



EARTHQUAKE CONTINGENCY PLAN
for Dhaka City Corporation (DCC)



Earthquake Contingency Plan

Dhaka City Corporation

**Under Comprehensive Disaster Management Programme (CDMP)
Ministry of Food and Disaster Management
Earthquake and Tsunami Preparedness
CDMP/EC/4a/PC-1**

In collaboration with



Contents

LIST OF ABBREVIATIONS	5
EXECUTIVE SUMMARY	8
CHAPTER 1	10
Earthquake Threat in Bangladesh and Identification of Risk Scenario related to Agency Functions	10
1.1 Introduction	10
1.2 Nature of Threats	10
1.3 Potential Damage in different Scenarios of Earthquake	11
Buildings Damage	11
Collateral Hazards.....	11
1.4 Potential Casualties in different Scenarios of Earthquake	12
1.5 Possible availability of Hospital bed after an Earthquake	14
1.6 Essential Facilities Damage in Dhaka City Corporation Area.....	14
1.7 Utility Damage in Dhaka City Corporation Area.....	16
CHAPTER 2	18
General Aspects of Agency Level Plan.....	18
2.1 Legal Provisions, Authority and DM Functions of DCC.....	18
2.2 The Need for Earthquake Contingency Plan for DCC.....	20
2.3 The Major roles assigned to DCC in relation to National Earthquake Contingency Plan.....	21
2.4 The support roles assigned to DCC under National Earthquake Contingency Plan	21
2.5 Objectives of DCC in fulfilling roles under National Earthquake Contingency Plan.....	22
2.6 Agency level structure for Command, Control and Coordination within the organization and with outside agencies	23
2.7 Plan Implementation Strategies by DCC	24
2.8 Plan Limitations	25
2.9 Intended Users of the Plan within DCC	25
CHAPTER 3	26
Functional Response Roles and Responsibilities Assigned for DCC.....	26
3.1 Emergency Response Tasks under Respective Functional Groups- Preparedness and Mitigation Phase (normal time activities)	26
3.2 Emergency Response Tasks under Respective Functional Groups – Response phase (activities during and soon after the disaster events)	28
3.3 Emergency Response Tasks Under Respective Functional Groups – Recovery phase (activities following a disaster event)	30
CHAPTER 4	32
Operating Procedure Guidelines	32
4.1 Planning Assumptions.....	32

4.2	Earthquake Contingency Plan Objective in an Earthquake Disaster Situation.....	33
CHAPTER 5	36
	Readiness Checklist	36
CHAPTER 6	38
	Agency Level Actions for Training & Capacity Building of Staff, Awareness Creation, Reporting, Pre-positioning of Emergency Facilities, Resource Mobilization for Purchase of Equipments	38
6.1	Assessment of Existing Capacity (Man power, equipment and material).....	38
6.2	Gap analysis and consultant’s recommendations for addressing the gaps.....	39
6.3	Process for addressing the gaps	43
6.4	Action Plan for Enhancement of Capacity.....	44
References	45
glossary of Terms	46

