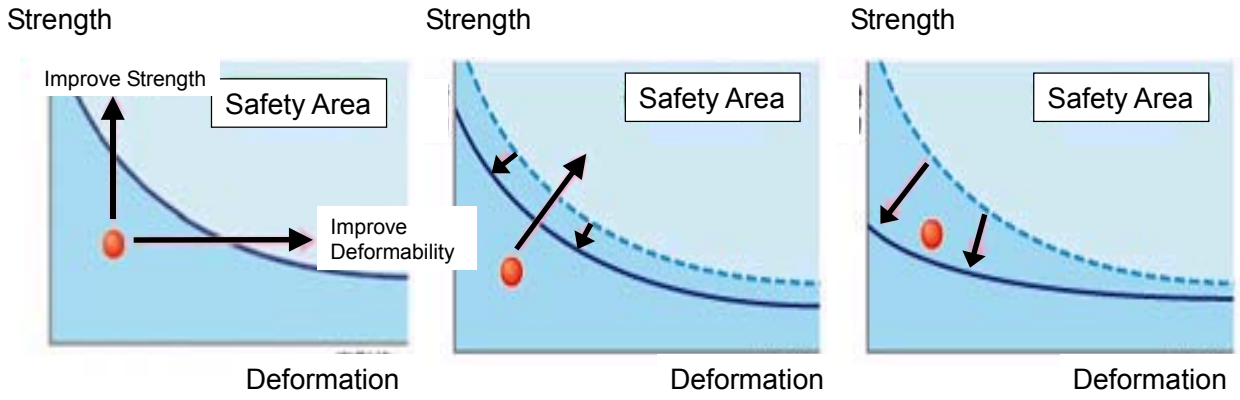


Figure 19.1.2 Methods for Improvement of Structural Member

Photo 1 Additional Concrete Wall Installed at the Ground Floor

Under the present situation in Philippines, the upgrading method for the public buildings is to increase the size of existing columns by placing reinforcing steel bars making the formwork, then pouring concrete. In this manner, sizing-up of concrete columns results in high strength and high ductility. Another upgrading method for public buildings is to construct a new reinforced concrete wall between the columns.

The cost for upgrading the building would be 10,000 pesos per cubic meters, the same as in case of residential buildings.

Besides these two upgrading methods, other methods are considered for the upgrading of public buildings, which are shown in the Figure 19.1.3.

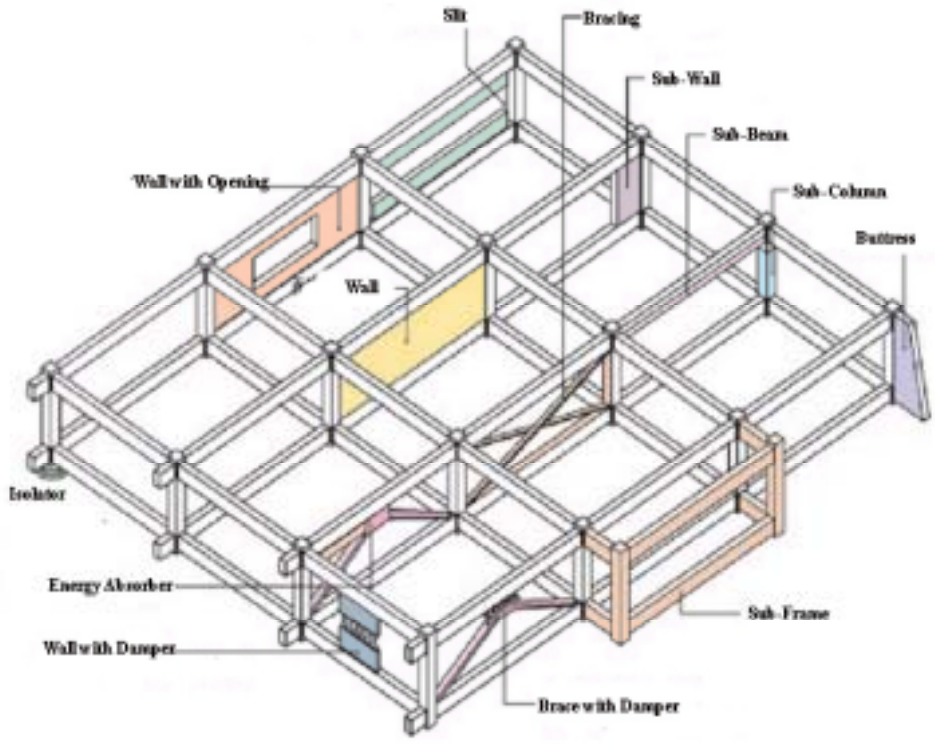


Figure 19.1.3 Various Methods for Retrofitting of Building Structures

The figure above shows various retrofitting methods for buildings. The engineers have to choose the most suitable method for their objectives. Presently in Japan, various dampers are utilized as the earthquake-energy absorbers. They are used to adopt oils, special steels and other industrial material. Some energy absorbers are available with control by computer system.

2) Considering the priority

The priority of the upgrading and/or retrofitting of the public buildings must be decided by considering the vulnerability of the building plus expected roles and functions of the buildings when an earthquake hits. In making the policy for the priority, the disaster coordinator should have sufficient knowledge on the diagnosis of building performance in case of an earthquake. Technical persons in engineering firms in metropolitan Manila have studied the diagnostic method for the existing buildings. On the other hand, the responsible persons in charge of risk management plan should decide the roles and functions of the public buildings at the time of earthquakes.

3) Making the Framework for Proper Building Design and Construction

The present supply situation of buildings in Philippines is not complete especially for ordinary residential buildings. Enforcement of the law governing all the aspects in design, construction and maintenance is urgently necessary. However, law alone cannot solve the present situation. It is necessary to establish a framework for the building industry. The overall framework and improvement measures are outlined below.

4) Improvement Measures for Building Design and Construction

For the countermeasures for earthquake disaster mitigation with respect to building design and construction in the metropolitan Manila, JICA study team recommends several long-term measures. It may need several years to materialize these recommendations,. However, these recommendations, once materialized, will produce effective results without large financial expenses from the government.

(1) Institutionalization of Process of Building Design and Construction

As stated in the previous description, there are limited governmental institutions to check the construction quality of buildings. Enforcement of the law for construction approval is not implemented well. Therefore, much stronger institutionalization on design and construction of buildings is recommended. Necessary governmental or private institutions responsible to check and review all the design and the construction process must be established. Empowerment of existing related institutions such as building officials in the LGUs is required for the institutionalization. All these institutions must have a close collaboration in order to share the

information daily. Shared information can be used for the disaster-oriented activities. Figure 19.1.4 shows the relationship of these institutions and their functions.

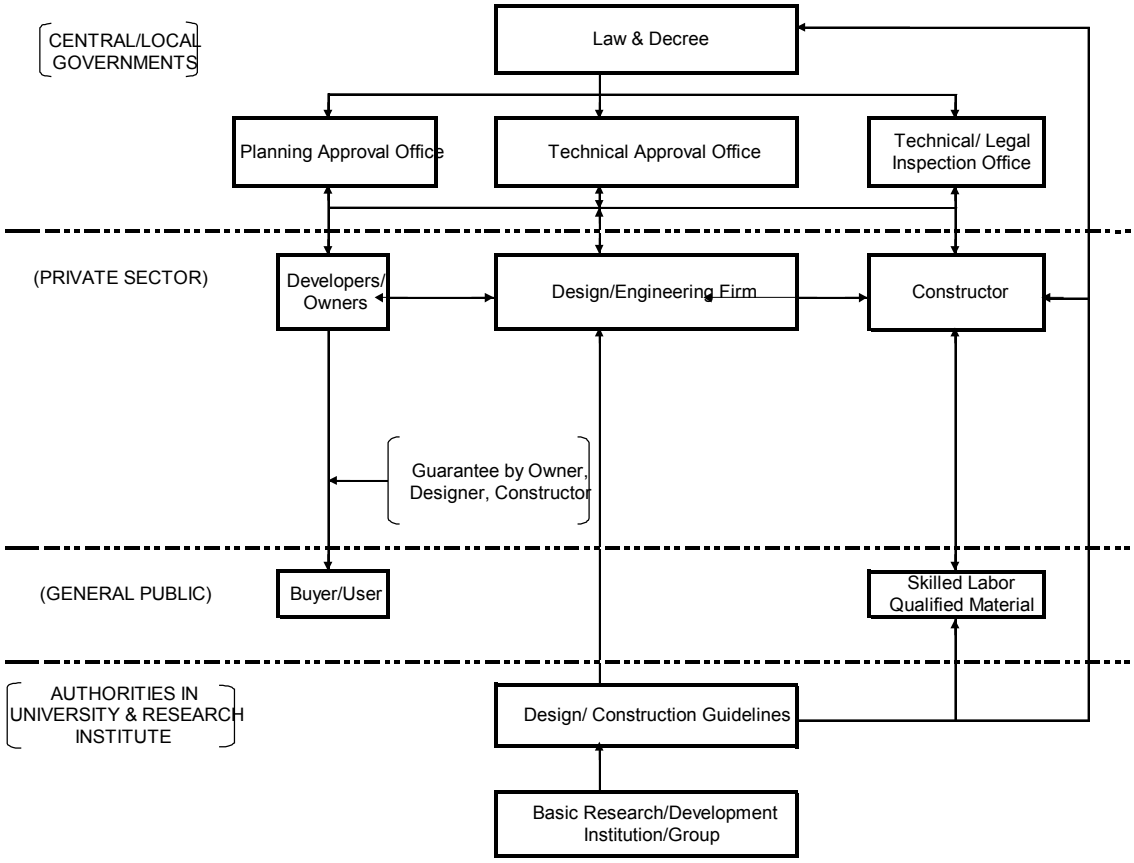


Figure 19.1.4 Institutionalization for Qualified Building Design and Construction

(2) Upgrading of Seismic Design Regulations

The present Philippines seismic codes should be reconsidered. Design earthquake forces specified in the code may be too small for the newly designing buildings to withstand future possible near and medium term earthquakes in comparison with the Japanese code. This is because large ductility is applied to the structure. For instance, in case of concrete structure, although the detail of the column and beam connection does not allow high ductility factor, the code specifies the value even up to 8.5. The ductility of this grade is not assured even in Japanese practice.

(3) Training System for the Skilled Labors

As the quality of the constructed buildings relies on the skill of individual workers, supervisors of the construction site holds heavy responsibility. In order to improve these situations, some

training system is necessary similar to driving school. If training is stipulated for the construction workers, almost all construction techniques by workers would be upgraded.

(4) Enhancement of Research and Development on Structure

In Manila, CHB is major cheap construction material. Almost all the items stated in the present regulation in relation to CHB are not based on the Philippines own technical accumulation, but are introduced from foreign experiences. Structural tests using CHB material are very few. For the concrete structure, the research and development that is applied for the actual construction works is also very rare, although there are many opportunities for improvement both in designing and constructing. Therefore, research and development to upgrade and improve the seismic performance of this material is necessary in the related institutions and universities where these research activities seem possible from an engineering viewpoint.

For example, in Chinese seismic code, it is mandatory that reinforcing bars should be placed in order to connect the masonry wall and adjacent concrete columns as shown in the Figure 19.1.5. By applying these techniques, the overall strength of column and wall is expected to increase up to twice that of the conventional column and wall. In Japan, there are some researchers in a university that are doing these developmental investigations. It is hoped that, in Philippine institutions, similar projects focusing on upgrading the building structure would be initiated as well.

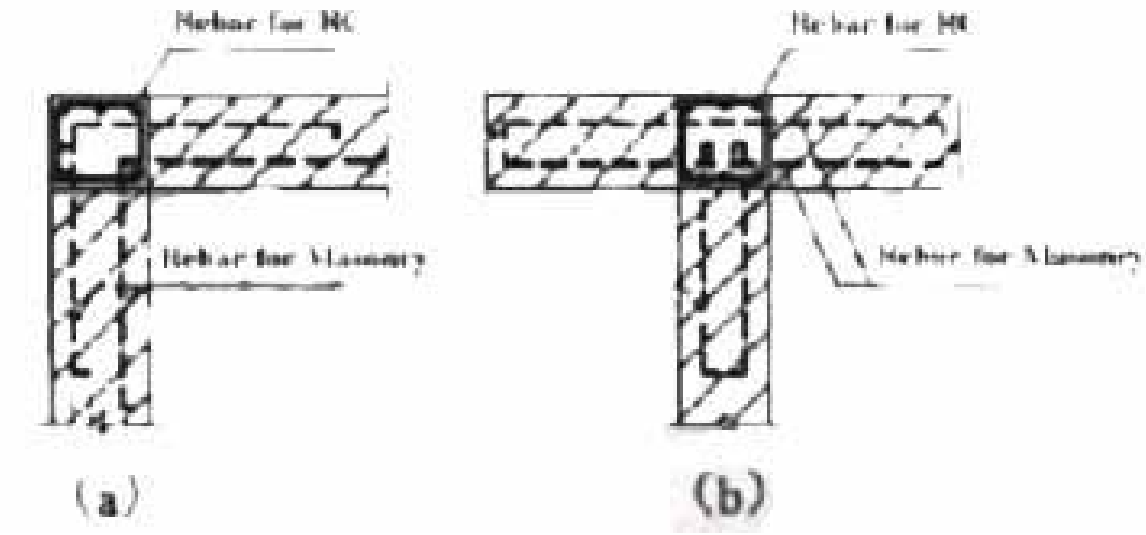


Figure 19.1.5 Improved detail of Masonry Wall and Adjacent Columns

19.2 Infrastructure

Infrastructure consisting of roads, bridges, ports, airports, etc. functions to make life traveling for one place to another convenient, as well as transporting goods. In case of a big earthquake, even if the emergency operation plan is well developed for emergency relief and rescue activity, these activities cannot be operated without infrastructure. Therefore, maintaining or securing infrastructure is crucial to avoid delay of emergency activities, which will be necessary right after an earthquake. In this section, characteristics of damages caused by past earthquakes are explained to show how earthquakes affect each infrastructure, and recommendations or strengthening methods are introduced for future development. It is once again to be emphasized that infrastructure must be strong enough to withstand an earthquake to avoid secondary disaster which will be caused by delaying of emergency activities.

19.2.1 Road

1) Characteristics of Road Damage

Road Damage against Earthquake can be categorized as shown in Figure 19.2.1 into four major types of damage: 1) Direct Damage to the Structure caused by Seismic Motion, 2) Damage caused by facilities by the roadside, 3) Damage caused by aerial dedicated facilities, and 4) Others.

Direct Damages are represented by road surface damage, bridge damage, etc., which will cause physical malfunction to the road network and will take time to recover. This should be prevented as a first priority.

Underground pipes and collapse of roadside structures represent damages caused by facilities at the roadside. Underground pipe damage (such as to water pipes) will cause subsidence of the road, and collapse of roadside structures will cause road closure.

Damages caused by aerial-dedicated facilities are represented by damage to utility poles and building damages. Fallen debris from the damage will result in closure of roads.

Other damages are represented by Submergence, Fire, etc. They will interrupt the flow of vehicles for all emergency activities.

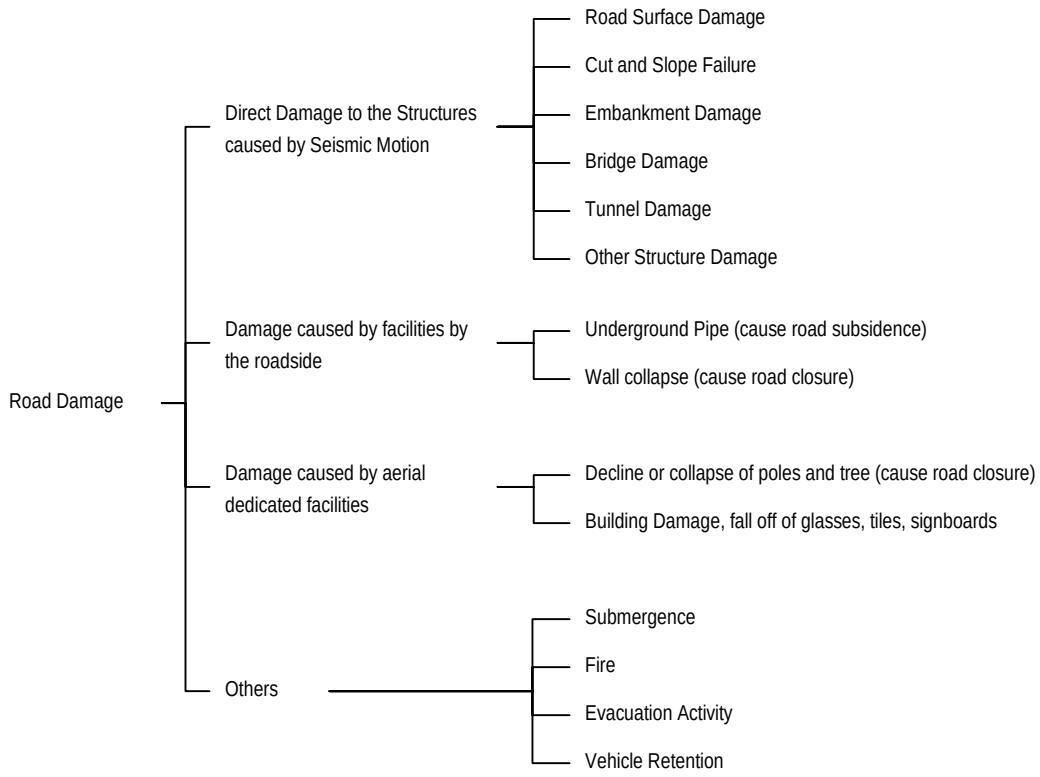


Figure 19.2.1 Characteristics of Road Damage Against Earthquake

Road network is an important infrastructure, which maintains citizen's life and economic activities. Therefore, once the road function is damaged, it will greatly affect emergency and recovery activities in the disaster-stricken area. Moreover, effect of road damage will not be limited to disaster-stricken area and may spread to other surrounding areas. Strengthening of road network is indispensable and it is necessary to put the appropriate effort on it.

Among the road facilities, bridge collapse will create the most serious malfunction of road network. Therefore, strengthening method is explained in detail in the following section.

2) Damage Characteristics observed in the Great Hanshin Awaji Earthquake in 1997

In case of the Great Hanshin Awaji Earthquake, among roads managed by national and municipal government at totally 230 points, hypofunction of transportation occurred. Road damage which caused hypofunction of transportation was bridge related damages, and damages to road surface and surrounding facilities, which occupied 67% (155 points), and effects other than road structure damages occupied 33% (77 points). Among the damages other than road structure damages, especially dedicated roadside facility such as utility poles, buildings damages occupied 62% (48 points). Moreover, based on the research on relationship between road damage, which will cause hypofunction of transportation, and ground acceleration, road

damages start occurring after seismic acceleration of over 250 gal, and if seismic acceleration reached over 600 gal, effective points increased rapidly.

Considering the case of Metro Manila, if the above figures are taken into account, the results are shown in Table 19.2.1. In case of Scenario Earthquake 08, 100% of area in Metro Manila exceeds 250 gal of PGA and 34.7% of area exceeds 600 gal. To avoid serious damage by earthquake, urgent measures should be taken now.

Table 19.2.1 Possibility Effects to Transport Function in Metro Manila

Scenario Earthquake	08		13		18	
PGA Scale	PGA exceed 250 gal	PGA exceed 600 gal	PGA exceed 250 gal	PGA exceed 600 gal	PGA exceed 250 gal	PGA exceed 600 gal
No. of Grid	2621	910	457	0	1152	85
Damage (%)	100.0	34.7	17.4	0.0	44.0	3.2

Once road damage occurs, it will greatly affect rescue and recovery activity in the disaster area together with human daily life. Furthermore, the effect of road damage will not limited to the disaster area and it has possibility to spread into remote areas other than disaster stricken area. Especially, highways which are a nationwide network, when they are damaged, extensive detour or no access will greatly affect daily life and economic loss will occur.

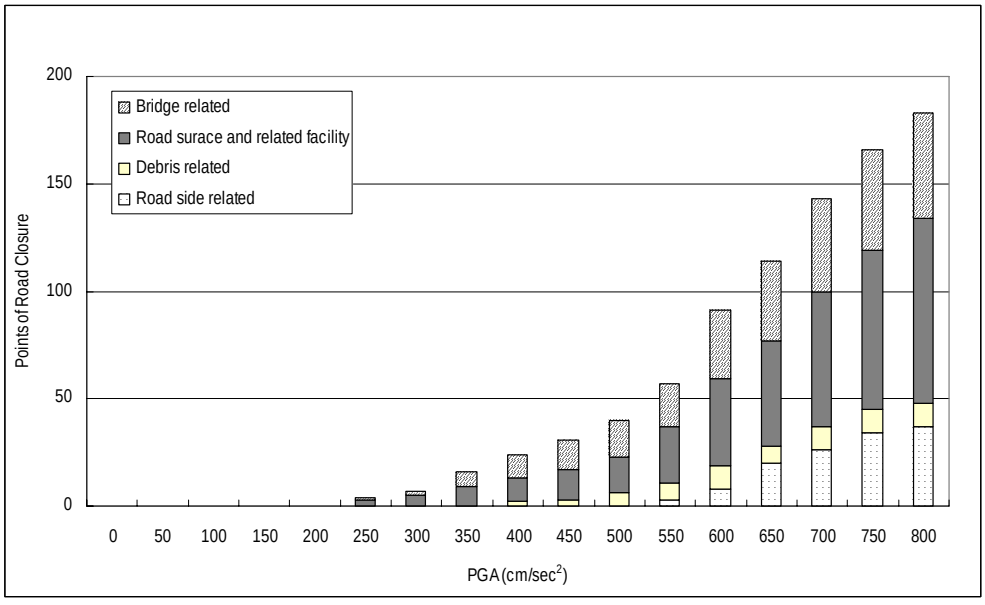


Figure 19.2.2 Relationship between Road Damage and Ground Acceleration

Source: Japan Road Association, 2002

3) Strengthening of Road Structure

Concerning emergency activities triggered by earthquake disasters, maintaining safety of an emergency road network is indispensable. If any part of the network gets blocked, this network will not function and any rescue, repair, and transport activities cannot be carried out. Therefore, the road network must be securely maintain its connectivity in the system. Road network cannot be considered only by itself because in this network node facilities such as bridges are included. Collapse of bridges directly effect the function of road network. Therefore, road network must be considered together with bridge structures.

19.2.2 Bridge

As mentioned in the previous section, to maintain road network, collapse of bridge structures must be avoided. DPWH put great effort into retrofitting of bridge structure and still continuing to strengthen the structures. However, considering scale of earthquake estimated in “Scenario 08”, revision of retrofitting will be necessary. Regarding the bridges estimated, as “Large Probability and Moderate Probability”, detail investigation of structure must be undertaken to avoid collapse of these bridges. In addition, bridges along access road to Manila ports and NAIA must be investigated in detail to secure connectivity to such facilities.

1) Characteristics of Bridge Damage

Collapse of bridges will greatly affect the road network and reconstruction of bridges will take an extended period of time. In the past earthquake experiences, the following characteristics of bridge damage were observed.

1) Damage to superstructures
2) Damage to abutments (Collapse)
3) Collapse of superstructures, and etc.

In Japan, highway bridges are designed applying “Specifications for Highway Bridges”. This specification were prepared to resist the earthquake similar to the Great Kanto Earthquake (M7.9) in 1923; however, numbers of bridges collapsed in Great Hanshin Awaji Earthquake (M7.2) caused by unexpected large horizontal seismic force that exceed the design of bridges. After the earthquake, the specification was revised and large numbers of bridges were retrofitted.

2) Strengthening Method of Bridge Structure

There are two major parts in bridge structure: one is superstructure such as girders and the other is substructure such as columns. Recently, effective method against earthquake were introduced and effects evaluated. In this section, this strengthening method will be explained as a sample method for the future strengthening of bridge structures.

Figure 19.2.3 shows typical types of strengthening methods widely used in Japan.

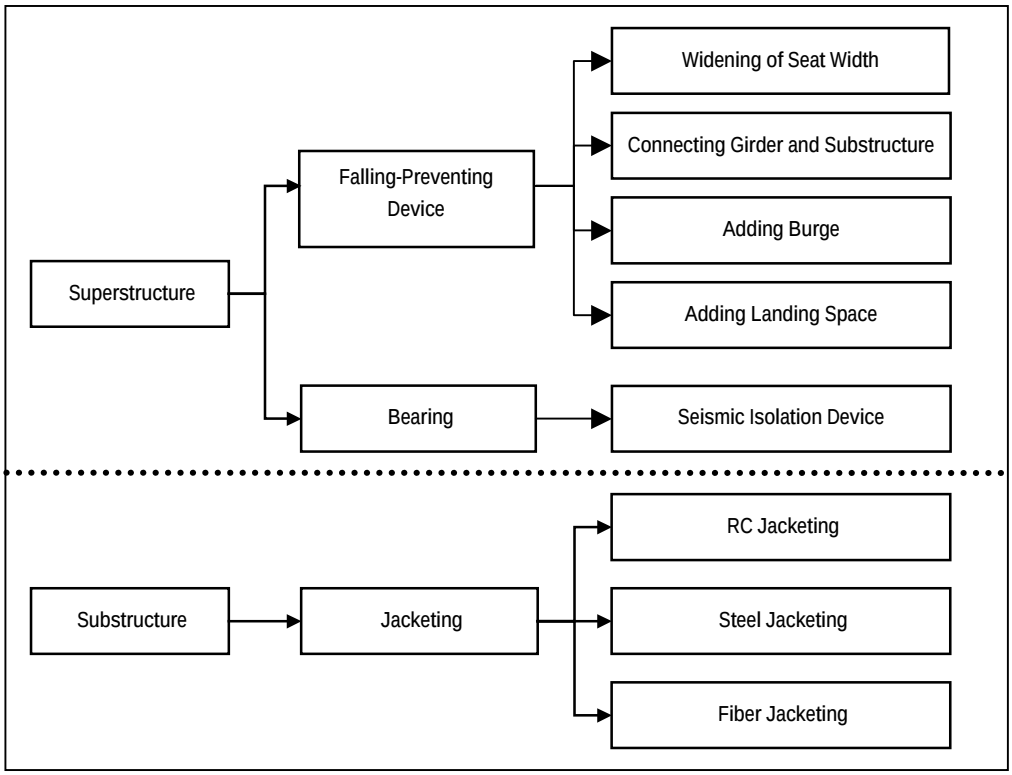


Figure 19.2.3 Type of Strengthening Method for Bridge Structure

(1) Strengthening Method of Superstructure

A.Falling-off Device System

Basically, the principle of strengthening is to prevent fall-off of superstructure, and there are three types of strengthening as follows:

1) Extension of seat width on pier cap
2) Control of relative displacement between girder and pier/abutment
3) Control of relative displacement between girder and adjoining girder.

As mentioned before, the worst case of bridge damage is the falling-off of the girder. A bridge can resume emergency activities, if the falling-off of the girder is prevented.

Emergency activities can be maintained by covering the void between the girder and adjoining girder with steel plate and asphalt, even if the edge of the girder was destroyed by excessive displacement under earthquake motion.

Even if serious cracks appear on the pier and the load carrying capacity is reduced, supporting the girder with saddle can give the next best solution for urgent use.

Figure 19.2.4 shows a schematic drawing of “Falling-off Prevention System” widely used in Japan.

Figure 19.2.5 explains the effect at each stage of the earthquake intensity. Figure 19.2.6 shows an example in which relative displacement between the girder and adjoining girder is controlled by damper with specially equipped viscous material.

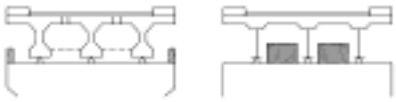
					Material	Schematic Configration	Remark
Regarding longitadinal direction	Widening of Seat width				R/C or Steel plate		Adding Bracket
	Fall–off prevention device and Relative displacement control	Fall-off prevention device	Connecting device between girder and adjoining girder		P/C Strand or Steel chain		
		Connecting girder and substructure	Abutment	Connecting girder and parapet			
				Connecting girder and Substructure			Attach to girder side or under surface
			Pier				Attach to girder side or under surface
		Bulge	Bulge on substructare		R/C or Steel plate		
			Conbination of bulge				
Transrerse direction			Bulge on substructure				Outside or inside of girder
			Conbination of bulge				
Adding of landing space			Landing space on substructure				

Figure 19.2.4 Typical Samples of "Falling-off Prevention System"

Source: Japan Road Association, 2002

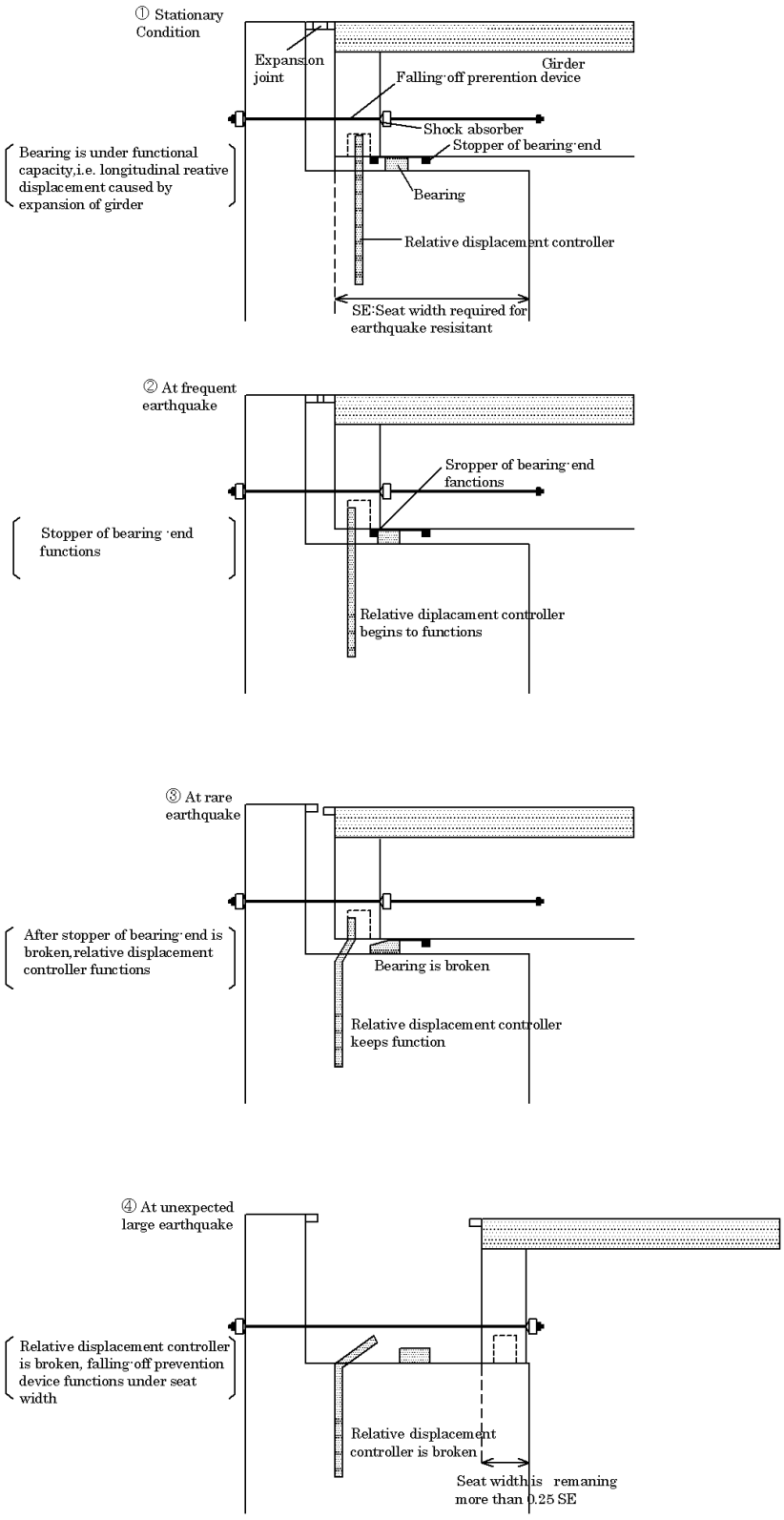


Figure 19.2.5 Explanation of the Effect at Each Stage of the Earthquake Intensity

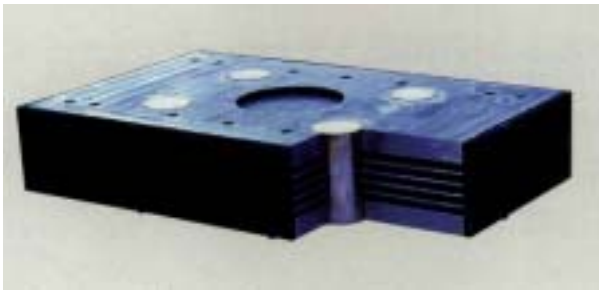
Source: Japan Road Association, 2002

Figure 19.2.6 An Example of Displacement Controlling by Damper

(2) Bearing

Replacement of bearing to seismic isolation device is very much effective to control horizontal movement of girders.

Figure 19.2.7 shows an example of seismic isolation device and Figure 19.2.8 shows behavior of seismic isolation device compared to the ordinary type of bearing.



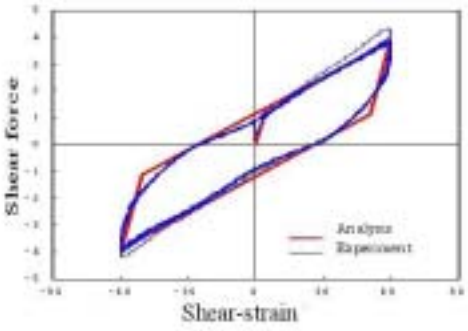


Figure 19.2.7 An Example of Seismic Isolation Device (Lead Rubber Bearing)

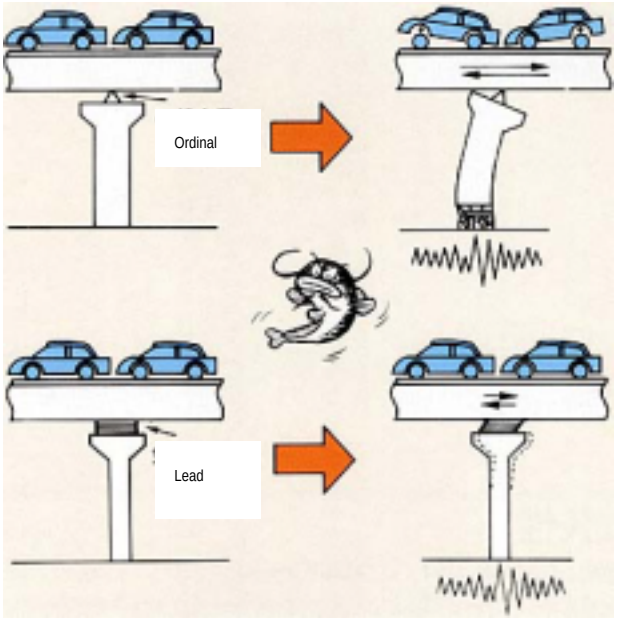


Figure 19.2.8 Behavior of Seismic Isolation Device

(3) Strengthening Method of Substructure

Typical strengthening method of substructure is mostly represented by a method called "Jacketing." The system is quite simple and it is basically wrapping up the column by various materials. There are typically three types of jacketing system used in Japan as indicated in Figure 19.2.8

Firstly, "RC Jacketing" newly allocates bars and creates an additional wall around the existing column. Secondly, "Steel Jacketing" is rendered between the existing column, placing mortar and covering with steel plate. Lastly, "Fiber Jacketing" is wrapping up with fiber string or sheet over existing column and applying a finisher on top of it.

This method is very much effective to avoid buckling of columns.

Figure 19.2.9 to Figure 19.2.11 show an example of each jacketing method with sample pictures.

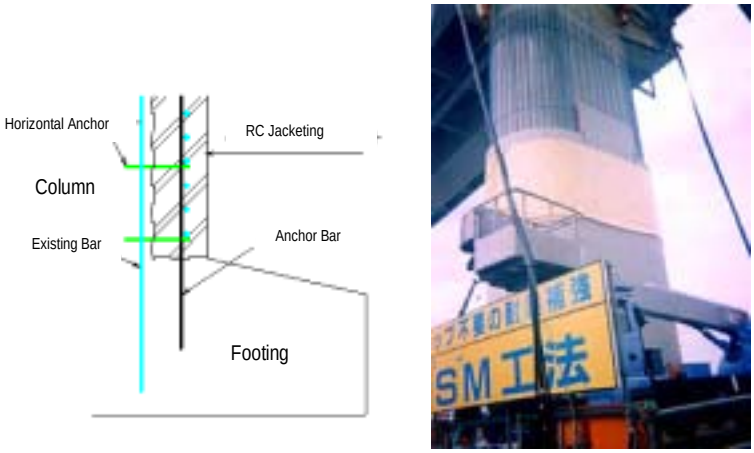


Figure 19.2.9 Example of RC Jacketing Method

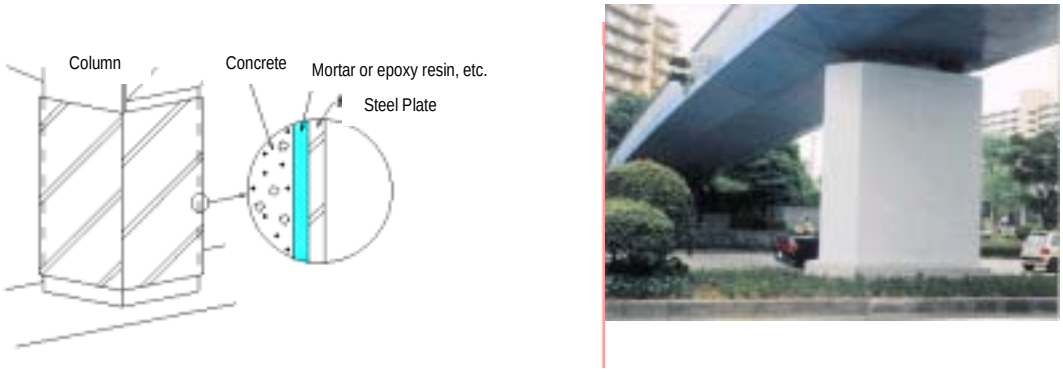


Figure 19.2.10 Example of Steel Jacketing Method

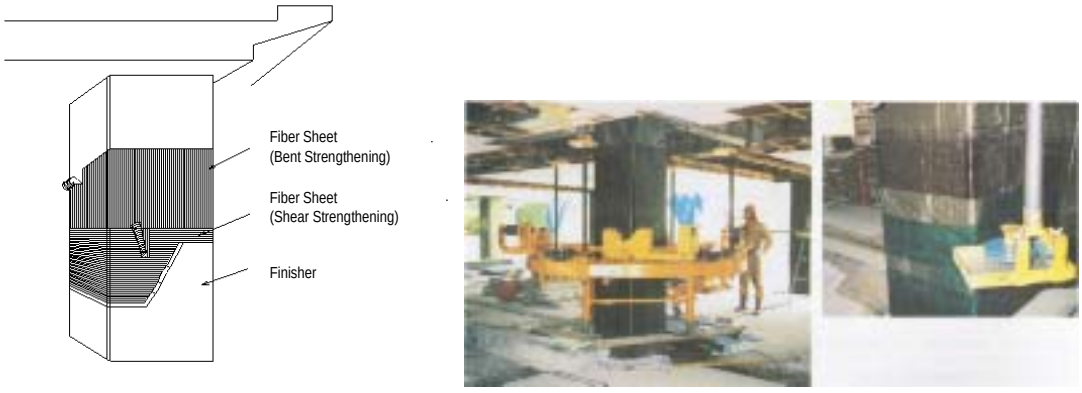


Figure 19.2.11 Example of Fiber Jacketing Method

19.2.3 Airport

Other than ordinary functions of an airport, after being stricken by an earthquake, an airport facility takes on important roles to implement prompt and effective emergency activities. Therefore, airport facilities must be strong enough to avoid unexpected dysfunction of their functions. The role of an airport after an earthquake is summarized as follows:

1) Acceptance of emergency relief teams and relief goods from abroad
2) Domestic transport terminal alternative to land transport
3) Temporary storage of relief goods
4) Treatment and transport of debris and garbage
5) Temporary housing area

To pursue the roles mentioned above, a manual to make coordination with NDCC must be prepared and responsible persons must be assigned in advance.