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AFD	Armed Forces Division
AMI	Anjumane Mofidul Islam Bangladesh
Ansar & VDP	Bangladesh Ansar and Village Defence Party
BA	Biman Airlines
BDR	Bangladesh Rifles
BCAA	Bangladesh Civil Aviation Authority
BCG	Bangladesh Coast Guard
BDRCS	Bangladesh Red Crescent Society
BFRI	Bangladesh Forest Research Institute
BGSL	Bakhrabad Gas Systems Limited
BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BIP	Bangladesh Institute of Planners
BIWTA	Bangladesh Inland Water Transport Authority
BKMEA	Bangladesh Knitwear Manufacturer and Exporters Association
BLRI	Bangladesh Livestock Research Institute
BMA	Bangladesh Medical Association
BMD	Bangladesh Meteorological Department
BP	Bangladesh Police
BPDB	Bangladesh Power Development Board
BR	Bangladesh Railway
BRTA	Bangladesh Road and Transport Authority
BRTC	Bangladesh Road and Transport Corporation
BSS	Bangladesh Sangbad Sangstha
BTMEA	Bangladesh Textile Mills Association
BTCL	Bangladesh Telecommunication Company
BTRC	Bangladesh Telecommunication Regulatory Commission
BTV	Bangladesh Television
BUET	Bangladesh University of Engineering & Technology
BWDB	Bangladesh Water Development Board
CAAB	Civil Aviation Authority Bangladesh
CBOs	Community-Based Organizations
CC	City Corporations
CCP	Bangladesh Centre for Communication Programs
CDA	Chittagong Development Authority
CDC	Communicable disease Control
CME	Centre for Medical Education
CMMU	Construction, Maintenance and Management Unit
CPA	Chittagong Port Authority
CPP	Cyclone Preparedness Programme
CWASA	Chittagong Water Supply and Sewerage Authority
DCC	Dhaka City Corporation
DPDC	Dhaka Power Distribution Company Ltd.
DESCO	Dhaka Electric Supply Company Ltd.
DFP	Department of Films and Publications

DG Fisheries	Directorate of Fisheries
DGoF	Directorate General of Food
DG Livestock	Directorate of Livestock
DGHS	Directorate General of Health Services
DMB	Disaster Management Bureau
DMC	Department of Mass Communication
DOA	Department of Architecture
DPHE	Bangladesh Department of Public Health Engineering
DRR	Directorate of Relief and Rehabilitation
DWASA	Dhaka Water Supply and Sewerage Authority
EMS	Earthquake Magnitude Scale
FAO	Food and Agricultural Organization
FBCCI	Federation of Bangladesh Chambers of Commerce
FSCD	Bangladesh Fire Service & Civil Defence
IAB	Institute of Architects Bangladesh
IFRC	International Federation of Red Cross and Red Crescent Societies
IOM	International Organization for Migration
IRC	International Rescue Committee
JICA	Japan International Cooperation Agency
GSB	Geological Survey of Bangladesh
HBRI	Housing & Building Research Institute
IAB	Institute of Architects Bangladesh
IEB	Institute of Engineers Bangladesh
IFRC	International Federation of Red Cross and Red Crescent
INGOs	International Non-Government Organizations
JGTDSL	Jalalabad Gas Transmission & Distribution Co. Limited
LGA	Local Government Agencies
LGD	Local Government Division
LGED	Local Government Engineering Department
LGRD	Local Government and Rural Development
LGRDC	Local Government Rural Development and Cooperatives
MinCom	Ministry of Commerce
MoC	Ministry of Communications
MoCAT	Ministry of Civil Aviation and Tourism
MoF	Ministry of Finance
MoFDM	Ministry of Food and Disaster Management
MoFL	Ministry of Fisheries and Livestock
MoHA	Ministry of Home Affairs
MoHFW	Ministry of Health and Family Welfare
MoHPW	Ministry of Housing and Public Works
MoI	Ministry of Information
MoL	Ministry of Land
NGOs	Non-Government Organizations
NHA	National Housing Authority
NIPSOM	National Institute of Preventive and Social Medicine
OHCHR	Office of the High Commissioner for Human Rights
PDB	Power Development Board
PetroBangla	It is a successor of Bangladesh Mineral Oil and Gas Corporation
PGCL	Power Grid Company of Bangladesh Ltd

PIB	Press Institute of Bangladesh
PID	Press Information Department
PSTN	Public switched telephone Network
PWD	Public Works Department
R&H	Roads and Highways
RAB	Rapid Action Battalion
REB	Rural Electrification Board
RAJUK	Rajdhani Unnyan Kortipakha
REHAB	Real Estate & Housing Association of Bangladesh
RHD	Roads and Highways Department
TGTDCL	Titas Gas Transmission and Distribution Co. Ltd
SoB	Survey of Bangladesh
UNDP	United Nations Development Programme
UN HABITAT	United Nations agency for human settlements
UNHCR	UN High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNRC	Resident Coordinator of United Nations
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
VDP	Village Defence Party
WFP	World Food Programme
WHO (DERG)	World Health Organization (Disaster Emergency Response Group)

EXECUTIVE SUMMARY

This Plan identifies the intended actions to be taken by Dhaka City Corporation (DCC) in response to a damaging earthquake.