1) Characteristics of Airport Damage

In past experiences of earthquakes, airport damages were reported; however, there were no critical damages, which cause total malfunction of airport. Types of damage are summarized as follows:

1) Slight damage to passenger terminals
2) Slight damage to control towers
3) Irregular displacement of pavement between taxiway and runway
4) Damage on surface of runway and taxiway caused by liquefaction

In case of Loma Prieta Earthquake that occurred in 1989 in San Francisco, most of damage was limited to minor damages, and details of airport damages were mentioned as follows.

San Francisco International Airport was unable to operate for a period of 13 hours because of a power failure and superficial damage to the control tower such as falling ceiling tiles and several broken windows. The passenger terminals all suffered cosmetic damage, with falling ceiling tiles, video monitors, and interior design elements. The International Terminal had minor flooding, and the North Terminal major flooding as a result of sprinkler heads shearing off and other piping breaks. One of the cargo terminals suffered severe damage and was closed as a collapse hazard. Other than this terminal, the damage was quickly repaired and the airport was back in operation the following day.

The major damage at Oakland International Airport was to the runway: 3,000 feet of the 10,000-foot runway became unusable. The apron and turnaround area had extensive cracking, but remained usable. The water main ruptured. Terminal One, an older building, had damage to the

structural members supporting the concourse. Terminal Two, built in 1985, suffered only cosmetic damage, mainly cracks in the corridor walls.

San Jose International's control tower had minor window damage, and a water line ruptured causing minor flooding in one parking area. The airport was able to continue functioning on emergency power.

2) Measures to Strength Airport Facilities

To secure the safety of airport facilities, DOTC and MIAA must take necessary measures to prevent damages caused by earthquake. Moreover, for the facilities in passenger terminal buildings, retrofitting of structures must be taken into consideration, and to prevent effects from secondary disaster caused by falling, dropping, or displacement of equipments, furniture, and etc., which affect evacuation, and periodic safety checks must be executed.

Considering the importance of the airport facility, they are constructed and building standards are strictly applied; however, seismic diagnosis of airport facilities must be implemented. As a result of diagnosis, if any problems are found, structures must be retrofitted.

In addition, some part of NAIA is located in an area where liquefaction potential is high, and ground surveys must be implemented to evaluate the vulnerability of the facilities.

Furthermore, electrical shortage will affect greatly for operation of airport, and necessary strengthening of emergency electric supply must also be considered

19.2.4 Port

Similar to airport facilities, port facilities also take on important roles after occurrence of earthquake; therefore, port facility safety must be maintained. Role of ports after earthquake is summarized as follows:

1) Acceptance of relief goods from abroad by sea
2) Transport of relief goods to disaster stricken areas
3) Temporary storage of relief goods
4) Temporary storage of debris and garbage
5) Temporary housing area

To pursue the roles mentioned above, a manual to make coordination with NDCC must be prepared and responsible persons must be assigned in advance.

Furthermore, in order for ports to be able to perform as active terminals immediately after earthquake, it is necessary that its port facilities are properly laid out and that their resistance against earthquakes be strengthened. To achieve this, it is necessary to enhance the earthquake

resistance not only of wharves but also of facilities for storage and landing, as well as access routes.

1) Characteristics of Port Damage

In past experiences of earthquakes, port damages have been reported, and by the geological location of port facilities, liquefaction potential of the port area is very high. Types of damage observed in past earthquakes are summarized as follows:

1) Cracks and subsidence of piers caused by liquefaction
2) Fall of gantry cranes

In case of Great Hanshin Awaji Earthquake that occurred in 1995, damages were observed as follows:

The predominant damage to the port facilities resulted from soil liquefaction and lateral spreading. A large number of the gravity-foundation quay wall caissons rotated and slid outward. Soil settlements immediately behind the caissons were as much as 3 meters and generally decreased toward the center of the islands. Pile-supported structures remained at their original elevations, while the surrounding ground settled substantially. Significant quantities of sand were ejected because of liquefaction and covered large portions of the pavements. Most gantry cranes were damaged, and one collapsed because the quay wall caissons were displaced.

Damage to the gantry cranes was in the form of leg and cross-beam buckling, as well as rupture at the wheels. The extent of buckling varied, depending primarily upon the relative horizontal displacement resulting from the movement of the caissons. Relatively few cranes jumped off the tracks, which can be attributed to most of the cranes being in the stowed position with their pins engaged at the time of the earthquake. Numerous other cranes throughout the port were damaged because of foundation damage. Several cranes collapsed; some collapsed because of structural damage caused by inertial forces generated by the earthquake.

Quay wall caisson displacements, which undoubtedly propagated the major damage in the port, may be attributed to several phenomena. Earthquake accelerations applied to the massive sand-filled caissons resulted in large horizontal forces, which may have exceeded the sliding resistance offered by the base. This can be further aggravated by the rocking motion of the caissons, which may result in excessive bearing pressures at the toe of the base. The latter coupled with the possibility of liquefaction may explain the observed tilting of many caissons. Since island fill placed below water was dumped from barges, it was relatively uncompacted. Hence, soil settlements resulted from lateral spreading as well as compaction. Such settlements continued during the first few days after the earthquake and are likely to continue for some time, especially in the event of further aftershocks.

Severe damage to other types of piers and their quay walls was observed throughout the port. In the older parts of the port, particularly to the south of central Kobe, such as Hyogo Pier, large parts of piers were submerged because of massive soil settlement. Settlements in excess of 2 to 3 meters were observed. Numerous warehouses and other facilities were also submerged and/or severely distorted and damaged because of ground settlement. Severely damaged, partially submerged, and collapsed cranes were observed throughout the older parts of the port, the shipyards, and other facilities.

2) Measures to Strength Port Facilities

To secure safety of port facilities, PPA, ICTSI, and AIT must take necessary measures to prevent damage caused by earthquake. Since ports have the stable characteristic of sea transport, even when stricken by strong earthquake, the constant operation of transport function can be maintained; therefore, ports are positioned as important disaster management facilities and necessary measures to maintain its function should be promoted as much as possible.

1) Development of Seismic Resistant Quay

In Port facilities at Manila Bay, seismic resistant quay must be developed to prevent confusion by securing uniform transport functions and to handle acceptance of relief goods. However, considering the time scale and cost, it is not realistic to develop all quays to be seismic resistant. Each port must have at least one quay, which is resistant against strong earthquakes.

2) Improvement of Bridges and Roads Adjacent to Port Facilities

Road access from seismic resistant quays to major roads must be maintained securely since damages will cause serious barrier for smooth transportation of received relief goods. To avoid damage to road network from port facilities, seismic diagnosis of bridge structures and retrofitting of these structures must be implemented.

19.3 Lifelines

Lifelines in the modern life have become indispensable and useful utilities in peoples lives. As a result, people will have difficulty if one lifeline goes out of service. Ironically, more developed lifelines will create more complicated systems and their failure sometimes cause serious damage to the city. And it is to be emphasized that each lifeline relates others (for example, without electric supply, none of the lifeline can be functional). Therefore, cooperation and information sharing among lifeline companies is also necessary for their own safety.

Fundamentally, supply of lifelines such as water, electricity, and telecommunication are operated by private sector selling their services to customers. Therefore, each lifeline company has the responsibility to keep supplying service to their customers constantly even in the event of earthquake, or to recover their service as quickly as possible.

To prevent long malfunction of their services, each lifeline company must make effort to minimize possible damage to their system and utility.

19.3.1 Damages on Lifeline Facilities and its effects

Damages to lifeline facilities such as water, sewage, electricity, and telecommunications cause large effect not only to facility management, but also to daily life including many aspects of recovery activities. Table 19.3.1 briefly shows major effects caused by damages to Lifeline facilities. It must be cautioned that if one system or equipment malfunctions, then, a chain affect will occur.

Consequentially, to ensure security of their network is crucial, and for every lifeline company, it is important to insist or provide guidance to apply seismic resistant joints or pipes.

Moreover, it is remarkable from past experiences that multipurpose underground conduits, which utilize many types of pipes and cables, have less damages in past earthquake experiences; therefore, replacement of aerial lines with underground conduits will be effective, after however, considering economic efficiency. Especially for cables, utility poles, which fall over roads and disconnected aerial cables, they will cause road closure; therefore, it is effective to change from aerial cables to underground conduits.

Table 19.3.1 Effects of Earthquake Damage to Lifelines

Item / Facility	Water	Electricity	Telecommunication	Sewage
Network Location	Underground	Aerial / Underground	Aerial / Underground	Underground
Direct Effect caused by Damage on Facility	- Water Immersion or road sank caused by Water leakage	- Danger from Short Circuit and utility pole collapse - Fire after resuming power distribution	- Danger from utility pole collapse	- Aggravation of hygiene environment
Effect to road transportation	- Closure of Road caused by road sank - Damage to underground facility and blockage caused by recovery work	- Hazard to moving traffic caused by malfunction of traffic light - lack of light in the night - Damage to underground facility and blockage caused by recovery work	- Damage to underground facility and blockage caused by recovery work	- Hazard to moving traffic caused by blockage of flow of rain water - Damage to underground facility and blockage caused by recovery work
Effect to daily life	- Lack of drinking water - No use of water in rest room or toilet - No use of cooking and washing facility - No use of using bath room	- Electric power failure - No use of TV, Refrigerator, etc - No use of Elevator - Panic by electric power failure - Effect to medical activity	-No use of Telephone	-No use of Toilet - Inability of cooking and washing - Inability of using bath room
Effect to earthquake disaster activities	- Effect to fire fighting activity	- No use of computer - No use of facility operated by electricity - No use of electric equipment such as TV, Video, etc. - No use of communication tools	-Information sharing Inability -No use of Facsimile	-
Alternate Method	- Well - Water Tank Truck	- Emergency Generator - Self Generator - Emergency Power Source Car - Switching channel of distribution - Electric torch, candle	- Community Wireless Radio - Satellite Telephone - Walkie Talkie	- Temporary Toilet

Source: Japan Road Association, 2002

19.3.2 Characteristics of Damage and Recovery for Lifelines

To understand the characteristics of damage for lifelines, and strengthening measures, an appropriate means is to observe experiences from past earthquakes. In this section, characteristics of damage and recovery difficulties are summarized as shown in Table 19.3.2. It is noted that damages to upper facilities such as power plants, purification plants, exchange stations, treatment plants, and etc, are less compared to lower facilities, mainly pipeline and cable networks. In addition, recovery of water distribution facilities needs much longer time compared to electricity and telecommunications.

Table 19.3.2 Characteristics of Damage and Recovery for Lifelines

Item	Water	Sewage	Electricity	Telecommunications
Easily damaged points in the past earthquakes	・Old reservoir ・ buried pipelines ・distribution pipes	・Old treatment plants ・Pipelines and utility holes	・Porcelain tube at Substation ・Utility pole	・Exchange Station ・Instruments in Exchange Station ・Poles along service line ・aerial line
Level of emergency in case of abeyance	・Secure water supply to medical facility ・Temporary water supply to areas without water	None	・Secure electric supply to medical, emergency operation, security facilities	・Secure communication network of disaster management information
Substitution	・Change the distribution channel ・water tank lorry ・well, pond, water stock	None	・Change the distribution channel ・supply form other city ・self generation ・Battery	・Change Circuit ・wireless communication ・mobile station
Difficulty level of determining damage	・Very difficult in case of buried pipelines	・Easy for pumping stations and treatment plants ・Very difficult in case of buried pipelines	・Easy for aerial lines ・Very difficult in case of buried pipelines	・Easy for aerial lines ・Very difficult in case of buried pipelines
Issues on recovery	Secure function of primary pipeline	Secure function of pumping stations and treatment plants	Secure function of substations	Easy occurrence of congestion
Expected Target time to system recovery	Several days	Several Days	Several hours	Several hours
Recovery time at Hanshin Awaji Earthquake 1995	2.5 months	3.5 months	6 days	14 days

Source: Takada, 1991

19.3.3 Strengthening of Lifeline Facilities and Networks

Since development of lifelines takes long periods of time, structures applied in different periods cause vulnerability for lifelines. In past earthquakes, an old type of structure was not considered seismic resistant and damages were concentrated in these structures. In disaster management measures for lifelines, physical damage mitigation measures consists of the following: 1) using materials/structures of pipes and joints with high flexibility, 2) promoting tip-resistant of equipments and fireproof of buildings, 3) retrofitting or reconstruction of existing structures, 4) preventing decrease of bearing power by rehabilitation of bearing stratum, and etc. Uncertainty of lifeline structural damage is high because of uncertainty of seismic hazard and multiplicity of cause of damages; therefore, it is difficult to set specific targets. Strengthening of all of lifeline facilities and networks is not realistic; however, gradual strengthening measures such as replacement with seismic resistant pipes and joints are strongly recommended.

In this section, weak points of each lifeline facility are mentioned and these weak points must be strengthened to minimize period of dysfunction.

1) Water

Based on the result of diagnosis of facilities, if the facilities are assessed as needing any measures, it is urgently necessary to take appropriate action. And if new facilities will be constructed, it is very necessary to plan and construct them considering seismic resistance. Measures for seismic resistance will be indicated for the points estimated to incur damages.

(1) Water Intake, Transmission Facility

Since stoppage of delivery of raw water will greatly affect purification and supply of water, seismic resistance of water intake and transmission facilities must be strengthened; it is important to stabilize raw water supply. For measures for seismic resistance, alternative channels for transmission system need to be prepared, and old and malfunctioned facilities need to be upgraded or strengthened.

(2) Purification Facility

Structure of Purification facilities are constructed based on seismic design, and on rather firm ground. Therefore, observing past experiences, there are no critical damages to purification plants. However, pipes around pumps, connection to body of machinery, and connection for chemical intake are to be considered as weak points; therefore, evaluation of seismic resistance is necessary. Especially, there is risk of loss of lives unless the chlorine facility in Purification Plans is fortified with anti-leakage measures. Moreover, most power supplies in purification plants use electricity; therefore, in case of electricity failure, backup power units must be prepared.

(3) Distribution Facility

Regarding pipes at reservoirs and pumping stations, breakage can be occur; therefore, it is necessary to maintain or improve facilities that are low in seismic resistance.

(4) Pipeline to each subscriber

From the past experiences, since many damages to service pipes were observed, at the same time of distribution pipe installation, mainly along the streets, it is better to replace with stainless pipes which have high seismic resistance in both material and joint.

2) Electricity

Knowing past trend of damage to electric power facilities will help to strengthen existing facilities. In this section, damage characteristics caused by earthquake will be explained in each component of electric power facilities.

In fact, most of damage to electricity facilities as a whole, mainly occurs in the area with high liquefaction potential; therefore, since potential of liquefaction is quite limited to one area, damage will be limited. However, considering the magnitude of earthquakes, strengthening of existing facilities is extremely important.

(1) Power Generation

In the past earthquakes, since power generation is the most important facility, structure of buildings should strictly apply building codes. Therefore, no damage is reported except minor damages. However, seismic diagnosis of buildings must be investigated.

(2) Sub Station

Damage at substations is concentrated to porcelain tubes (circuit-breaker, lightening arrester, etc.). The major reason of damage was by sympathetic vibration, ground subsidence, and tension from lines.

(3) Transmission line

A.Overhead Transmission line

For overhead transmission lines, damages to steel towers and steel poles were limited, and some damages were caused by ground displacement such as liquefaction, which causes steel towers and poles to fall. However, concrete poles are relatively vulnerable and many damages such as breaking and falling of poles were observed. Falling of towers and poles causes severing of electric cables.

B.Underground Transmission line

Underground transmission lines are safer compared to overhead transmission lines. In past earthquakes, however, some damages were observed caused by ground subsidence such as liquefaction. However, damage was limited to pipes, and the cable itself had very limited damage reported in past earthquakes.

(4) Distribution Facility

There are four types of damages observed in the past earthquakes: 1) destruction, breakage, or declination of poles, 2) broken or crossed lines, 3) declination of transformers on the poles, and 4) broken lines to individual users. These damages mostly occurred in areas with high liquefaction potential.

Chapter 20. Fire and Hazardous Treatment and Management

CHAPTER 20. FIRE AND HAZARDOUS TREATMENT AND MANAGEMENT

20.1 Fire Emergency Response

20.1.1 Existing Conditions of Fire-causing Factors

1) Causes of fire in Metropolitan Manila

Metropolitan Manila had 4,359 fires on average between 1992 and 2001, accounting for 5.6 cases per 10,000 persons from 1995 to 2001, as shown in the Table below.

Table 20.1.1 Fire Incidences in Metropolitan Manila

City/Municipality	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total	Average
City of Manila	350	351	507	369	368	582	651	540	475	637	4,830	483.0
Kalookan City	36	148	171	275	259	230	198	157	147	191	1,812	181.2
Malabon	566	264	586	158	164	186	179	121	117	106	2,447	244.7
Navotas	542	489	485	67	62	69	89	99	62	58	2,022	202.2
Quezon City	158	369	569	902	877	1,124	1,316	878	943	1053	8,189	818.9
City of Valenzuela	203	569	569	128	151	261	292	51	47	188	2,459	245.9
City of Las Pinas	34	195	218	242	188	239	219	127	210	180	1,852	185.2
Makati City	63	322	621	246	204	198	209	122	188	182	2,355	235.5
City of Muntinlupa	338	309	475	157	170	256	234	126	225	178	2,468	246.8
City of Paranque	568	379	351	255	281	406	205	203	272	215	3,135	313.5
Pasay City	396	130	402	146	146	155	141	91	136	127	1,870	187.0
Mandaluyong City	91	64	426	171	195	133	95	118	104	96	1,493	149.3
City of Marikina	543	183	327	213	123	175	253	104	191	113	2,225	222.5
City of Pasig	481	340	321	229	171	259	331	150	265	151	2,698	269.8
Pateros	232	290	91	39	52	50	27	36	35	26	878	87.8
San Juan	80	31	593	50	64	47	55	40	46	38	1,044	104.4
Taguig	80	286	530	97	113	175	182	100	161	90	1,814	181.4
Total	4,761	4,719	7,242	3,744	3,588	4,545	4,676	3,027	3,625	3,664	43,591	4,359.1
Population (1,000)				945	962	982	1,001	1,020	993	1,058		
No. of Fire Incidents (per 10,000 pxs)				3.96	3.73	4.63	4.67	2.97	3.65	3.46		3.87

Source: BFP

As shown in the table below, in Metropolitan Manila area, electrical cause is top known cause with 36.9%, followed by open flames/cooking, excluding unknown/others with 40.8 %. Inappropriate usage[20-1] of electric devises and cables seems to occur causing electric leakage or

[20-1] For example, vinyl wires used are easy to damage; circuit breakers sometimes are not installed; wires are used instead of fuse.

short-circuit, and that then causes fires. Causes of fires in peaceful times are well correlated to those in the event of earthquake. Also in Metropolitan Manila, the two causes are the most probable causes of fire in the event of earthquake.

Because the likelihood of electricity-caused fire is recognized by people, according to the Social Survey which the team conducted with 50 barangay leaders and 150 households in ten communities, about three quarters of households answered “they would switch off the main electric switch."

Table 20.1.2 Causes of Fire in Metropolitan Manila (1999-2002)

Cause	1999	2000	2001	2002	Average	%
ELECTRICAL	1,247	1,445	1,335	1,357	1,346	36.9
COMBUSTIBLE/HEAT/BONFIRE	53	90	68	81	73	2.0
OPEN FLAMES/COOKING	330	561	571	890	588	16.1
CIGARETTE BUTT/SMOKE	26	29	49	72	44	1.2
FIREWORKS/EXPLOSIVE/SPARK	1	3	32	12	12	0.3
FLAMMABLE LIQUID	26	24	21	15	22	0.6
LPG/TANK, STOVE	42	57	90	110	75	2.1
UNKNOWN/OTHERS	1,302	1,416	1,498	1,728	1,486	40.8
TOTAL	3,027	3,625	3,664	4,265	3,645	100.0

Source: Fire statistics

2) Hazardous material facilities

In Metropolitan Manila, there are few earthquake-resistant facilities including those handling hazardous materials such as petroleum. It is very likely that these facilities will cause fire in the event of earthquake. What’s worse, the possibility of fire spreading from them is also high in case they are located in residential areas, especially in wooden housings areas. In addition, energy sources used for cooking in Metropolitan Manila also reveal a high likelihood of fire in case of earthquake.

(1) Energy source of cooking

A. LPG

In Metropolitan Manila, LPG is widely used as an energy source for households, restaurants, hospitals offices, and so on. However, earthquake-resist devises, like tip-resistant devises of steel cylinders, flexible gas plumbing, fuse-cock, etc. are rarely found, based on visual observation on the Social Survey done by the study team. Accordingly, risk of LPG leakage is seemingly high.

According to the Social Survey of ten communities, only 4 % of households answered "that they would shut the main cock of gas" when an earthquake occurs. This low response to fire risk caused by gas may be attributed partly to the fact that gas accounts for only 2.1 % as cause of fire

in Metropolitan Manila. Consequently, it is necessary to teach people to recognize gas related fire risk.

B. Petroleum (kerosene) stove

Although the use of petroleum, kerosene, or firewood for cooking stoves is very rare, some are used. However, it is possible to cause fire in case of earthquake due to kerosene spills on the stove, and so on.

(2) Facilities storing and handling petroleum

A. Gasoline stands (gasoline selling sarisari stores)

In Metropolitan Manila, there are many so-called “gasoline stands”, small shops (sarisari stores) which sell glass-bottled gasoline of about 1 liter in the storefront. They are put on the shelves in the storefront without any earthquake-resistant devices. It is highly likely that they will cause fire in the event of earthquake.

B. Establishments storing and handling petroleum

Incidentally, in Metropolitan Manila, some establishments are storing a great deal of petroleum and establishments handling petroleum have organized fire fighting corps. They are equipped with the fire-extinguishing chemicals and other fire extinguishing materials. In addition, such establishments have joined the system of fire fighting corps and have mutual support response agreement among them. It is assumed that they can cope with fire to some extent. Such fire fighting systems with its facilities is thought to be a fire restricting factor.

The following table shows the fire extinguishing resources of such petroleum handling facilities.

Table 20.1.3 Fire-extinguishing Resources of Large Petroleum Storage

	INC 1	INC 2	INC 3	INC 4
Water Source	30 Mb Tank Pasig River	5 Mb Tank Pasig River	Psig River	Water Tank
Fire Pump	2×1500 gpm Reddy- Buffalose Pump	3x1500 gpm Readdy Buffaloes Pump 2x1200 gpm Peerless Pump	1x1400 gpm Goulds Pump 1x1250 gpm Goulds pump 1x1800 gpm Goulds Pump 1x1500 gpm Kubota Pump 1x250 Hp Goulds Pump (electric)	1x1600 gpm Peerless Pump
Fire Truck	1x1500 gpm FoamTruck (IH) 1x1500 gpm E-1 Foam Truck (Nissan)		1x1250 gpm E-1 Fire Truck	None
Water/foam Equipment	28 units Fixed Monitor 8 units Portable Monitor 17 units 2 1/2 Nozzle 6 units 1 1/2 Nozzle 160 lgths 2 1/2 Fire Hose 48 lgths 1 1/2 Fire Hose 6 units In-Line Foam Educators 2	23 units Foam Nozzle 24 units 2 1/2 Nozzle 11 units 1 1/2 Nozzle 78 lgths 1 1/2 Fire Hose 19 units Foam Inductor 14 units Foam/water Cannon	20 units fixed Monitor 4 units Portable Monitor 28 units 2 1/2 Nozzle 6 units 1 1/2 Fire Hose 22 lgths 1 1/2 Fire Hose	6 units Fixed Foam Monitor 2 1/2 x 500 gpm 4 units Potable Foam Monitor 1 unit Foam Monitor 30 lgths 2 1/2 Fire Hose 20 lgths 2 1/2 Fire Hose 15 units 2 1/2 Fire Hose Nozzle 10 units 1 1/2 Fire Hose No
Fire Extingusheres	140 units	157 units	350 units	35 units
Foam Inventory	5000gallons	2552 gallons	9957 gallons	1895 gallons
Fireman's Helmet	55 pcs	21 pcs	43 pcs	20 pcs
Fireman's Boots		16 pairs	43 pairs	20 pairs
Fireman's Coat	66pcs	21 pcs	43 pcs	20 pcs

Source: BFP

C. LPG storage and refilling facilities

LPG storage and refilling facilities in Metropolitan Manila are located along inland riversides or in urbanized residential areas. They are not fully earthquake-resistant.

They use an open flame from LPG as energy source in the offices located in the same property as the LPG facilities, and other offices and housings adjacent to the LPG facilities.

When LPG leaks in case of earthquake under such situation, it is highly likely that fires will cause an LPG explosion.

D. LPG sales facilities

In Metropolitan Manila, LPG is often sold in wooden buildings and gasoline stations. Almost all gas stations sell LPG with the main cock closed.

When an earthquake occurs, it is likely that the collapse of the facilities will cause leakage or explosion of LPG because they seldom adopt counter-earthquake measures to protect LPG cylinders. Such facilities are usually located in urbanized areas, and leaking gas could start a fire from cooking fires nearby or exhausts of running automobiles. In case of a gas station, a petroleum-causing fire would heat up the cylinders and explode the LPG.

E. Other facilities of hazardous materials

Other facilities of hazardous materials are laboratories of universities, pharmaceutics firms, etc. Chemicals of such facilities would break out into fire by chemical reaction or fire nearby.

3) Wooden buildings

In Metropolitan Manila, 56% of the total buildings are thought vulnerable to fire, with concrete-wooden (29%), wooden (16%) and squatter housing (11%) for a total of 1,325,896 buildings. They also often use galvanized-iron for roofs and galvanized-iron or wood for outer walls which easily catch fire.

In addition to building materials, many houses have big ventilation outlets in the upper part of the outer walls and the ceiling part outside, which help start a fire.

20.1.2 Fire Fighting Capacity

1) Fire fighting system of Bureau of Fire Protection

(1) Resources of BFP

The BFP fire resources in Metropolitan Manila as of June, 2003 are as follows:

The number of fire fighters of Metropolitan Manila meets 44.5 % of the required number of 5,468, and that of fire trucks 40.9% of the required 391 vehicles, according to international standards respectively, with standard rates of one firefighter to a population of 2,000 and one engine to a population of 28,000.

Many fire trucks are older than 20 years. In addition, 76 fire trucks out of 160 (47%), 8 ladder trucks out of 12 (67%), 9 ambulances out of 24 (37.5%) are out of order and not in operational as of June, 2003.

Table 20.1.4 Fire-Fighting Resources of BFP

Item	Actual number	Required number	Standard
BFP headquarters	1 place		
District Headquarters	4 places		
Fire Station / Sub Fire Stations	124 places		
Fire Personnel	2,433 persons	5,468	1 per 2,000 people
Fire Apparatus	196 sets		
Fire trucks	160 vehicles	391	1 per 28,000 people
Ladder	12 pieces		
Ambulance	24 vehicles		

Source: BFP

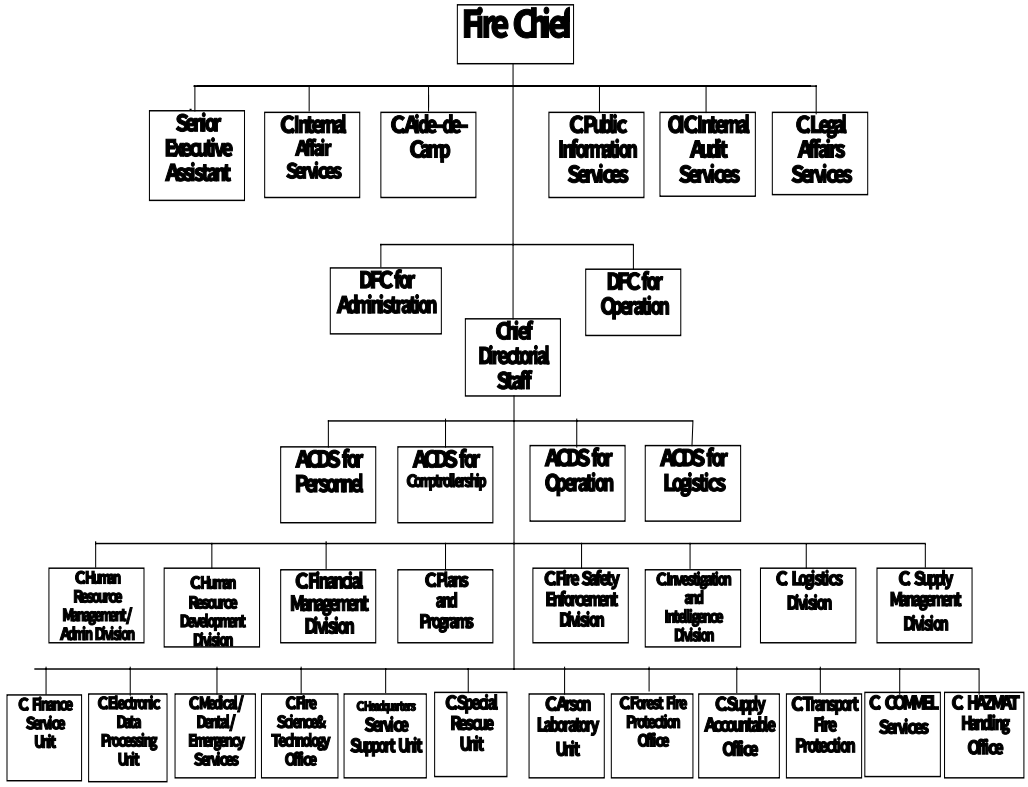
Table 20.1.5 Operational Condition of Fire Vehicles

DISTRICT/STATION	FIRETRUCK			LADDER			AMBULANCE			TOTAL		
	OPNL	Non OPNL	TOTAL	OPNL	Non OPNL	TOTAL	OPNL	Non OPNL	TOTAL	OPNL	Non OPNL	TOTAL
District I												
Manila CFS	17	6	23	2	1	3	5		5	24	7	31
District II										0	0	0
Quezon CFS	13	22	35		3	3	1		1	14	25	39
Calookan MFS	5	7	12	1	1	2	1	1	2	7	9	16
Malabon MFS	3	4	7					1	1	3	5	8
Navotas MFS	2	4	6					1	1	2	5	7
Valenzuela CFS	4	2	6					1	1	4	3	7
D II Total	27	39	66	1	4	5	2	4	6	30	47	77
District III												
Pasay CFS	4	3	7					1	1	4	4	8
Makati CFS	6	7	13	1	1	2	1		1	8	8	16
Paranaque CFS	3	2	5				1		1	4	2	6
Las Pinas CFS	4	1	5				1		1	5	1	6
Muntinlupa CFS	3	2	5				1	1	2	4	3	7
D III Total	20	15	35	1	1	2	4	2	6	25	18	43
District IV												
Headquarter							1		1	1	0	1
Marikina CFS	4	5	9				2		2	6	5	11
Pasig CFS	3	4	7					1	1	3	5	8
Pateros MFS	1	2	3							1	2	3
Taguig MFS	3	1	4					1	1	3	2	5
Mandaluyong CFS	5	2	7		2	2	1		1	6	4	10
San Juan MFS	4	2	6					1	1	4	3	7
D IV Total	20	16	36	0	2	2	4	3	7	24	21	45
TOATL	84	76	160	4	8	12	15	9	24	103	93	196

Notes: CFS: City Fire Station, MFS: Municipality Fire Station, D: District, OPNL: operational
Source: BFP

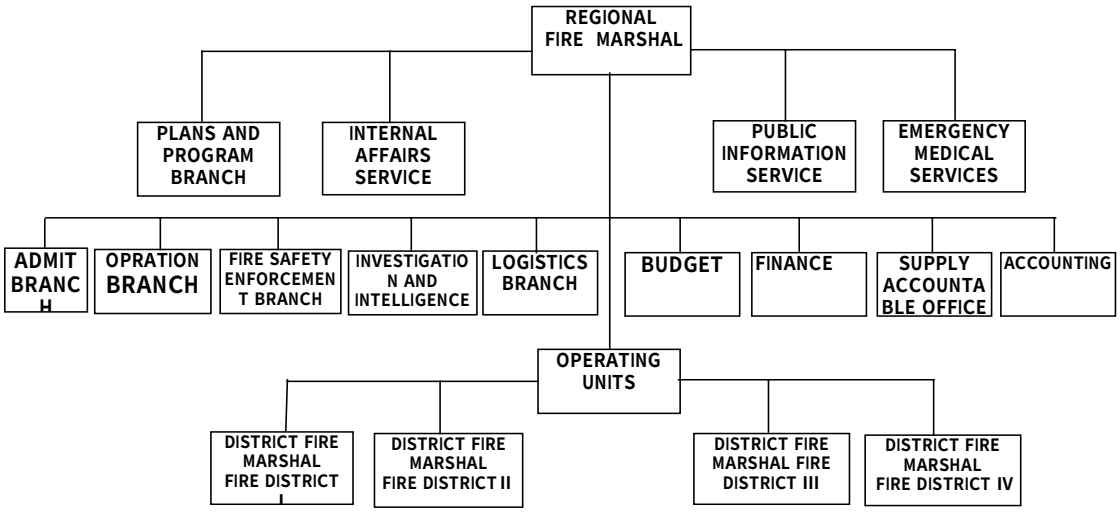
(2) Organizational structure of BFP

The organizational structures of BFP and regional fire organizations is shown in the figures below.



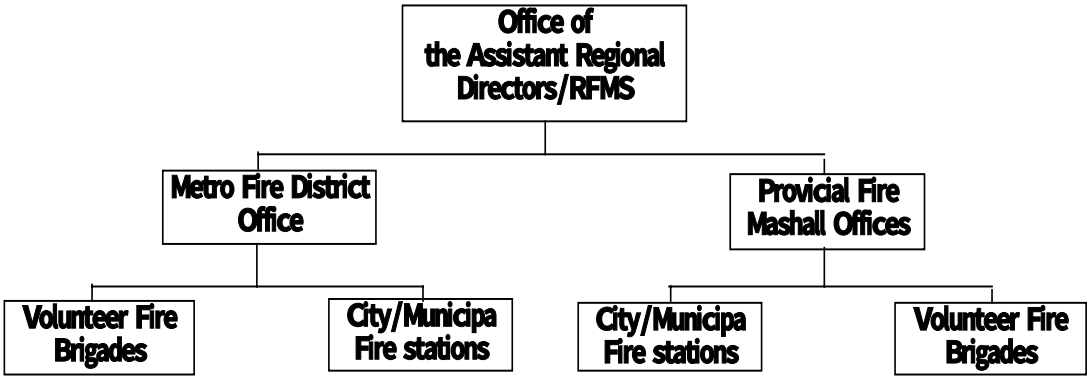
Source: BFP

Figure 20.1.1 BFP Organization Structure



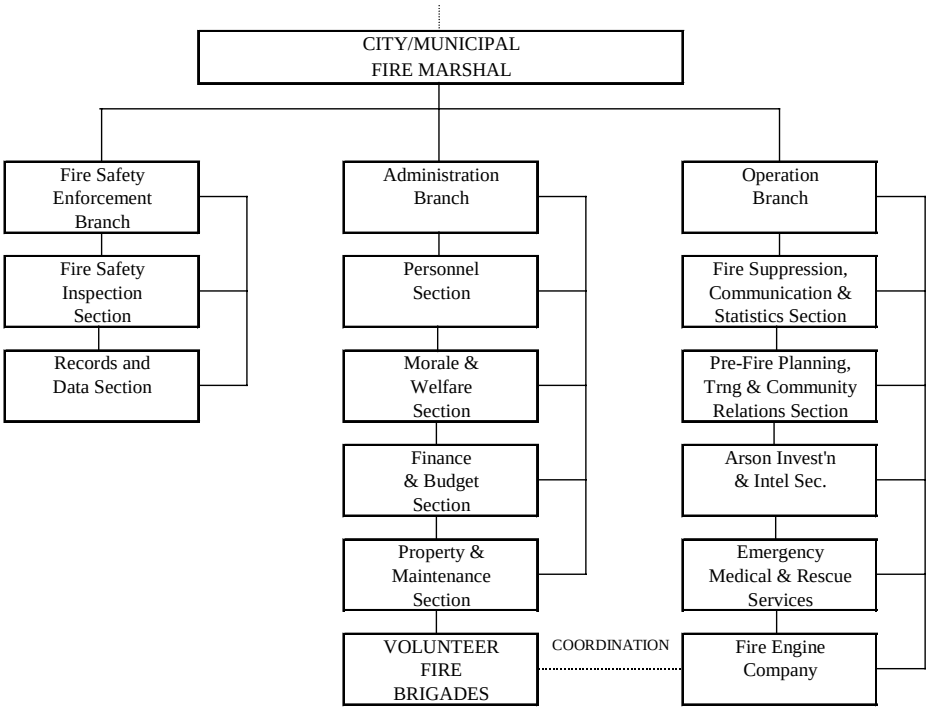
Source: BFP

Figure 20.1.2 Regional Fire Organizational Structure



Source: BFP

Figure 20.1.3 Regional Operational Units



Source: BFP

Figure 20.1.4 Organizational Structure of City and Municipality Fire Stations

2) Auxiliary fire fighting operations

Volunteer fire fighting corps, or fire brigades, which complement public fire fighters play a very important role and are necessary. For instance, in the Hanshin Awaji Great Earthquake in 1995, a total of 164,000 people who were trapped in the collapsed buildings were rescued. Out of this total, 129,000 (78.7%) escaped by themselves without the help of other persons and 27,100 (16.5%) were rescued by their neighbors. Only 7,900 (4.8%) were rescued by the public organizations such as fire fighters and police officers. This shows the activities by the public fire fighters and the police officers are limited in case of a large disaster. Accordingly, fire-extinguishing and rescue activities, to some extent, are done by neighboring citizens.

(1) Fire-fighting Capacity of Barangays

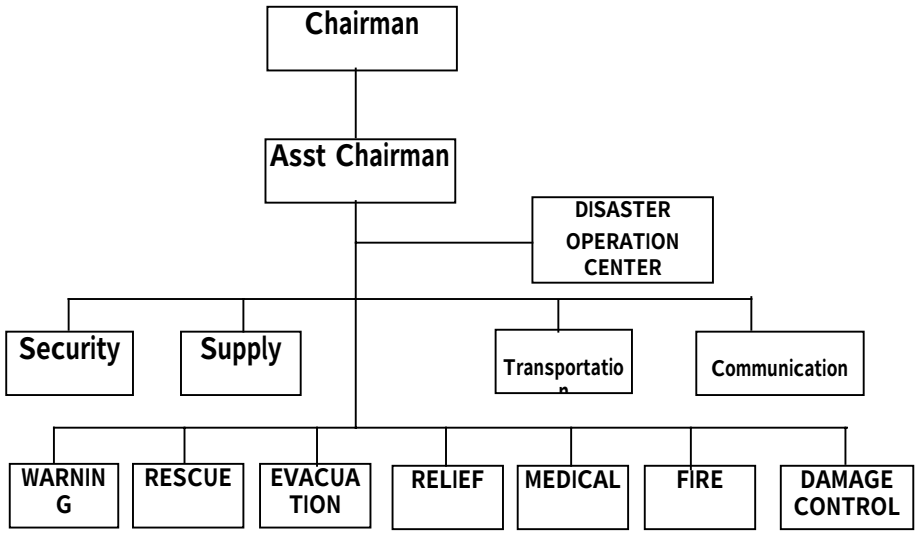
There are volunteer fire fighting corps and a civil-defense corps which is established in the auxiliary fire fighting organization. According to the Fire Code, “every business establishment and baranagay should provide an organization to deal with fires and related emergencies when they occur. The chairman/captain of the barangay or head of the business establishment should evaluate the potential magnitude of a fire emergency within the community or property, or of an exposure to fire and the availability of fire fighting assistance from a public fire department to determine the nature of the organization to be established”.