The overall goal of the project on **Contingency planning with regard to earthquake hazard** will be to develop a comprehensive geo-hazard risk reduction “Contingency planning” strategy that is linked to an easy implementation framework to be able to address the current needs and issues, which would be implacable at all the national, city and agency level and cover all the levels of disaster risk management from preparedness to response.

The project on Contingency planning with regard to earthquake hazard is comprised of two main activities:

- Task I: Determine status of Contingency planning and design of interim Contingency Plan
- Task II: Turn interim Contingency Plans into final versions (using maps for selected urban areas that highlight earthquake-vulnerable school/hospital/emergency response and control buildings etc.)

Planning requires the active participation of the stakeholders involved in implementation of the activities including in the planning stage. Time becomes more valuable once an emergency occurs, so planning before the emergency when workloads may be more flexible is very important. Earthquake happens without any early warning and although stakeholder community in Bangladesh is quite capable of responding to events such as floods, cyclones etc. there is a need for conducting Contingency planning in advance. One reason for conducting Contingency planning is because it will facilitate a **rapid emergency response** by allowing planners, in advance of an emergency to:

- Consider the likely consequences of an emergency before it occurs
- Identify the key resources, both human and physical, which may be available to respond to the emergency
- Identify the critical areas for immediate action
- Build and train the emergency response team in advance
- Define the general policies and approach to the emergency in advance

All of these measures allow constructive intervention immediately after the emergency. Team building is particularly useful, as the ability to act as a team may be critical to the success of the initial emergency response. Another benefit to Contingency planning is that,

before an emergency, there is comparatively more time to consider all the aspects of problems that are likely to arise. Once the emergency has occurred, it may be very difficult to bring all of the players together. Agreement on policies in the Contingency planning stage may help clarify applicability and resolve contradictions that may occur. **Rapid decision making** on operational issues after an emergency is important because delays may cost lives.

The Contingency planning also serves as a tool for ***maintaining control over events or limiting the risk of loss of control***. Because of the scale of the problems that they pose, earthquakes sometimes provoke erratic or unpredictable responses. Well-intentioned but ill-equipped agencies may rush to help, leading some agencies to over-react to the emergency. The risk of inappropriate responses is much lower when clear plans are in place. The Contingency planning process also allows identification of projected needs that may arise as a result of an emergency and the resources that will be immediately available to meet those needs. One benefit of a realistic Contingency Plan is that it may encourage donors and others to provide the needed resources for enhancement of resource base of the agencies involved in plan implementation.

Although the objective of Contingency planning is usually the production of a Contingency Plan, many useful outputs of Contingency planning come from the ***process*** through which the plan is developed. Therefore, there are many advantages in a plan prepared by coming together of all major potential actors, agreeing on the broad policies and working groups filling the detail of the plan to a plan developed by an experienced emergency planner developing a Contingency Plan. It does not mean that the plan is not important. The plan is a measure of the quality of the process. A good planning process will produce a good plan. Even though the earthquake that occurs may be very different from the one planned for, the plan will still be useful. A good Contingency Plan ensures better preparedness for any emergency that may occur, even one that is very different from the scenario in the plan.

This draft plan identifies the intended actions to be taken by the Dhaka City Corporation (DCC) in response to a damaging earthquake. This report contains six sections. Section 1 includes a general discussion regarding earthquake threat in Bangladesh and identification of risk scenario related to the agency's functions. In Section 2 general aspects of agency level plans have been discussed. In Section 3, functional response roles and responsibilities assigned for DCC have been identified. In Section 4, operating procedure guidelines for DCC has been developed. In Section 5, a readiness checklist has been proposed for DCC. In Section 6, agency level actions for training & capacity building of staff, awareness creation, reporting, pre-positioning of emergency facilities, and resource mobilization for purchase of equipments have been identified.