Volunteer fire fighting corps are to be organized in barangays and self-defense corps in companies.

For purposes of this Code, “company ” should include government offices and buildings”.

By this regulation, a volunteer fire fighting corps is organized for each of the 1,694 barangays in Maetro Manila. However, some baranngays have regular fire trucks, some barangay have simple fire trucks, and some barangays do not have any fire trucks at all. Generally, barangays have a clear organization for fire fighting corps, but not enough fire fighting resources.

There exist 55 self-defense fire fighting corps and 108 fire trucks in Metropolitan Manila, as of December 2001.



Source: BFP

Figure 20.1.5 Organization of Barangay Disaster Coordination Council

(2) Civil-defense corps of establishments

Some establishments that handle dangerous objects of large scale and some large buildings have organized civil-defense corps in Metropolitan Manila area, and even some have established a fire fighting plan and prepared for disaster. However, the priority of the civil-defense corps activities is basically put on fire fighting within their own properties. Unless there is a fire within their property, they would not go out for fire fighting in the neighborhood; however, they would contribute much as auxiliary fire fighting units.

3) Water sources for Fire Fighting

There are 2,150 hydrants in Metropolitan Manila, as of March 2003, and 490 or 22.8 % of them are out of order. They are not well maintained and also are unevenly located so that it is rather difficult to reach a fire in some places[20-2]. This requires better-designed locations for hydrants.

Moreover, in case of a large earthquake, they will not work because of breakage of water pipes. Natural water resources of rivers, ponds and seas are also not used for that purpose yet. Also, there is no earthquake-resistant fire cistern in Metropolitan Manila.

The situation requires the construction of earthquake-resistant cisterns and alternative water resources. Earthquake-resistive cisterns of about 100 - 200 tons in parks, schools, sports facilities, etc. are to be developed to improve the fire fighting ability. Furthermore, swimming pools of

[20-2] Target of hydrant installation is one per 1 km^2.

schools, sports facilities, etc. are to be considered for alternative resources as well. To utilize natural water from the sea, the rivers and the ponds, etc, an access road and hook up facilities are to be constructed.

20.1.3 Recommendations

As mentioned above, to make Metropolitan Manila resistant to fire outbreaks and fire-spreading in the event of earthquake disaster, there are a wide variety of countermeasures such as increasing awareness of people and community, housing structure and materials, treatment of hazardous materials, fire-fighting system and capacity, spatial structure of Metropolitan Manila, etc.

In this section, based on the analysis of the existing conditions of possibility of fire outbreak in the event of earthquake and physical fire-resistance, and the fire-fighting capacities of the relevant organizations, the following measures are preliminarily recommended.

1) Improvement of Capacity of BFP

(1) Improvement of BFP buildings

As of March 2003, there are 124 fire stations and sub-fire stations in Metropolitan Manila, including the BFP headquarter. By visual observation, some 37% of them, or 46 stations, are found decrepit and will suffer from collapse in the event of a huge earthquake like the Kobe quake. 85 stations that were constructed before 1995 would be damaged even by a medium-size earthquake, while the remaining 26 fire stations and fire sub-stations which were constructed in 1995 and afterward are found sound.[20-3].

In case of earthquake disaster or fire outbreak, the fire stations and fire sub-stations would be the emergency base of fire fighting and rescue. Accordingly they must be resistant to earthquake and fire. Moreover, it is required to construct new stations in the areas where fire stations or fire sub-stations are underprovided.

Table 20.1.6 Age of Fire station (FS) and fire sub-stations (FSS)

Year	～	Year	FS & FSS	Accumulated
1901	～	1950	7	7
1951	～	1960	10	17
1961	～	1970	5	22
1971	～	1980	19	41
1981	～	1990	33	74
1991	～	1994	11	85
1995	～	2000	22	107
2001	～		4	111
Total			111	

Notes: As of March, 2003. .Age of 13 buildings out of 124 buildings are unknown, Source: BFP

[20-3] Ages of 13 buildings are unknown.

(2) Reinforcement of fire resource

Bureau of Fire Protection of Metropolitan Manila, as mentioned in section 1.7, is understaffed and under-equipped with fire fighting apparatus according to international standards, lacking 3,035 fire personnel and 231 fire trucks as of June 2003. To prepare for a disaster, it should have adequate fire fighting resources to the international standards, to cope with emergency such as fire or earthquake disaster. Also, as already mentioned, almost half the existing fire trucks, ladder trucks, and ambulances are poorly maintained and non-operational. To improve this situation, repair/maintenance shops should be developed.

In this context, in December 2002, the exchange of notes for Special Yen loan by the Japanese government to the Philippine government was signed to reinforce the fire fighting capacity. The five-year project will include construction of 30 stations and sub-stations, repair of the existing 124 stations and sub-stations, construction of a central motor pool/maintenance shop, purchase of 81 fire trucks, supply of spare parts, and improvement of information system and equipment.

(3) Reinforcement of fire fighting capacity of barangays

Some barangays use fire extinguishing water pump carts, portable pumps, and rescue first aid tools[20-4] while only 141 barangays out of 1694 barangays in Metropolitan Manila have fire trucks and other tools as shown in the Table below. To reinforce fire fighting capacity of barangays, each barangay should have the following equipment: 1 portable fire pump which can used on alleys or roads blocked by collapsed buildings; a set of rescue tools including chain saw, concrete cutter, crow bar, wire rope, shouldering stick, clipper, jack, hammer pincers, handsaw and abaca rope; and a set of ambulance tools including stretcher, the spin boards injured person, splints for the bone fracture, the first aid kits, gauze bandage etc .

[20-4] Those tools include rescue tools such as chain saw, concrete cutter, crow bar, wire rope, shouldering stick, clipper, jack, hammer pincers, handsaw and abaca rope, and ambulance toolset such as stretcher, the spin boards injured person, splints for the bone fracture, the first aid kits, gauze bandage, etc .

Table 20.1.7 Fire Fighting Equipment of Barangays

City & Municipality	No of Barangay	Fire Truck	Ambulance	Rescue Ambulance	Rescue Van	Rescue Tender	Paramedic Van	Water Tanker	Total
KALOOKAN CITY	188		4		1				5
LAS PINAS CITY	20	9	5						14
MAKATI CITY	33	13	8		4				25
MALABON	21								0
MANDALUYONG CITY	27	3	3		1				7
MANILA	897	2	9						11
MARIKINA CITY	14	5	10	9	3	1	1		29
MUNTINLUPA CITY	9								0
NAVOTAS	14								0
PARANAQUE CITY	16	8	21		2				31
PASAY CITY	201	3	3		2				8
PASIG CITY	31		4		1				5
PATEROS	10	6							6
QUEZON CITY	142								0
SAN JUAN	21								0
TAGUIG	18								0
VALENZUELA CITY	32								0
Total	1,694	49	67	9	14	1	1	0	141
MMDA									
Emergency Unit		4	7		2				13
Flood Control Unit		2						4	6
TOC		2	1						3
Cleaning									0
DPWH									0
DIEG-BFP		160	22						182
SF-PA									0
DOH									0
AFP DRTF									0
PCG									0
PNRC									0
Total		168	30	0	2	0	0	4	204
Grand Total		217	97	9	16	1	1	4	345

Source: BFP

2) Measures to be taken against fire

In Metropolitan Manila, as mentioned above, causes of fire are LPG cylinders in households or offices, gasoline stands, gasoline stations, petroleum storage and sales facilities, facilities storing flammable chemicals, etc. LPG cylinders in households are to be made full tip-resistant because collapsed house buildings will cause them to fall off or destroy them or gas pipes which leads to gas leaks and then to fire. Gasoline stands and stations are not constructed to be fully earthquake resistant and will possibly leak gasoline when an earthquake occurs. The storage tanks of large

scale petroleum storage facilities, by liquefaction or strong quake, are likely to suffer from damages such as settling down, inclination, cracks, or breakage of pipes, breakage of oil retaining wall, etc. Such damage is assumed to cause oil leak or gas leak and thus fire-outbreak and fire spreading. Although large facilities have been prepared according to the safety standard stipulated by the Philippine Fire Code, it is required to revise the safety standard, provision of equipment, and improvement of management system of hazardous materials including staff training and drills.

3) Inter-organizational measure for emergency response

(1) Inter-organizational relations

In the event of disaster, coordination and cooperation among national government, local governments, relevant organizations, community disaster preparedness and mitigation organization, establishments, fire brigades, disaster volunteers, and other organizations are required. It is crucial for a smoother operation in a real situation, for national government, local governments, and relevant organizations and citizens to have joint committees, activities, trainings, and drills during peaceful times.

(2) International assistance

Moreover, in preparation for a larger disaster that the country alone cannot handle, an international assistance system also should be arranged.

Chapter 21. Medical and Health Emergency Response

CHAPTER 21. MEDICAL AND HEALTH EMERGENCY RESPONSE

21.1 Capacity of Health Resources

21.1.1 Estimated Damages by a West Valley Fault Model

Table 21.1.1 shows the physical damages and human casualties, which are closely related to disaster medical service activities, estimated by "West Valley Fault Model".

Table 21.1.1 Estimated Building Damage & Human Casualties

Category	Estimated Damages
1. Residential Buildings	Around 180,000 (13% of total) will collapse or suffer severe damage, and another 350,000 (26%) moderate damage
2. Mid-rise (10-30 story) & High-rise (30-60 story) buildings	110 out of 1,000 mid-rise (11%) will get severely damaged or collapse, and 270 (27%) moderately 2 out of 100 high-rises will get damaged severely
3. Hospital & Health Center	15 out of 177 hospitals damaged severely, 37 moderately At least 30% of hospitals in total will become malfunction due to damages to structural and non-structural elements
4. Health Center	9% may get damaged severely or collapse as same rate as residential buildings because of their structure's similarity
5. Hospital functions	Almost all surviving hospitals may just function poorly due to lasting disruption of life-line
6. Lifelines	Electric power, water and gas supply will be disrupted for considerably long period all over the metropolitan area
7. Fire Occurrences	1.500 outbreak of fire may be expected after the impact over the effected area especially in Manila, Quezon and Pasig 2.Spreading fire may lead to explosions of LPG and petroleum tanks.
8. Human Casualties	35,000 death toll will be expected by the first earthquake impact The injured severely will amount to around 120,000 Spreading fire in the aftermath may cause another 20,000 deaths.

Source: JICA Study Team

Damages to buildings and casualties are analyzed as follows in terms of needs for rescue and relief activities after the incident.

(1) Residential Buildings

The estimation reveals the possibility of enormous residential building destruction, which will inevitably leads to massive emergence of casualties. Search and rescue activities will concentrate on those who may be trapped in damaged buildings and confined in elevators.

(2) Hospital Buildings

The table above also indicates the potential damages to hospitals. Severe damages will lead those hospitals being completely out of use. Furthermore, it must be noticed that even partially damaged hospitals will not be able to keep functioning due to critical damages to non-structural elements, installations and medical equipment, which are more vulnerable to earthquake impacts.

(3) Human casualties

Estimated number of the injured is one of the most important indicators to assess the capacity of health and medical resources. In addition, the number of slightly injured may reach at least triple to that of severe cases, judging from the experience of past earthquakes.

2) Response Capacity Assessment

Agencies in charge and their response capacities to deal with the estimated damages are summarized in Table 21.1.2 by activity category. Physical and human resources for lifesaving activities (rescue, field treatment and hospital care) are completely short to meet explosive emergency needs.

Table 21.1.2 Summary of Response Capacity Assessment

Response Activity	Agency in charge	Needs	Response Capacity
1. Search and Rescue	1. Central Gov.: OCD, DPWH, BFP, PAF 2. LGU 3. PNRC, NGO	Minimally 220 teams (100staff/team in 2-shift system) for 110 damaged high, mid -rise buildings only	Assumed to be less than 20 teams with equipment at the same time → Severe Short
2. Advance Medical Post (AMP) settings for field treatment	1. Central Gov.: DOH, Others 2. LGU 3. Private Hospitals	Minimally 700 posts for triage and treatment of 500 thousand injured within 24 hours after the impact.	525 survived hospitals and health centers, and 175 schools might be secured. → Securable
3.Field Treatment	1. Central Gov.: DOH, BFP 2. LGU 3. PNRC, NGO	Minimally 4,320 medical doctors (3/team in 2-shift system) for 700 AMP operations	681 doctors employed by LGUs in MM → Severe Short
4. Hospital Care	1. Central Gov.: DOH, Others 2. LGU 3. Private	Approximately 120,000 severely injured need hospitalizations other than thousands burn cases.	140 institutions with 20,000beds maximally available in MM and 78,000 over the country. → Severe Short
5. Disease Prevention and Sanitation	1. Central Gov.: DOH, Others 2. LGU	770 Environmental Health Teams (1 doctor & 2 nurses/ team, 2 teams/Health Center) for 2 million evacuated people.	681 doctors, 817 nurses and 1,218 midwives employed by LGUs in MM → Securable

Source: JICA Study Team

(1) Search and Rescue

- Operations for 110 high- and mid-rise buildings will require 220 teams of 22,000 staff per day, assuming that one team with 100 staff works on a single building in two shifts a day. Only professional and well-equipped teams from DPWH, BFP, OCD, PNRC and PAF can perform operations, but less than 20 teams at most may be mobilized.
- And for 180,000 residential buildings will need almost 900,000 rescue staff (5 staff for a single building), and this estimation will justify the training and mobilizing of barangay rescue teams and volunteers.

(2) Advance Medical Post (AMP)

Advanced Medical Post (AMP) is a kind of temporarily facility established in the affected area for triage, treatment and stabilization of victims.

- Available places: Almost 700 AMPs will be required for 500,000 injured that may be treated until 24 hours after the impact. In addition to 385 health centers and 140 hospitals that survive the incident, another 175 places need to be secured for potential AMPs sites. This will be attainable in the evacuation places since most of them are supposed to be set up in schools.
- Required staff: 4,320 medical doctors will be needed totally when 3 assigned in 2 shifts a day, and it will account for 6 times more than those employed by LGUs now. The will never meet required number even though physicians in the private sector may be mobilized.

(3) Hospitals in Metropolitan Manila

- Assuming that 30 % of existing hospitals in Metropolitan Manila (203 facilities with 31,000 beds) may become non functioning, 140 facilities with 20,000 beds may only remain available for 120,000 severely injured.
- Deployable hospital beds nationwide: Table 21.1.3 shows that expected hospital capacity will totally be short for 120,000 severely injured victims.

Table 21.1.3 Estimation of Hospital Beds Deployable over the Country

Region	Target hospitals to be mobilized	No. of beds deployable	Expected Capacity
NCR (Metro Manila)	70% of surviving hospital beds: Half of them may be unusable due to breakdown of lifelines. Furthermore half of usable beds may assume to be occupied by existing patients.	10,000	Twice of usable capacity: 20,000
Region3 & 4	Secondary and tertiary hospitals: Victims will be transported by cars to 2nd & 3rd hospitals in adjoining regions to MM.	15,400	Twice of usable capacity: 30,000
Other Regions	Tertiary hospitals only: Victims will be transported by airplanes/helicopters or ferryboats to 3rd hospitals located in manor cities in remote regions.	17,300	18,000
Total	-	42,700	68,000

Source: JICA study team

3) Analysis of Hospital Capacity in Cities/Municipalities in Metropolitan Manila

Hospital capacity is one of indispensable indicators to assess the level of emergency response system. Table 21.1.4 shows the hospital bed ratio to 1000 population, which is called “Receiving Capacity (RC)”, by administrative jurisdiction in Metropolitan Manila. It should be noted that RC fluctuates significantly from 0 in Navotas and Pateros to 446 in San Juan.

Figure 21.1.1, which shows the injured ratio with four level colors by administrative jurisdiction, justifies the concept of grouping cities/municipalities by minimally five characteristics, judging from the stock of medical resources, magnitude of damages and geographic accessibility.

Enclosed circles shows the spatial extent of each group, and allows indication of the possible direction to evacuate the injured. These five zones have following characteristics respectively.

Table 21.1.4 Estimated Human Damages by District by West Valley Fault Model

Name	Casualties by building damages			1st.-3rd. Hospital & beds (public+private)		
	Number (x 1,000)		Injured ratio	Number	Beds	Response Capacity (Bed/1000 injured)
	Death	Injured				
Manila	6.236	20.962	1.3%	30	7,077	***337.6***
Mandaluyong	1.027	3.563	1.3%	4	636	178.5
Marikina	2.596	8.844	2.3%	8	318	36.0
Pasig	3.402	11.902	2.4%	12	681	57.2
Quezon	5.756	19.408	0.9%	52	8,362	***430.9***
San Juan	0.389	1.182	1.0%	4	528	***446.7***
Valenzuela	0.549	1.616	0.3%	8	350	***216.6***
Kalookan	1.721	5.452	0.5%	14	724	132.8
Malabon	0.886	3.025	0.9%	3	43	14.2
Navotas	0.879	3.517	1.5%	0	0	0.0
Las Pinas	1.274	4.274	0.9%	8	428	100.1
Makati	2.329	7.703	1.6%	7	1,201	155.9
Muntinlupa	1.991	7.558	2.0%	8	255	33.7
Paranaque	1.699	5.682	1.3%	6	300	52.8
Pasay	1.605	5.394	1.5%	5	655	121.4
Pateros	0.267	0.912	1.6%	0	0	0.0
Taguig	2.153	7.221	1.5%	5	137	19.0
Total	34.760	118.213	1.2%	174	21,695	183.5

Source: JICA Study Team

Group1: Is composed of 4 cities/municipalities in northern Metropolitan Manila: namely, Valenzuela, Kalookan, Malabon and Navotas. Injured ratio ranges from 0.5 to 1.5% but lower Receiving Capacity (RC) will make it inevitable to evacuate most injured out to neighboring areas.

Group 2: Is composed of 4 cities: namely, northern half of Manila city, Quezon, San Juan and Mandaluyong, which are located north of Pasig River. Although the injured ratio scores relatively higher 0.9～2.4%, RC is very high. This group will be expected to be self-sufficient in terms of hospital accepting capacity.

Group 3: Is composed of 4 cities: namely, Marikina, Pasig, Taguig and Pateros1, and is located at eastern part of Metropolitan Manila. Since this group is just on the West Valley Fault System, the highest casualty ratio of 1.5 to 2.4% could be expected. Most injured need to be evacuated out of the area due to very low RC. However road conditions, such as blockage by damaged buildings, fire occurrence and damaged bridges over Pasig River, will make it almost impossible to move them to Quezon.

Group 4: Includes Makati, Pasay and southern part of Manila City with higher casualty ratio of 0.9～1.6% and lower RC than Metropolitan Manila average value. Since this area is caught

between Pasig River and Group 5 area, there may be no way to take the injured out but they will need to be treated in the area.

Group 5: Is composed of Las Pinas, Muntinlupa and Paranaque, and is located in the southern part of Metropolitan Manila. Despite higher casualty ratio from 0.9 to 2.0%, RC is at lower level from 33 to 100, and this will force the injured to go out of the area for treatment.

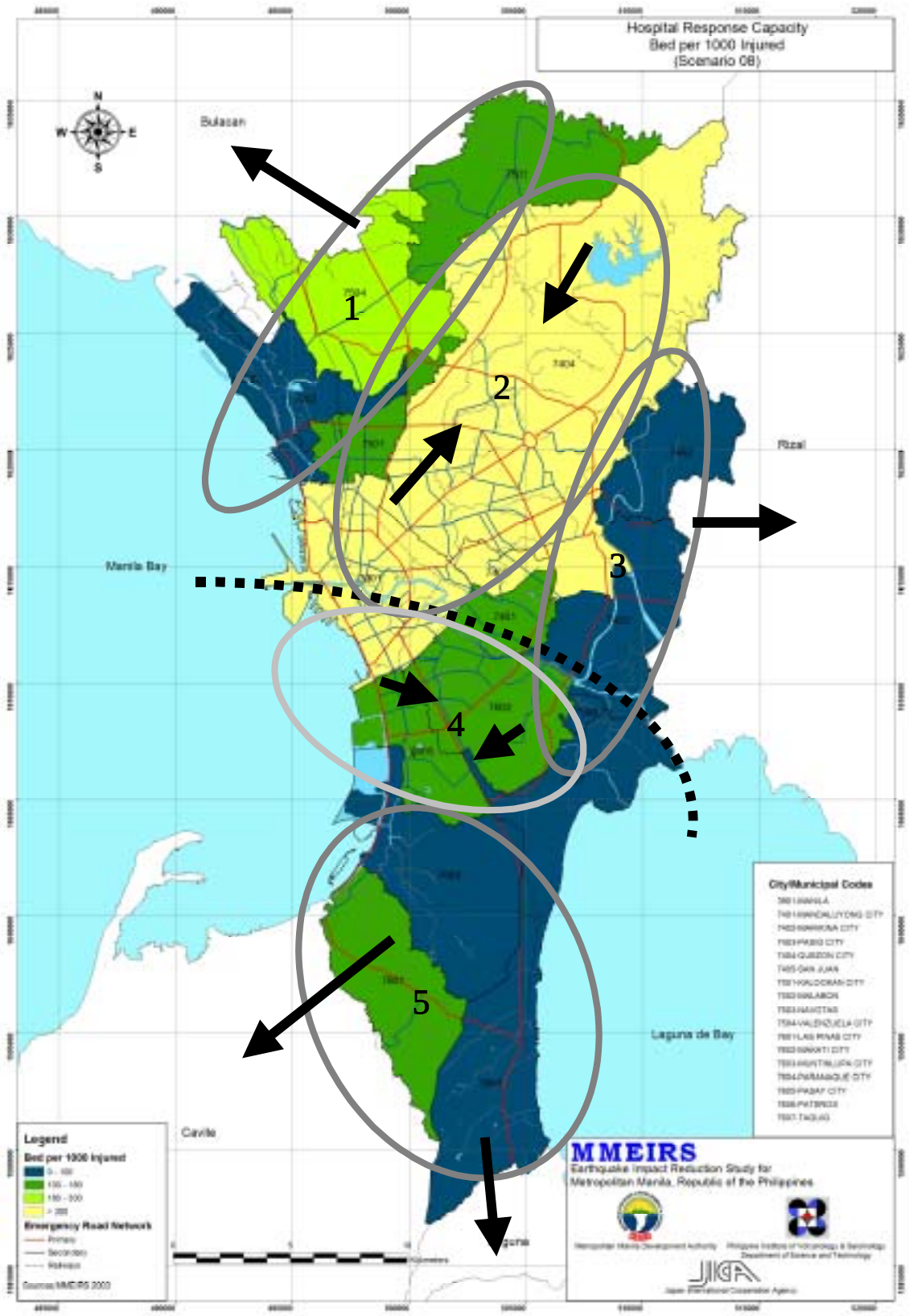


Figure 21.1.1 Direction to Evacuate the Injured to Less Affected Area by Earthquake Damaged Zone

21.2 Assessment of Health Response Capacity and Capability

In conclusion, the health sector in Metropolitan Manila is expected to respond poorly as described below once a massive West Valley Fault System moves.

21.2.1 Governmental Response Area

The current disaster plan specifies to formulate "Disaster Coordinating Councils" at four political/administrative levels from National down to Barangay. Among them, National and Metropolitan Manila Councils are key organizations over the Metropolitan Manila area as shown in Figure 21.2.1. Any catastrophic level disaster occurrence in Metropolitan Manila will inevitably activate not only Metropolitan Manila Council, but also National Council.

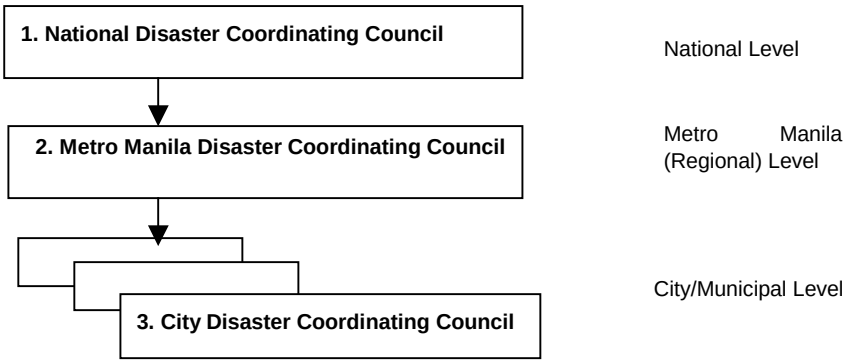


Figure 21.2.1 Three-level Structure of Disaster Coordinating Council

However, it is very likely that this institutional setup will not work effectively during the national level crisis due to following reasons:

- Both National and Metropolitan Manila Council, which have more than 20 members respectively, are supposed to be activated simultaneously. This two tier mechanism in the same Metro Manila area surely make the coordinating procedures very complicated and overlapping, and will finally require a long time to start relief operations.
- Most members at two level councils belong originally to the same ministries or agencies. For example, DOH-NCR office is under control of central DOH office. Government blanches have far closer relations with their parent offices than with MMDA, or have almost no functional combinations with MMDA in terms of disaster preparedness. In addition, almost no meeting has been held among MMDCC members before.
- MMDA will try to fulfill its designated role as a chairman of MMDCC in the wake of a big earthquake, but its critical lack of proficiency for disaster management, trained staff and operation facility will surely hinder its quick and proper coordination. In consequence, NDCC will take over the role of MMDCC to carry out the damage assessment and relief operations.

- Even NDCC will not be able to make a very quick response as expected, because the offices and staff of the central government may also be damaged. Minimally, there will be three days absence of command and coordination, and so some international humanitarian assistance will be needed to start relief activities.

1) Community-based Response Area

People living in severely damaged area will not be able to expect government relief assistance at all for a long period. Treatment for the injured will be available only through community health workers or a part of voluntary groups, while most victims will not be able to receive even simple treatment due to lack of health personnel and short supply of medical necessities (including pharmaceuticals) and equipment.

2) Field Care Area

- In some of cities with preparedness plan, emergency medical teams will be activated to deploy right after the earthquake. However, soon their functions will breakdown when facing massive increasing casualties. Advance medical posts, which are temporarily established facilities for treatment, will overflow with casualties since they can not be transferred to hospitals due to congested road traffic and shortage of transport vehicles.
- No or little information about availability of hospitals (e.g. which hospital is functioning, or how many people can it receive) will throw communities and families into disorder as to where to go.

3) Hospital Treatment Area

- Hospitals may be severely structurally damaged or destroyed. Those facilities which survive with little or no structural damage may be rendered unusable or only partially usable because of a lack of utilities (power, water, sewer), or because staff are unable to report for duty due to personal injuries and/or damage/disruption of communication and transportation systems. Medical and health care facilities which remain in operation and have the necessary utilities and staff will be overwhelmed by the "walking wounded" and seriously injured victims who are transported there in the immediate aftermath of the occurrence.
- In the face of massive increases in demand and the damage sustained, medical supplies (including pharmaceuticals) and equipment will soon fall into short supply, which will drive even hospitals in operation into further functional breakdown. Most health care facilities usually maintain only a small inventory stock to meet their short term normal patient load needs.
- Some hospitals may cause problems of filtering and neglecting patients for admission by reason of their lack of money or insurance status.

4) Wide Range Patient Distribution Area

Lack of experience and training may throw hospitals and EMS systems into disorder in executing the following activities for victim:

- Transferring inpatients from broken-down hospitals to usable ones with capacity
- Transferring massive casualties from Metropolitan Manila to hospitals in other regions

5) Health and Sanitation Area

- Disruption of sanitation services and facilities, loss of power, and massing of people in shelters may increase the potential for disease and injury.
- Delay of environmental health operations and short supply of pharmaceuticals and equipment will soon lead to outbreak of cholera and dengue fever all over the area.

6) Logistics Area

- Disruptions in local communications and transportation systems could prevent timely re-supply. Uninjured persons who require daily medications such as insulin, antihypertensive drugs and digitalis, and further who undergo artificial dialysis may have difficulty in obtaining these medications and treatment because of damage/destruction of normal supply locations and general shortages within the disaster area.
- Voluntary medical aid team may not be utilized due to critical shortage of information where the most needs exist. Likewise medical people who are mobilized throughout the country by the government may not work effectively because of shortage of medical supplies and accommodations for them.
- Lack of training on supply management will hinder the effective distribution of donated goods. Especially private medical providers may have difficulty to obtain these humanitarian assistance goods.

21.3 Important Issues to be Concluded in the Plan

Results of the assessment suggest making the recommendations listed in Table 21.3.1 as feedback to the disaster management master plan.

Table 21.3.1 List of Important Issues for the Plan

Area	Important Issues
1. Governmental Response Area	✓ Simplified MMDCC organization ✓ Substantial division of responsibility with NDCC for catastrophic level of disasters ✓ Mutual assistance in disaster medical services among cities and municipalities in MM, and agreements with neighboring provinces ✓ Necessity to formulate of disaster medical system plan at catastrophic level ✓ Necessity of health care insurance system which include the articles to enforce the hospitals to have disaster management system
2. Community-based Response Area	✓ City/Municipality's commitment to support the barangay's activity for disaster preparedness: education and training for community people, stockpiling medical supplies, communication measures, and preparing barangay disaster preparedness plan.
3. Field Care Area	✓ Formulation of standardized AMPs in city/municipality health organizations, and candidate places for AMPs ✓ Communication system between local hospitals and health centers in city/municipality
4. Hospital Treatment Area	✓ Seismic diagnostic study and reinforcement of government secondary/tertiary hospitals ✓ Method to assess the hospital damages as quicker as possible right after the incident, especially the capacity to receive victims ✓ Hospital mutual assistance system for staff and supplies ✓ Compensation system for emergency expenditure of disaster victims by private providers
5. Wide Range Patient Distribution Area	✓ Necessity of pre-arrangement for transferring disaster victims over the country ✓ Concrete method to secure transportation measures, e.g. vehicles, vessels and planes
6. Health and Sanitation Area	✓ Formulation, mobilization and deployment of Environmental Health Teams
7. Logistics Area	✓ Pre-arrangement of ways to procure medical necessities based on the earthquake damage estimation: essential items and potential amount of them, estimated amount of items obtainable locally and internationally. ✓ Necessity to arrange Alternative airports to Manila for international assistance, standard procedures to handle and transport assistance goods

Source: JICA Study Team

21.4 Planning Issues

Based on the earthquake damage estimation and recommendations of the study, the government of Philippines is supposed to commence the formulation of disaster management plan for Metropolitan Manila, in which health and medical response area will account for a considerable part of the plan. Planning issues in this section intend to show what and how some essential components of the plan could be improved and strengthened.

21.4.1 Target Emergency Level

Magnitude of estimated damages by "West Valley Fault Model" seems incredible, indicating that 13% of residential buildings will suffer severe damages and more than 200,000 citizens will get some injury. No capital city in the world could cope with such devastating consequences of earthquake, and no major city in any country could compensate for the shortage of health resources in the dominant metropolis. Such a significant earthquake disaster that overwhelms Metro Manila would necessitate both national and international time-critical assistance. This situation falls clearly into the highest emergency or "**catastrophic**" level, never into the day-to-day emergency level.

21.4.2 Objectives

The overall objective of "Health and Medical Services" operations will be to "reduce mortality and morbidity in the catastrophic emergency situation created by an earthquake".

21.4.3 Strategies

Medical resources available in MM are expected to be totally short to cope with enormously surging needs after the earthquake. Given the harsh situation, some clear and affirmative strategies to attain the overall objective have to be adopted as follows:

1) Place the top priority on life-saving treatment throughout emergency operations

Treatments must be provided to the injured selectively whose lives might be surely saved through triage practice at every treatment point.

2) To mobilize and utilize available resources fully regardless of locations, ownership and source.

Government commitment to endorsing monetary compensation for their expenses to treat the injured unconditionally is crucially important to totally mobilize the private sector.

3) To make systematic response by establishing a tiered treatment level system throughout the country

Establishment of a system to provide appropriate care, first from the community, then to transfer to hospitals in the local network, and then to hospitals in metropolitan and national network, is crucially important.

4) To provide health care to meet needs of affected people that change over time

Health resources must shift from treatment for surgical cases during first several days to care for acute internal problem cases, followed by patients with chronic diseases.

21.4.4 Area to be covered by the plan

Emergency Medical Services Authority (EMSA), State of California, has developed standards and guidelines for disaster medical systems available to the public. The intended plan for Metropolitan Manila is, modeled on it, requires coverage of at least the functions listed in Table 21.4.1 as indispensable components.

Table 21.4.1 List of Medical and Health Functions to be Covered by the Plan

A	Common Functions and their Elements
1	System to develop and maintain the disaster medical and health plan and procedures/arrangements 1. Disaster medical system planning 2. Departmental Operations Center Procedures 3. Training and exercises 4. After action reviews
2	Coordination of disaster medical and health resources 1. Resource planning and preparedness 2. Procedures for resource acquisition, allocation and mobilization 3. System for distribution, utilization, and support of external resources 4. Resource tracking 5. Deactivation/Demobilization
3	Assessment of immediate medical and health needs 1. Notification of key positions and activation of the disaster medical and health system 2. Procedures for gathering, evaluating, reporting, and disseminating assessment information
4	Provision of medical and health public information and protective action recommendations
B	Medical Functions
5	Coordination of patient distribution and medical evacuation 1. Patient dispersal system
6	Coordination with hospital inpatient and emergency care providers 1. Conduct hospital status/damage assessment 2. Support standardized hospital emergency system 3. Support hospital efforts to obtain resources needed to sustain hospital operations, and continued provision of care
7	Coordination with Out-of –hospital care providers 1. Support Out-of-hospital care (non-hospital facilities and services)
8	Coordination of Pre-hospital emergency services 1. Pre-hospital system transformation to disaster status 2. Triage systems and methods 3. Austere medical care 4. Field operations management 5. Command/tactical communications
9	Coordination of the establishment of temporary field treatment (or AMP) sites 1. Designation/Activation 2. Personnel, supplies, and other resources 3. Integration into system
C	Health Functions
10	Health surveillance and epidemiological analyses of community health status
11	Provision or coordination of mental health services
12	Provision or coordination of vector control services
13	Assurance of Food Safety
14	Assurance of drinking water safety
15	Assurance of the safe management of liquid, solid and hazardous wastes
16	Investigation and control of communicable diseases

Source: abstracted and re-arranged from "Disaster Medical System: Standards and Guidelines", EMSA, State of California

21.4.5 Major Planning Issues

Among recommendations described in "Recommendations for planning a Health Disaster Management System", the following three issues will form the backbone of the comprehensive health disaster management plan.

- Reorganization of disaster coordinating mechanism
- Strengthening of inter-LGUs assistance arrangement
- Establishment of the systematic response mechanism

1) Reorganization of Disaster Coordinating System

Comprehensive but simple organizational set-up is essential to make decisions quickly and respond effectively in the course of disaster. The fact, that Metro Manila (MM) is the seat of central government, will justify a policy different from those in other regions. It is natural that the central government manages the situation directly and puts local governments under its control when a catastrophic level earthquake occurs. This system will clearly be different from the current one. One way to reorganize the current disaster coordinating system is illustrated conceptually in Figure 21.4.1. It is composed of the following policies:

- DOH-NCR will be included in NDCC organization as well as all other NCR offices of the central government.
- MMDCC will be composed of representatives from 17 cities and municipalities in Metropolitan Manila in addition to MMDA as the chairman.
- MMDA will increase its coordinating capacity by establishing a Disaster Management Unit which includes the staff for health/medical sector.

In the reorganized MMDCC, MMDA will be the coordinator of 17 LGUs only in Metropolitan Manila, and will keep close relationship with NDCC as a representative of MMDCC.

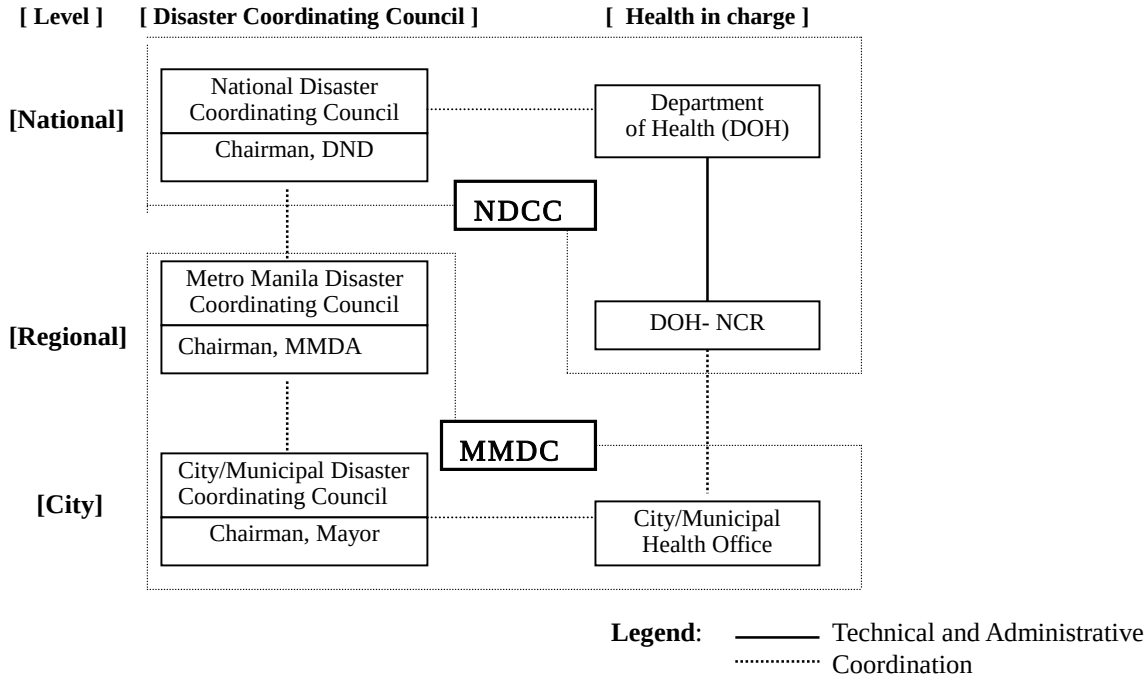


Figure 21.4.1 Proposed Organizational Set-up for Health Command and Coordination

There may be different ideas about the ways to rearrange the nonfunctional MMDCC, but it should be a prerequisite to strengthen its comprehensive capacity for disaster management by establishing a full-time unit.

2) To facilitate LGU's mutual assistance system through Zoning System

The idea of LGU's mutual assistance for response activities comes from following two earthquake scenarios.

1. Expected blockage of main roads and unstable bridges, together with spreading fires, will make road travel impossible for responsible agencies to deploy rescue and relief teams widely over the Metropolitan Manila area.
2. It will be entirely impossible to transfer casualties from peripheral cities in northern and southern Metropolitan Manila to centrally-located cities such as Manila and Quezon due to traffic constraints. In addition, open spaces for temporary field hospitals will be totally short and will be useless for the severely injured.

This expectation leads to the idea of establishing self-contained areas by dividing Metropolitan Manila into several zones with similar characteristics, and have a couple of cities/municipalities support each other by accommodating resources for rescue and relief operations. There will be two kinds of zoning in this idea.