CHAPTER 1

Earthquake Threat in Bangladesh and Identification of Risk Scenario related to Agency Functions

1.1 Introduction

Over the past decades, urbanization in Bangladesh has been rapidly taking place without proper guidance. As a result many of the urban centers have developed haphazardly. These urban centers are fast growing and influence the economic developments of the country. It is therefore essential to have a realistic understanding on the nature, severity and consequences of likely damage/loss that a possible event of earthquake could cause. A strong earthquake affecting a major urban center like Dhaka, Chittagong, or Sylhet may result in damage and destructions of massive proportions and may have disastrous consequences for the entire nation.

A low to moderate level of earthquake may cause Sevier damages to the life and property that may go beyond the existing capacity of Dhaka City Corporation (DCC). Considering likely earthquake threat in Bangladesh, the Comprehensive Disaster management Programme (CDMP) under the Ministry of Food and Disaster Management of the Government of Bangladesh (GoB), took initiative to develop likely scenarios of earthquake for Dhaka, Chittagong and Sylhet. This report presents the likely building collapse, debris generation, fire hazards and casualties during different level of earthquakes in these three cities and current preparations/ capacity of Dhaka City Corporation to cope with the situation.

1.2 Nature of Threats

Geographically Bangladesh is located close to the boundary of two active plates: the Indian plate in the west and the Eurasian plate in the east and north. In the past there were several earthquakes that caused severe damages to life and properties. Some of the major earthquakes around the region includes the 1548 earthquake, the 1664 earthquake, the 1762 earthquake, the 1869 Cachem earthquake (Ms 7.5), the 1885 Bengal earthquake (Ms 7.0), the 1897 Great Assam earthquake (Ms 8.1), and the 1918 Srimangal earthquake (Ms 7.6) (Earthquake in website “Banglapedia”; Oldham, 1883; Ambraseys, 2004; Bilham and Hough, 2006 etc). However, recently Bangladesh did not experience with any large earthquake since 20th century for about 100 years. The 1918 earthquake is thought not to be a characteristic one, since the magnitude is small for the plate boundary fault. This may mean that Bangladesh has a high risk of large earthquake occurrence in near future. Several

major active faults, e.g. the plate boundary fault (the northern extension of subduction fault) and the Dauki Fault, are inferred in Bangladesh. These faults must generate large earthquakes over M 8. However, the nature, detailed location, and the faulting history on these faults are not well known yet (Morino, 2009).

1.3 Potential Damage in different Scenarios of Earthquake

Three different scenarios have been developed to identify the possible damage to infrastructures, buildings, transportation and number of casualties. The scenarios are least, moderate and worst case as assumed based on different magnitude of earthquake. Following are the scenarios of elements at risk in Dhaka city.

Buildings Damage

During an earthquake at 7.5 Mw originated from Madhupur fault, about 166,570 buildings will be moderately damaged. This is about 51.00 % of the total number of buildings in the city. It is estimated that about 75,218 buildings that will be damaged beyond repair. If the magnitude of the earthquake is 8.0 Mw, about 93,605 buildings will be at least moderately damaged which is about 29.00 % of the total number of buildings. During an earthquake originated from under the city at 6.0 Mw will moderately damage about 136,434 buildings and about 53,989 buildings will be damaged beyond repair.

Collateral Hazards

There might be several hazards due to earthquake which may affect structures as well as may cause damage to human life and increase economic losses. These collateral hazards include fire, debris generations etc. Following are the possible fire hazards and debris generation that may appear due to earthquake in Dhaka.

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. For this scenario development, possible estimation has been made using Monte Carlo simulation model to get the number of ignitions and the amount of burnt area.

During an earthquake of 7.5 Mw originated from Madhupur Fault, there will be 920 ignitions that will burn about 4.12 sq. mi 9.04 % of the city area. It is estimated that the fires will displace about 701,134 people and burn about 1,577 (millions of dollars) of building value. Similarly an earthquake originated from Plate boundary fault-2 will be responsible for 918 ignitions that will burn about 4.08 sq. mi 8.95 % of the city area. It is also estimated that the fires will displace about 726,606 people and burn about 1,665

(millions of dollars) of building value. The earthquake if originated from under the city of 6.0 Mw will be responsible for 920 ignitions that will burn about 4.22 sq. mi 9.26 % of the city and the fires will displace about 730,857 people and burn about 1,563 (millions of dollars) of building value.

Debris Generation

Estimated the amounts of debris that will be generated by the earthquake are categorized into two general categories:

- a) Brick/Wood
- b) Reinforced Concrete/Steel.

This distinction is made because of the different types of material handling equipment required to handle the debris.

During an earthquake of 7.5 Mw originated from Madhpur Fault a total of 30,599.00 million tons of debris will be generated. Out of this, Brick/Wood comprises 22.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 1,223,960,000 truckloads (@25 tons/truck) to remove the debris generated by the earthquake. Similarly an earthquake originated from Plate boundary fault-2 will generate a total of 19,147.00 million tons of debris of which Brick/Wood comprises 19.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 765,880,000 truckloads (@25 tons/truck) to remove the debris generated by the earthquake. The earthquake if originated from under the city of 6.0 Mw, will be responsible for generation of a total of 21,059.00 million tons. Out of this, Brick/Wood comprises 23.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 842,360,000 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

1.4 Potential Casualties in different Scenarios of Earthquake

In order to take necessary preparation by different agencies, during earthquake study under CDMP, the numbers of people that will be injured and killed by the earthquake have been estimated into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening

- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimations are for two times of day: 2:00 AM and 2:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum and the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum. Following are the description on the casualties in the city of Dhaka in different time on different scenarios.

During an earthquake at 7.5 Mw originated from Madhupur fault at night time, about 18 thousand people will be killed immediately after the earthquake. About 9 thousand people will require hospitalization and can become life threatening if not promptly treated, about 50 thousand people will require hospitalization but are not considered life-threatening and about 150 thousand people will require medical attention like first aid or some kind of treatment. Similarly about 2 thousand people will be killed, one thousand need to be hospitalized on a critical condition, seven thousand need to be hospitalized on moderate injuries and about 24 thousand people will require medical attention if there is an earthquake at 8.0 Mw from plate boundary Fault-2. During an earthquake originated from under the city at 6.0 Mw, about 13 thousand people will die immediately, about seven thousand people will need to be hospitalized on a critical condition, about 38 thousand people will require taking admission in hospital with moderate injuries and about 110 thousand people will require medical attention.

Table: Casualties in Dhaka during different cases in Different Time

<i>Time and Case</i>	<i>Level of casualties</i>			
	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4</i>
<i>2 AM</i>				
<i>Case 1</i>	<i>152,307</i>	<i>50,905</i>	<i>9,028</i>	<i>17,884</i>
<i>Case 2</i>	<i>23,965</i>	<i>6,952</i>	<i>1,139</i>	<i>2,251</i>
<i>Case 3</i>	<i>110,753</i>	<i>37,265</i>	<i>6,671</i>	<i>13,216</i>
<i>2 PM</i>				
<i>Case 1</i>	<i>137,582</i>	<i>45,810</i>	<i>8,221</i>	<i>15,892</i>
<i>Case 2</i>	<i>32,021</i>	<i>9,433</i>	<i>1,572</i>	<i>3,021</i>
<i>Case 3</i>	<i>91,863</i>	<i>30,759</i>	<i>5,586</i>	<i>10,804</i>

Source: Hazus calculation based on database, engineering geology and seismic hazard

An earthquake at 7.5 Mw originated from Madhupur fault at day time, will kill about 16 thousand people immediately after the earthquake. About 8 thousand people will require hospitalization and can become life threatening if not promptly treated, about 46 thousand people will require hospitalization but are not considered life-threatening and about 137 thousand people will require medical attention like first aid or some kind of treatment. Similarly about 3 thousand people will be killed, one thousand five hundred need to be hospitalized on a critical condition, nice thousand five hundred need to be hospitalized on moderate injuries and about 32 thousand people will require medical attention if there is an earthquake at 8.0 Mw from plate boundary Fault-2. During an earthquake originated from under the city at 6.0 Mw, about 10 thousand people will die immediately, about five thousand five hundred people will need to be hospitalized on a critical condition, about 30 thousand people will require taking admission in hospital with moderate injuries and about 92 thousand people will require medical attention.