1. Zoning of cities/municipalities within Metropolitan Manila.
2. Coupling of cities with external provinces in neighboring Regions.

(1) Zoning of cities/municipalities in Metropolitan Manila

Figure 21.1.1 illustrates a tentative combination of cities/municipalities to formulate proposed mutual assistance system for "rescue & relief operation". The only difference between Figure 21.1.1 from Figure 21.4.2 is that Manila City and Quezon City are separated to form independent zones. Grounds for this proposed zoning are as follows:

- Cities in center of Metropolitan Manila (namely, Quezon, Manila, Makati, Mandaluyong and San Juan) have relatively abundant resources for rescue and relief activities compared to volume of needs, and have capability to plan, organize and implement disaster preparedness and mitigation by themselves.
- Cities and municipalities in the fringe of Metropolitan Manila (namely, northern, eastern and southern areas) have less resources and poor system, and seem to have little capability to prepare. They need to depend on resources in other cities in case of extensive quakes.

(2) Coupling of cities/municipalities with external provinces in neighboring Regions

It is natural to evacuate victims from heavily affected area to less or non affected ones. Since provinces next to Metropolitan Manila also have hospitals even though there are not enough in total as shown in Table 21.4.2, it is recommended to set up new tiers by coupling the

cities/municipalities in the periphery of Metropolitan Manila with provinces of Bulacan, Rizal, Cavite and Laguna in Region 3 and 4. These four provinces have almost 8 million population but are equipped with only 6,000 hospital beds, and their Bed/1000 population ratio is at the much lower level of 0.8 than 3.1 in Metropolitan Manila. This proposed administrative combination is also illustrated in Figure 21.4.2. It is one of the indispensable conditions to strengthen the hospital capacity in these provinces through following two measures in order to realize this coupling system.

1. Expansion of existing hospitals or establishment of new hospitals
2. Relocation of existing hospitals in central Metropolitan Manila

Table 21.4.2 Hospital Bed and Its Ratio to Population in Adjoining Provinces

Administration Area	Province	Hospital Total		Population 2000 CP (in thousand)	Bed/1000 pop
		No.	Beds		
Metro Manila	Total	203	31,161	9,906	3.1
Region 3	Total	219	7,504	7,746	1.0
	Bulacan	70	1,800	2,234	0.8
Region 4	Total	326	10,607	9,124	1.2
	Rizal Province	29	822	1,707	0.5
	Cavite Province	36	1,713	2,063	0.8
	Laguna Province	41	1,743	1,965	0.9
4 Provinces Total		176	6,078	7,969	0.8
Region 3 and 4 Total		545	18,111	16,870	1.1
National TOTAL		2,095	95,723	76,500	1.3

Source: Statistics from DOH Web-site, 2003

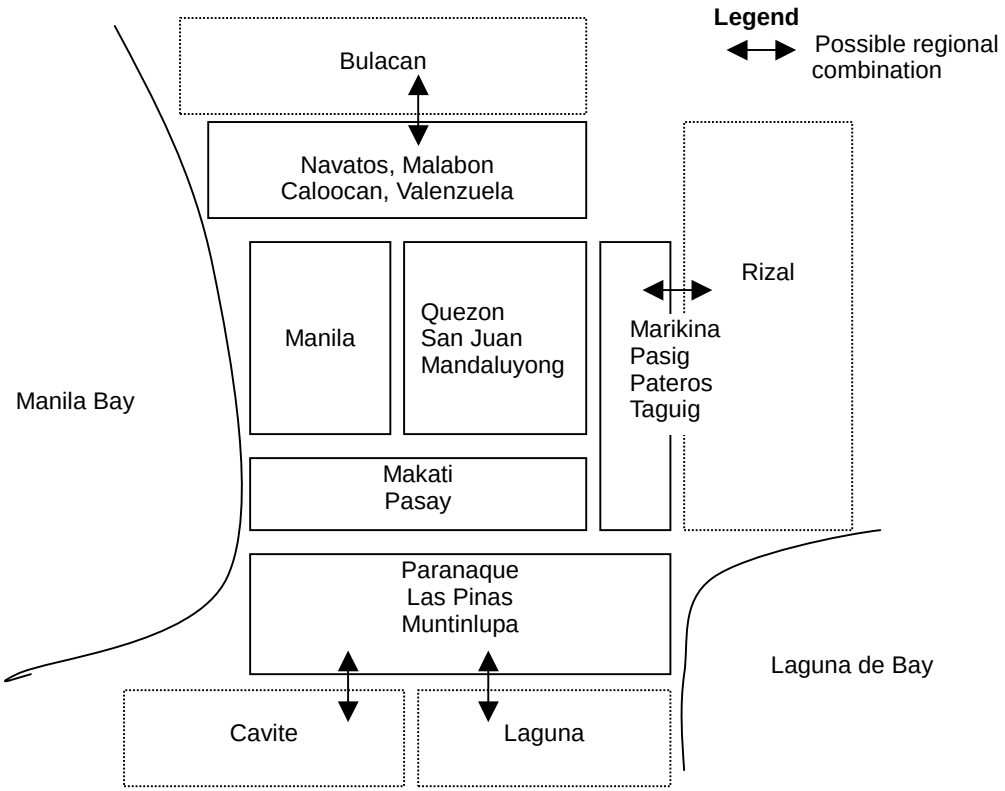


Figure 21.4.2 Proposed Rescue & Relief Operation Zoning

3) To establish the Systematic Response Procedures

(1) General Operating Procedures

Systematic response procedures are illustrated in Figure 21.4.3 and include the following components:

- Community Response Activity
- Establishing Advance Medical Posts (AMPs) at sites
- Transportation of the injured
- Hospital care in the affected area
- Hospital care in less or non affected area
- National/International support organizations
- Logistics: supply of health and medical necessities

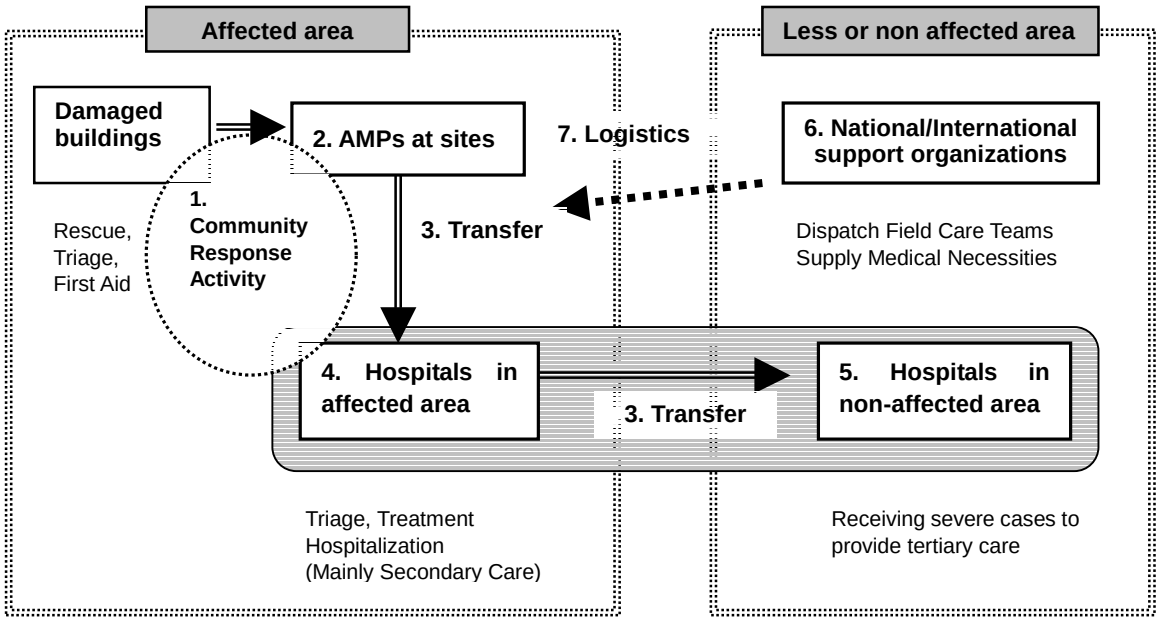


Figure 21.4.3 Principle Structure of Medical Relief in the Zone

(2) Community based Response Activity

Health related institutions in the community are categorized into two types: One is Local authorities, personnel and groups, and another is Local Health Personnel (LHP). The role of each group is summarized by disaster period in Table 21.4.3.

Table 21.4.3 Role of Community and Local Health Personnel in Rescue and Relief Activities

Institution	1. Urgent period	2.Aftermath period	3. Preparedness period
Community*	1. Set up of Emergency Committee 2. Dissemination of information 3. Search and Rescue operations 4. Fire Extinguish operations 5. Transfer of casualty 6. Assistance of Reception at Health Centers or Hospitals	1. Assessment of people's needs 2. Coordination of external assistance groups 3. Family grouping 4. Sanitation at shelters 5. Monitoring food supply and Distribution 6. Caring orphan children 7. Dealing with the dead 8. Post-disaster develop	1. Analysis of the past experiences 2. Adding to knowledge of the local risks and resources 3. Practicing exercise and activities to promote community preparedness 4. Practicing basic education
Local Health Personnel	1. Organizing Health Centers or Hospitals 2. Triage 3. Emergency Care	1. Monitoring community's health conditions 2. (Vaccinations) 3. Nutrition 4. Instruction/education on health and sanitation 5. Mental health care 6. Periodic reports	1. Improving certain professional knowledge and skills 2. Preparedness at Health centers and hospitals 3. Training of voluntary health workers 4. Preparedness activities for the population

Note: * local authorities and persons or groups who concern themselves in the localities with rescue work, communications, transport, shelter and food supply

Source: Coping with Natural Disasters: The Role of Local Health Personnel and the Community: Working Guide, WHO-OMS, 1989

(3) AMPs at Site

One of key components is AMP, which will play the role of checking station between the communities and hospital to manage patient flow. Its role will shift over time as shown in Table 21.4.4.

Table 21.4.4 Role of Team at AMP

Time, Place & Job principles
A. During emergency period – for first 5 to 7 days after the impact
1. Target: community people who are injured by impact or fire 2. Place: At the entrance of health center, hospital and in evacuation places 3. Major role: 1) To provide first aid at collecting points 2) To carry out triage, treat minimally, and transfer severe cases to hospitals after stabilization 3) To open for 24 hours 4) To have drugs, consumables and equipment for trauma cases mainly
B. Post emergency period – from 6th to 8th day onward
1. Target: evacuated people at shelters and camps, and patients who need care at sites 2. Place: not always AMP but at fixed- shelters/camps and affected area on visiting base 3. Major role: 1) To transfer severe cases to hospitals 2) To provide 12 hours service for injured cases as well as acute internal and chronic cases 3) To have medical necessities for internal, chronic and mental cases mainly

(4) Hospital Care

Not all hospitals can provide surgical operations and in-ward care to earthquake victims. Table 21.4.5 shows the categorization of hospitals based on their capabilities to provide care. Patient flow from AMPs to hospitals needs to be controlled according to this hospital level. Note that Emergency Level is different from Current Level of hospitals based on the reference system.

Table 21.4.5 Role of Hospitals by Level during the Disaster Period

Emergency Level	Current Level	Expected role during the disaster
I	Primary and Part of Secondary	1. Outpatient treatment: Triage and providing simple treatment 2. No inpatient service: Transfer severe cases to hospitals at Level II or III 3. Almost as same function as those of AMP
II	Secondary and Part of Tertiary	1. Outpatient treatment: Triage and providing simple treatment 2. Inpatient service: To intermediate cases only, severe cases need to be transferred to Level III hospitals 3. Only hospitals with surgical disciplines can provide inpatient services. 4. Need to discharge preexisting patients to increase capacity
III	Tertiary	1. Outpatient treatment: Not providing principally, but for the transferred from AMPs and hospitals at Level II and I. 2. Inpatient service: provide care to the severely injured but restrict those who are expected savable only 3. Need to discharge or transfer preexisting patients to increase capacity

Several Emergency Level III hospitals, regardless of ownership (public or private) will be appointed as “Disaster Medical Hospitals (DMH)”, which play a key role in life-saving treatment for hospitalized cases. Some key roles are defined as follows:

- Provide life-saving care to the severely injured such as multiple-injured, internal organ damage, crash syndrome and widely burned.
- Manage to transfer these injured severely to hospitals at less or non-affected area
- Lend medical equipment out to other hospitals in the same zone

DMH has to meet requirements listed in Table 21.4.6.

Table 21.4.6 Requirements that "Disaster Medical Hospitals" should Meet

1. To have seismic resistance structures.
2. To equip self-sustainable lifelines: water, electricity, fuel and sewage for minimally three days.
3. To provide tertiary emergency services with 1) Bed room for inpatient, 2) ICU, 3) Consultation room, 4) Laboratory, 5) X-ray room, 6) Operating theatres, and 7) Artificial-dialysis unit
4. To have enough space to receive twice more in-patients and five times more out-patients than those in the ordinary time in case of a massive disaster.
5. To equip a terminal of wide-area disaster & emergency information system and to have a role of its center
6. To function as a key channel to receive and/or send out patients with following facilities on a nation wide basis 1) Minimally one emergency ambulance to transport patients 2) A heliport pad with a medical doctor to attend the patients
7. To function to dispatch self-sustained medical aid teams with portable equipment for treatment, drugs, triage tags, tent, power generator, water, food and daily necessities

In addition, minimally one hospital in a zone will have the following functions to contribute to activities of other hospitals.

- To lend equipment out to health institutions in the zone with the following facilities:
  - i) Storage of equipment and supplies
  - ii) Portable type beds, Treatment kits and etc.
- To educate and train personnel working in health institutions in the zone.

Hospitals provide in-patient treatments at secondary and tertiary level within the treatment tiered-system illustrated in Figure 21.4.3. Principally severely injured but expected savable cases will not be treated long in Level III hospitals in an earthquake stricken area, but be transferred to those hospitals in less or non affected areas right after their stabilization. Securing transportation measures such as ambulances and helicopters will fall into the responsibility of DOH's coordinating system.

(5) Logistics

Stock of medical consumables for at least 3-day usage is internationally recognized as the desirable preparedness level for self-contained operation. While major hospitals in Metropolitan Manila keep generally medical consumables for a week and more on average, health centers do not stock sufficient consumables, especially for surgical treatment.

DOH is to bear an overall responsibility for logistics, regardless of public or private ownership. However, private hospitals will not be able to depend on DOH to secure supplies in an actual situation, although they are counted to receive as many as disaster victims as possible. The following measures will be taken into consideration in order to supplement the shortage of medicines and supplies.

- Procurement of stocks in local distribution pipelines.
- Relief goods obtained through International Humanitarian Assistance.

Relief goods will handle distribution to local facilities in need based on following principles:

- Government Channels: DOH will bear a responsibility for inventory management and for delivering them to hospitals and LGUs.
- Private Channels: Philippine Red Cross will handle distribution mainly for their own activities.

4) Environmental Health and Disease Prevention

Natural disasters do not always yield outbreak of communicable diseases. However, Environmental Health intervention needs to be started as soon as possible after the impact in parallel with medical relief activity.

- All health centers and environmental health units in Metropolitan Manila will commence their environmental health and disease prevention activities with involvement of Local Health Personnel according to a response and preparedness plan. DOH-NCR will coordinate CHO's activities in case they have need for external assistance.
- DOH central office will formulate 'Epidemic Control Teams' to support CHOs and health centers in order to patrol all the affected areas and evacuation places. Teams, aiming to prevent the potential outbreak of epidemics, will detect outbreaks earlier and disinfect the dwellings in case it is found; they will stay on duty for one month after the occurrence, based in the health centers. Composition and functions of team are described in Table 21.4.7, including many voluntary staff.

Table 21.4.7 Epidemic Control and Water Safety Monitoring Team

Type of team	Member	Function
Epidemic Control	✓Physician ✓Environmental Health Specialist ✓Nurse ✓Management ✓Supporting staff ✓Driver	1) Health check and consultation 2) Primary treatment 3) Isolation and disinfection of patients 4) Instruction to evacuees on disease prevention and health maintenance 5) Community awareness
Water Safety Monitoring	✓Sanitary Engineer ✓Management ✓Supporting staff ✓Driver	1) Biological examination 2) Control of usage of well water

Source: JICA Study Team

21.5 Role and Responsibility of Activities

21.5.1 Overall Response Activities and their Responsible Level

Type of disaster response activities is listed in Table 21.5.1 together with responsible levels from barangay to central government, with the role of DOH in every activity. It is clear that DOH-NCR bears the most extensive responsibility from primary to secondary level in disaster medical activities, other than community level ones.

Table 21.5.1 Responsible Level by Activity

Activity	Responsible Level				Role of DOH
	Baran-gay	City	DOH-NCR	DOH-central	
1. Community Based Activity	ⓞ	⊙			To provide guidelines and technical supports
2. Advance Medical Posts		ⓞ	⊙		To provide teams and equipment
3. Transfer of injured (Short-distance)	ⓞ	⊙			To provide EMS teams and vehicles
4. Hospital Care in the area		ⓞ	⊙		To provide information on active facilities
5. Transfer of injured (Long-distance)			ⓞ	⊙	To provide services and coordinate measures
6. Hospital Care out of the area			ⓞ	⊙	To activate supporting system and hospitals
7. National/International Support Org.			⊙	ⓞ	To coordinate arrangement and distribution
8. Environmental Health	⊙	ⓞ	⊙		To provide teams and technical support
9. Logistics		⊙	ⓞ	⊙	To coordinate, procure and distribute supplies

Note: symbol ⓞ shows that marked administrative level bear the primary responsibility to implement or coordinate the activity, while ⊙ shows the secondary level responsibility.

1) Community Response Activities

Community based activities can never be self-sufficient, and most of their problems can be solved only through outside assistance at various levels. The barangay disaster coordinating council is, in this sense, a legally established agency for the community to contact first. Targets and contents of support from the city disaster coordinating council for communities is pointed out in Table 21.5.2, and these supporting actions should be involved in the city disaster management plan.

Table 21.5.2 Role of Community and Local Health Personnel in Rescue and Relief Activities

Player	Community Based Activity	Essential Support from City Council's
Community*	I. Urgent period ✓Set up of Emergency Committee ✓Dissemination of information ✓Search and Rescue operations ✓Fire Extinguish operations ✓Transfer of casualty ✓Assistance of Reception at Health Centers or Hospitals	✓Activation of Emergency Response System or Incident Command System ✓Securing communication measures with community and other relevant agencies ✓Deployment of damage evaluation teams ✓Assessment of public facilities such as hospitals, schools, fire-fighting stations ✓Mobilization of LGU's employers
	II. Aftermath period ✓Assessment of people's needs ✓Coordination of external assistance groups ✓Family grouping ✓Sanitation at shelters ✓Monitoring food supply and Distribution ✓Caring orphan children ✓Dealing with the dead ✓Post-disaster development	✓Provision of necessary information for relief activities and their coordination ✓Set-up of Evacuation Shelters ✓Formulation and deployment of teams for Search & Rescue, AMP operation, Environmental Health and various Relief Activity ✓Procurement & distribution of equipment, vehicles, foods and supplies
	III. Preparedness period ✓Analysis of the past experiences ✓Adding to knowledge of the local risks and resources ✓Practicing exercise and activities to promote community preparedness ✓Practicing basic education	✓Technical support to formulate/activate the Barangay disaster coordinating councils ✓Organizing community workshops ✓Dispatching trainers and illuminators ✓Providing fundamental tools and instrument
Local Health Personnel	I. Urgent period ✓Organizing Health Centers or Hospitals ✓Triage ✓Emergency Care	✓Damage assessment of health facilities ✓Activation of Incident Command System ✓Set-up of AMPs and Coordination of EMS deployment
	II. Aftermath period ✓Monitoring community's health conditions ✓ (Vaccinations) ✓Nutrition ✓Instruction/education on health and sanitation ✓Mental health care ✓Periodic reports	✓Development of AMPs for chronic diseases, mental health ✓Dispatching Environmental Health teams ✓Disinfection of temporary shelters and camps ✓Procurement & distribution of equipment and supplies to hospitals, health centers and AMPs
	III. Preparedness period ✓Improving certain professional knowledge and skills ✓Preparedness at Health centers and hospitals ✓Training of voluntary health workers ✓Preparedness activities for the population	✓Dispatching trainers ✓Holding professional workshops and seminars ✓Providing first aid kits to health centers and barangay halls ✓Establishment of standard operation procedures for health disaster management

Note: * 'Community' includes local authorities and persons or groups who concern themselves in the localities with rescue work, communications, transport, shelter and food supply

21.6 List of Actions to Strengthen the Response Capacity

21.6.1 Feedback from the 2nd Workshop on Health Issues

Working group for Medical Services in 2nd Workshop on Health Issues held on August 26, 2003 has recommended some important issues such as "Mitigation and Preparedness Actions" which is shown in Table 21.6.1. Most of the actions support the themes that were already described in the quantitative analysis section before.