1.5 Possible availability of Hospital bed after an Earthquake

During scenario development for three cities, available hospital beds and other facilities are considered. Based on these, following is a likely scenario of hospitals to cope with the situation.

In Dhaka there are about 59,849 hospital beds available for use. On the day after an earthquake of 7.5 Mw, it is estimated that only 26,171 hospital beds (44%) will be available for use by patients already in the hospital and those injured by the earthquake. After one week, 57% of the beds will be back in service. By 30 days, 73% will be operational. After an earthquake at 8.0 Mw only about 28,265 hospital beds (47%) are available for use by patients already in the hospital and those injured by the earthquake. During this situation after one week, about 63% of the beds will be back in service and by 30 days, 80% will be fully operational. In least case during an earthquake at 6.0 Mw about 38,489 hospital beds (64%) will be available for use by patients already in the hospital and those injured by the earthquake during first day. After one week, 78% of the beds will be back in service. By 30 days, 88% will be operational.

1.6 Essential Facilities Damage in Dhaka City Corporation Area

There will be severe damage to essential facilities like Hospital, schools, police stations after different level of earthquakes. An earthquake at 7.5 Mw originated from Madhupur fault will be responsible for damaging about 197 hospital or clinics in Dhaka city and 10 will be totally damaged. About 90 schools will be totally damages. However 21 police station and 4 fire service stations will be moderately damaged.

Table : Expected Damage to Essential Facilities in Dhaka City Corporation Area

Classification	Total	Facilities		
		At Least Moderate Damage >50%	Complete Damage >50%	With Functionality >50% on day 1
<i>Dhaka : Case 1</i>				
Hospitals	600	197	10	280
Schools	2,737	857	90	1,241
EOCs	1	0	0	1
Police Stations	62	21	0	23
Fire Stations	10	4	0	5
<i>Dhaka : Case 2</i>				
Hospitals	600	22	1	431
Schools	2,737	97	2	2,029
EOCs	1	0	0	1
Police Stations	62	1	0	46
Fire Stations	10	0	0	7
<i>Dhaka : Case 3</i>				
Hospitals	600	178	0	301
Schools	2,737	791	0	1,294
EOCs	1	0	0	1
Police Stations	62	17	0	25
Fire Stations	10	4	0	5

An earthquake at 8.0 Mw from plate boundary Fault-2 will moderately damage 22 hospitals and one totally damage. However 431 hospital or clinics will be fully functional on the first day. During this situation 97 schools will be moderately damaged and fire service & police station will remain normal. During an earthquake originated from under the city at 6.0 Mw, about 178 hospital or clinics will be moderately damaged. About 791 schools, 17 police station and 4 fire service station will be also moderately damage at the same time.

1.7 Utility Damage in Dhaka City Corporation Area

An earthquake at 7.5 Mw originated from Madhupur fault will be responsible for moderate damage to potable water at 153 points, waste water at 2, natural gas at 2 points, electrical power at 15,200 and communications at 5 places. During this period there will be 79 leaks and 272 breaks in water supply system, 107 leaks & 360 breaks in waste water system and 56 leaks & 191 breaks in gas supply network.

Table : Expected Utility System Facility Damage in Dhaka City Corporation Area

System	Scenario 1 Number of Locations					Scenario 2 Number of Locations					Scenario 3 Number of Locations				
	Total Number	With at Least Moderate Damage	With Complete Damage	With Functionality >50%		Total Number	With at Least Moderate Damage	With Complete Damage	With Functionality >50%		Total Number	With at Least Moderate Damage	With Complete Damage	With Functionality >50%	
				After Day 1	After Day 7				After Day 1	After Day 7				After Day 1	After Day 7
Potable Water	748	153	0	548	748	748	0	0	747	748	748	4	0	676	748
Waste Water	14	2	0	0	14	14	0	0	14	14	14	0	0	0	14
Natural Gas	7	2	0	2	7	7	0	0	7	7	7	7	7	6	7
Electrical Power	54,815	15,200	0	0	0	54,815	0	0	5,497	0	54,815	405	0	0	0
Communication	30	5	0	0	29	30	0	0	0	29	30	1	0	0	29

Table : Expected Utility System Pipeline Damage in Dhaka City Corporation Area

System	Scenario 1			Scenario 2			Scenario 3		
	Total Pipelines Length (km)	Number of Leaks	Number of Breaks	Total Pipelines Length (km)	Number of Leaks	Number of Breaks	Total Pipelines Length (km)	Number of Leaks	Number of Breaks
Potable Water	1,118	79	272	1,118	39	132	1,118	39	139
Waste Water	630	107	360	630	62	202	630	58	202
Natural Gas	834	56	191	834	26	86	834	26	94

An earthquake at 8.0 Mw from plate boundary Fault-2 all facilities will remain under operations from the first day of earthquake. During an earthquake originated from under the city at 6.0 Mw, all 7 points of natural gas system will be completely damaged. During this period there will be moderate damage to electrical power at 405 places. Waster water operation will remain under operation after seven day in all 14 points and potable water will be functional after 7 days in all places. During this period there will be 39 leaks and 139 breaks in water supply system, 58 leaks & 202 breaks in waste water system and 26 leaks & 94 breaks in gas supply network.

CHAPTER 2

General Aspects of Agency Level Plan

2.1 Legal Provisions, Authority and DM Functions of DCC

Disaster Management Act

Bangladesh has developed a draft regulative framework, which provides for the relevant legislative policy and best practice framework under which the activities of disaster risk reduction and emergency management can be managed and implemented.

While the Bangladesh Government assigns roles and responsibilities to various Ministries of the Government, Disaster Management roles and responsibilities are assigned through the Standing Orders on Disasters (SOD). Disaster Management Committees at all levels including city corporations also receive their assigned roles and responsibilities through the SOD as well.

National Disaster Management Policy

Defines the national perspective on disaster risk reduction and emergency management, and describes the strategic framework, and national principles of Disaster Management in Bangladesh.

Disaster Management Plans

The draft National plan has been developed to address the Government of Bangladesh's Vision to reduce the vulnerability of the poor to the effect of natural, environmental and human induced hazards and this plan is currently under review. The plan has taken a comprehensive and holistic approach to Disaster Management within Bangladesh with particular emphasis on capacity building across all levels to improve the response and recovery management at all levels. Specifically the objectives of the National Plan are to:

- Align the strategic direction of Disaster Management programs with national priorities and international commitments.
- Articulate the vision and goals for Disaster Management
- Outline the strategic direction and priorities to guide the design and implementation of Disaster Management policies and programs.
- Create a cohesive and well coordinated programming framework incorporating government, non-government and private sector.
- Ensure that Disaster Management has a comprehensive and all-hazards focus comprising disaster risk reduction and emergency response.
- Illustrate to other ministries, NGOs, civil society and the private sector how their work can contribute to the achievements of the strategic goals and government vision on Disaster Management.

The National Plan for Disaster Management essentially sets out a framework for other agencies and participating organizations and committees to consider when adopting plans for their particular level. Key issues such as risk reduction, capacity building, climate change adaptation, livelihood security, gender mainstreaming, community empowerment and response and recovery management are all factored in the National Plan.

The draft National Plan provides a detailed synopsis of the following hazards that Bangladesh is exposed to:

- Flood
- Cyclones and Storm Surges
- Tornado
- River Bank Erosion
- Earthquake
- Drought
- Arsenic Contamination
- Salinity Intrusion
- Tsunami
- Fire
- Infrastructure Collapse

While the draft National Plan outlines clearly those threats listed above it does not attempt to provide details on how each of those hazards would be managed in terms of pre disaster response and post disaster activities. These specific actions are derived firstly from the Standing Orders and then from Agency and Sectoral plans and Contingency planning documents. A number of these Contingency Plans exist for hazards such as Cyclones and Floods however nothing for Earthquake.