Table 21.6.1 Recommended Mitigation and Preparedness Actions

Needs	Issue or need	Action to meet needs	Spearhead agency
1. Response Plan in place a) LGU b) MMDA	Format Review	Format of Response Plan Body to review them	MMDA
2. To identify a pool of Incident Commander	Acceptance of Local Chief Executives (LCEs)	Creation of MOA for all LCEs	MMDCC
3. To have a database of health emergency resources		Collection of data on hospitals with their capabilities, ambulances, rescue groups and EMS	MMDCC All LGUs National agencies
4. Communication Link up	-Finance -So many members being used at present	- Decision on one number - LGU support to be tapped	MMDCC
5. Develop Guidelines/ protocols/ SOPs to improve delivery of services	-Multi-sectoral -Local Government Code	LGU support needed	MMDCC
6. Coordination to be institutionalized with regular meetings	-Politically influenced -Fast turn over of personnel	Assign a point person per LGU and agency with a permanent alternate	MMDCC
7. Capability Building especially in Search & Rescue, EMS, Mass Casualty Incident and ICS	-Lack of trainers and training module -Financial support -Brain drain	-Training needs and assessment -Standardized training modules	MMDCC LGU National Agencies

Source: JICA Study Team

The working group explained the contents of their opinions as follows:

- First, 'Needs' stress that no consistent disaster response plan has been in place at any LGU, and nothing will be implemented without such plans. The plans should follow a certain format, so that it could answer the questions raised, and plans should be reviewed because there might be a problem between the LGU's and the MMDA plans. Working group recommended that MMDA should undertake it within a year.
- The second issue is mass casualty management which requires an Incident Commander. The group suggests identifying a pool of Incident Commanders in metro Manila. The issue addressed is the acceptance of Local Chief Executives. The MMDCC should lead the support entities within a maximum timeframe of 1 year.
- Third is, to have a database of all health sector entities. MMDCC, all LGU's and national agencies are responsible to undertake action with a maximum timeframe of 1 year.

- Fourth need is about the communication link up. The problem here is financial and the existence of so many numbers in use at present. The group recommends having one number. LGU support needs to be tapped. MMDCC should undertake the action within 1-2 years timeframe.
- Fifth is to develop guidelines/ protocols/ SOP's to improve delivery of health services. It should be addressed by the multi-sectoral group and Local Government Code. The Local Chief Executive is the head of the area. LGUs and MMDCC should undertake action within 1-2 years.
- Sixth is that the coordination should be institutionalized within regular meetings. The problems here are lack of personnel, political influence, and fast turn over of personnel. Therefore the group suggests that there should be an assigned or appointed person per LGU and a different agency with a permanent alternate.
- Lastly, is capability building, especially in Search and Rescue, Emergency Medical services, Mass casualty Incident and Incident Command System. The problem is there is lack of trainers and training modules, financial support and some are lost due to brain drain. The action needs to include a training assessment and standardized modules. The action should in the cooperation of MMDCC, LGU, and other national agencies. The timeframe is from 1 to 5 years.

1) Plans and Project for Preparedness

Institutional, personnel and physical measures need to be taken aimed at strengthening earthquake disaster response capacity, and capability in overall disaster medical services. These measures can be categorized into the following five areas in terms of formulating plans and projects.

- Enhancement of Organizational Response Capacity
- Expansion of Emergency Information System
- Improvement of Government Hospital Capacities for Disaster
- Enforcement of Logistics
- Expansion of Training Programs

Table 21.6.2 lists the plans with level and timeframe to execute them by area. In the category of "Level", NCR means that DOH-NCR should be the responsible agency to implement the plan, and LGU means LGU should be.

Table 21.6.2 List of Projects to Strengthen Capacity

Area		Measures to improve and strengthen		Level	Period
1	Enhancement of Organizational Response Capacities	1.1	Introducing and applying Incident Command System (ICS) to both central and local government units, and health organizations	NCR LGU	3 years
		1.2	Formulation of Disaster Management Plan for LGUs and hospitals	NCR	2 years
		1.3	Assisting LGUs and health centers/hospitals for LGUs and all hospitals based on the prepared format/pro-formats	NCR	2 years
		1.4	Accreditation of health institutions by health insurance funds to confirm disaster preparedness	National	5 years
		1.5	Strengthening response capacity through formulating mutually assisting zones	NCR LGU	3 years
		1.6	Facilitating the arrangement for mutual medical assistance between LGUs in MM and surrounding provinces	NCR LGU	3 years
		1.7	Developing the arrangements between LGUs/central government and private venders for priority procurement of medical supplies	NCR LGU	2 years
		1.7	Facilitating the arrangement to compensate the private hospitals' expenses for providing the disaster victims with unconditional treatments	National	2 years
		1.8	Formulation of handbook for disaster medical and health services: Definition of roles of all health organizations and government departments	NCR LGU	2 years
		1.9	Institutionalization of regular meetings among health organization for disaster preparedness	NCR LGU	2 years
		1.10	Establish "Disaster Medical Centers" in the proposed zones by providing financial support for their facility development	National NCR	5-10 years
2	Expansion of Emergency information system	2.1	Expanding Radio-communication system from DOH network to major private hospitals and other government hospitals	NCR	5 years
		2.2	Facilitating reunification of EMS telephone numbers	NCR LGU	3 years
		2.3	Establishment, maintenance and provision of database for disaster medical services: health centers, hospitals, EMS agencies, directory, etc.	NCR LGU	2 years
		2.4	Facilitating activity to make arrangement with private ambulance services and transportation companies to mobilize vehicles at the disaster	NCR	2 years
3	Government hospital capacities for disaster	3.1	Strengthening functions of tertiary level hospitals to expand Intensive Care such as Hemodialysis Units, Burn Unit for severely injured victims	National	5 years
		3.2	Enlarging emergency services capacity at tertiary level hospitals by extending spaces and increasing staff for the Emergency Unit	National	5 years
		3.3	Equipping secondary/tertiary level hospitals with more portable equipment like tents, generator and stretchers to enlarge the patient receiving capacity	National	2 years
		3.4	Implementing building structural diagnosis and seismic reinforcement work of facilities at secondary and tertiary level hospitals	National LGU	2 years
		3.5	Enlarging capacities of water reservoir, fuel tank, and medical gases at secondary and tertiary hospitals to sustain themselves for 3 days	National LGU	5 years
		3.6	Increasing stocks of drugs and medical supplies at hospitals to sustain themselves for 3 days without supplementing at the disaster	National LGU	5 years
		3.7	Reserving open spaces next to tertiary hospitals in order to set up temporary camps to receive more injuries during the earthquake disaster	National LGU	5 years
		3.8	Securing helicopter pads near tertiary hospitals for victims transportation	National LGU	5 years
4	Logistics	4.1	Increasing stocks of drugs and medical supplies at central level to supply to EMS, health centers and government's hospitals for 3 days activities	National LGU	5 years
		4.2	Increasing stocks of blood and derivatives for transfusion at central level to supply to tertiary level hospitals for 3 days activities	National LGU	5 years
		4.3	Increasing stocks of disinfectants and Instrument for environmental health activities for health centers	LGU	5 years
5	Education and Training	5.1	Establishing training module on disaster health activities and first aids for education and training of health personnel and community people	National LGU	3 years
		5.2	Training of trainers for disaster medical system development	National	5 years
		5.3	Prevailing first aid techniques and disaster preparedness to community people by increasing frequency of seminars	NCR LGU	5-10 years
		5.4	Implementing triage and disaster medicine training to health personnel at community	NCR LGU	5-10 years

Chapter 22. Local Governance and Community Disaster Management

CHAPTER 22. LOCAL GOVERNANCE AND COMMUNITY DISASTER MANAGEMENT

22.1 Basic Principle of Community Based Disaster Management

The basic principle of disaster management is self-reliance. Self-reliance means that each individual should protect the safety of oneself and one's own family by oneself, and neighbors should protect their own community by themselves. For community based earthquake disaster management, certain preparation is needed to mitigate possible damages and prevent secondary hazards such as fires. Neighborhood community organizations are the basic bodies for community based disaster management activities. Even though Metro Manila citizens are metropolis dwellers, the bayanihan[1] spirit, a Filipino traditional communal volunteer spirit that makes seemingly impossible feats possible through the power of unity and cooperation, exists. According to a social survey result, people have the tendency toward fatalism and thinking that someone will help them.

However, the fatalism and dependency on others should be eliminated and self-reliant thinking needs to be primarily stressed. In the pilot community activities, even tough people initially had the sense of fatalism, but after attending several workshops and receiving knowledge and direct perception about earthquake disasters, the fatalism started slowly to vanish.

The fatalism derives from the lack of knowledge; many people simply did not know how to react and what to do to minimize the earthquake impacts. Thus the attitude was fatalistic. However, knowledge is power. Once citizens come to know how to prepare for the earthquake disaster, they will no longer be fatalistic, and they will start taking appropriate actions. The damage estimation results helped very much in visualizing the situation and gave them the chance to think about how to respond to it to minimize the impact. Resilience and resistance that has been acquired prior to the earthquake event will define the damage conditions at the time of the event and eventually become a precondition that defines the evacuation and recovery processes. Developing resilience and resistance has to be carried out by the individual, family, community, barangay and local government units. During emergency situations, the following resources are found to be needed: human power, tools for search and rescue, fire extinguishing, emergency medical assistance, life supporting materials like food and water, evacuation facilities, clothes, daily commodities, medical supplies, individual physical strength, decision making, family cooperation and solidarity, local resources, leadership, knowledge about the locality and the weak, aged , and disabled.

[1] Bayanihan originally means that neighbors would help a relocating family by gathering under their house, and carrying it to its new location

22.2 Plan and Tasks

The following table is the sample format for the planning session. Audiovisual presentation materials that describe the possible earthquake situation will facilitate effective planning opportunities. Knowledge sharing by disaster response agencies also helps participants imagine the precise emergency situation and leads to concrete plans. Participants will also learn how to prepare for the earthquake and actually prepare for it.

Disaster response agencies that can assist in promoting community based disaster preparedness can get first hand perceptions of community capacity and individual capacity by experiencing the process of the planning workshops.

Task allocation

Task	**Goal**	**Tasks in Emergency Time**			**Tasks in Ordinary Time**		
		Individual Response	Community Response	Bgy Response	Individual Response	Community Response	Bgy Response
Search and Rescue							
Emergency Medical							
Fire Extinguish							
Information Management							
Evacuation							
Public Awareness							
……							

22.3 Dissemination Framework

22.3.1 Agreement on Supporting Disaster Management Activity in Communities

Three model barangays were selected to learn lessons to disseminate the similar activities to other barangays in Metropolitan Manila. Even though the activities of three model barangays are successful, the safety level of the barangays in Metropolitan Manila still needs to be raised. Rather choosing a community in which typical difficulties and problems may be commonly envisioned in the Metropolitan Manila will provide the suggestive results. Furthermore, establishing the framework for disseminating the activities into other barangays is the ultimate goal. To expand the activities, close collaboration with the local government is essential. At present, formulating a barangay disaster preparedness plan and organizing a barangay disaster coordination council are clearly defined in the legal form, but instructions for the concrete planning steps have not been provided. This is the main reason why the system remains only in the form but not put into practice.

In the three pilot communities, Minutes of Agreement that ensures further support of community based disaster management activities through the LGU are to be signed with MMDA and PHIVOLCS. MMDA will assist in formulating the disaster preparedness plan and PHIVOLCS will assist with technical knowledge about the earthquake disaster.

Further continuous community activities are expected. LGUs are expected to expand the similar activities to other barangays within the city.

In addition to this, MMDA has free training programs within its own budget, and any community or barangay can access this training by writing a request letter addressed to the MMDA Chairman.

Consequently, the outputs of the activities and experiences in the three selected communities are ready to be trickled down to the other communities.

PHIVOLCS and MMDA are expected to sign the Minutes of Agreement for expanding similar activities to other barangays that are willing to be assisted in disaster management activities on the condition that necessary budgetary funds are to be provided by the LGUs.

22.3.2 Publication of “Community Activity Guidebook”

For the dissemination of community based disaster management activities, JICA MMEIRS has produced a guidebook titled as “Community Activity Guidebook”. The guidebook is attached in the appendix. The main contents are an explanation of the concept of participatory planning and activity guides on how to organize community disaster management workshops. Especially

procedures for vulnerability and capacity assessment, community watching, risk and resource[2] mapping, disaster imagination game, and drills are included.

The Disaster Imagination Game (DIG) is a practical tool for the community to understand actual situations and make plans accordingly. There are two major features of the DIG; one is that ambiguous information will be minimized, since any information more or less attributes location. The other is that damage estimation results will be delineated on the map and the real situation can be visualized and participants can make realistic and practical plans.

This guidebook is produced based on the experience of the pilot community activities in the three selected areas. The procedures were tested and reviewed in these activities and the effectiveness of the planning process has been proved. The JICA Study Team is now approaching the Office of Civil Defense, MMDA, and PHIVOLCS for authorization of the guidebook to be utilized as an official guidebook for disseminating community disaster preparedness programs.

Along with the Minutes of Agreement, the framework for assisting community based disaster management activities has been established.

The Community Activity Guide is composed of three sections, introduction, planning guide and activity guide. In the activity guide section, activities are explained in the following steps.

Step 1	Identifying Participants
Step 2	Establishing Planning Committee
Step 3	Mapping out Stakeholders' Commitment
Step 4	Needs Analysis
Step 5	Disseminating Damage Scenario
Step6	Identifying Vulnerability and Capacity in the Community
Step7	Locating the Vulnerabilities and Capacities
Step8	Setting Planning Objectives
Step9	Allocation of Responsibilities
Step 10	Documenting the Plan
Step 11	Testing and Reviewing the Plan

[2] The word "risk" in "risk and resource map" is intrinsically "vulnerability". However, for easier understanding among community people "risk and resource map" was adopted in the MMEIRS activities. International Strategy for Disaster Reduction (ISDR) adopts "risk map" for similar term.

22.4 Lessons

In promoting community based disaster management activities in Metropolitan Manila, the following lessons are learned from the pilot activities.

1) Requirement of physical assets (such as community centers) to enhance communication and networking in the community
2) Introduction of low cost housing program for earthquake safety
3) Dissemination of disaster mitigation culture through social and health workers
4) Identification and establishment of smaller units and chain of command system within the barangay
5) Incorporation of livelihood programs in community activities
6) Establishment of synergetic collaboration network to enhance barangay's planning function with the local governments
7) Setting up flexible scope of works and time schedule in the community activities
8) Inception of priority activity from flood prone area
9) Securing enough time for close interactive dialogue about hazards, building vulnerabilities, and damage estimation results
10) Utilizing community Global Positioning System (GPS) to facilitate map reading and community watching session (need not be owned by the communities)
11) Agreement of cost sharing to organize workshops

22.5 Community Responsibilities for Earthquake Disaster Management

Some communities are suffering from recurring floods, and earthquake is not the first priority. For promoting earthquake disaster management activities, it is more effective to start from the area where both flood and earthquake disasters are more serious. In terms of risk management, most people can easily imagine the situation of flood but not for the earthquake. In the workshop, visual presentation should be fully utilized, and the difference of earthquake and flood disaster should be explained. Especially we have to stress that in the case of flood, pre-disaster measures are possible and the first reaction is evacuation, while an earthquake is a sudden destructive, huge, mass disaster, and first reaction is rescue. Public officials can be victims and the response capacities of Police, Bureau of Fire Protection, Armed Forces, MMDA, LGUs, Barangays are limited for such an catastrophic disaster like an earthquake. Thus, self-help, mutual help, and community help are the essential and initial stage response, and the community needs to respond effectively. The danger of secondary disasters such as fires and gas explosion is expected. At the initial stage of an earthquake disaster, nobody knows the total pictures of damages. That is why a community plan is essential. The planning process is a training process in which people think about how to react and manage to the different adversity situations. In emergency situations, people have to react quickly to the changing situations. The planning process gives people

opportunity to think how to react, consequently it will be a mind set for emergency risk management.

22.6 Local Governance and Community Governance

After the implementation of the Local Government Code in 1991, the decentralization process has been progressed. Authority, responsibilities and budget have been transferred to the local governments. But in reality, the process has not always been so smooth and the capacities and the experience of the local governments are not fully transferred and accumulated yet. In the Philippines, city councils and councilors have played certain roles for implementing public service for the citizens. Local governments are the primary response agencies for this. It is due to the certain amount of budget that councilors have commonly called "pork barrel" and the decision power the city councils have. In reality, barangay captains, who are in need of extra projects that cost beyond the budget of their own barangay, often consult city councilors and congressmen and the proposal has been materialized. With this background, local governments have been weak in the function of planning and budgeting. However, in the decentralization, local government is the primary responsible agency for development, and necessary capacity building for institutions and human resources is essential.

In this regard, national and international assistance are effective, when the project is implemented in close cooperation with the local government, especially in making linkages with local governments and barangays and building synergetic partnerships. Right now the smallest government body, the barangay, can play an essential role to assess local needs. Therefore, putting local demands and prioritizing them into the development process are suitable tasks for barangays. More linkages should be made between local governments and barangays in terms of public administrative services. This will accelerate effective community governance, too.

22.7 Community Resilience and Social Capital Enhancement

To visualize community resilience, the assessment of social vulnerability and capacity and the root causes of vulnerability are often stressed. In the pilot communities, the assessments were conducted, too. The importance of the assessment is fully understood, however the study team confronted three difficulties. The assessment process is very time consuming and it does not match with the time schedule for the community based disaster management activities. Even though it is a product of spending a certain amount of time and money, the results tend to be narrative, and analytical solutions are not fully withdrawn for the planning session. The importance of each component and their interrelations are not so clear. Naturally, human relationships and notions are complicated in nature and factors that can take more effect differentiate from each socio-cultural context. Even after starting a planning session, the analytical conclusions of the survey results were not withdrawn for the effective planning. For

one thing, even after planning session started, organizers were still observing how the community decision-making structures operated through the participatory planning session.

Nowadays social capital[3] is regarded to be one of the essential capitals in development along with human, natural, physical, and financial capital. Social capital at the macro level is legitimacy, political system, and decentralization, and at micro level, social cohesion, mutual reliance, trust, leadership, decision making structure, attitude, and normative behavior. It is not visible, therefore in the past it was regarded to be external conditions. However, nowadays in international development, social capital is regarded to be one of the capitals that will be enhanced by external interventions. "Bridging type" social capital helps to build the relationships among the organizations and local communities and "Bonding type" is to build trust within each organization and activate mechanism for mutual help community level disaster management is closely related to social capital enhancement and it involves development of mutual help and partnerships among institutions. Enhancement of these also leads to sustainable development.

Citizens in Metro Manila are busy urban dwellers who try to make a better living place. Approaching for upgrading to a better living environment and amenities will strike residents' hearts more than talking to them about earthquake disaster management activities. Political will is one of the most important factors in the Philippines and this approach is easier to build political will.

[3] Social capital refers to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. Increasing evidence shows that social cohesion is critical for societies to prosper economically and for development to be sustainable. Social capital is not just the sum of the institutions which underpin a society. It is the glue that holds them together.