Standing Orders on Disaster (SOD)

The Standing Orders on Disasters have essentially been prepared to outline the various roles and responsibilities for pourashava/ City Corporation and committees involved in Disaster Management at all levels within Bangladesh. From these Standing Orders it is required that all DCC would develop its own action plans outlining how they will manage their respective responsibilities outlined in the Standing Orders. In addition to outlining the general responsibilities of each organization, the Standing Orders also outline agency responsibilities across the following four disaster phases:

- Normal Time
- Alert and Warning Stage
- Disaster Stage
- Rehabilitation Stage

The Standing Orders are not written to cover a specific hazard but rather takes an all hazards approach outlining a range of roles and tasks which would need to be undertaken regardless of the hazard concerned.

Paurashava/City Corporation Disaster Management Plan

These emergency activities will be guided by the DCC Ordinance 1983 and Standing Orders on Disaster. The Chief Executive Officer of DCC leads the overall execution with various units including Evacuation, Communication & Utilities, Health Services, Waste Management and Debris, Relief. The Paurashava/City Corporation **Disaster Management Plan** will be prepared by the "Paurashava/City Corporation Disaster Management Committee" having linkages with the National Plan for Disaster Management.

2.2 The Need for Earthquake Contingency Plan for DCC

- As per the seismic macro-zonation studies urban areas such as Chittagong, Sylhet, Dhaka, Rangpur, Bogra, Mymensingh, Comilla, Rajshahi are located within possible seismic active zone. The country is far behind the minimum preparedness level to face earthquake disaster occurrence in any of such urban areas.
- As per the historical catalogue of Bangladesh and its surrounding region, significant damaging historical earthquakes have occurred in and around Bangladesh in the past. The 1897 Great Indian Earthquake which occurred with a magnitude of 8.7 (Oldham, 1899) is one of the most significant major events recorded within Bangladesh. The epicentre of the same earthquake was only around 230 km from Dhaka. As per the records this particular earthquake was capable of inflicting significant damages in Dhaka as most of the brick buildings have suffered a serious damage.
- Due to such past occurrences, scientists believe that country's position adjacent to the very active Himalayan front and ongoing deformation in nearby parts of south-east Asia potentially expose it to strong shaking from a variety of sources that can produce tremors of magnitude 8 or greater in future. They also have warned that potential for magnitude 8 or greater earthquakes on the nearby Himalayan front or within some parts of Bangladesh is very high, and the effects of strong shaking from such an event can directly effect much of the country, urban built up in particular.
- The rapid increase in vulnerability of urban areas is evident from the rapid urbanization, population growth in most of large urban centers, population migration and development of major economic zones in and around major cities like Dhaka, Chittagong. Major reclamation efforts in and around Dhaka increases the potential for liquefaction. During sustained strong shaking, poorly consolidated, water saturated sediments can liquefy and lose their ability to support loads. The foundations and supports of structures built on liquefiable sediments can fail, causing damage or destruction during major earthquakes. Much of the country is of loose sandy soil and most of it remains in saturated condition round the year, thereby increasing the vulnerability to liquefaction in case of sustained ground motions. Possibility of fire outbreaks in an event of an earthquake as a secondary hazard is another source related to possible high economic losses.
- Present capacities in Disaster Management in Bangladesh are largely centered on emergency response and post disaster recovery. There is a need for a comprehensive geo-hazard risk reduction "Contingency planning" strategy for low frequency high magnitude events, which occur without warning. Such Contingency planning efforts should be linked to an easy implementation framework to be able to address the related issues.

- Government and Institutional structures, policy and legal framework are some vital features in ensuring clear delineation of aspects of Contingency Plan preparation and implementation. This is an important step towards longer-term investment in plan preparation and in effective implementation. To achieve further benefits from such an endeavor appropriate spatial planning at all level is also needed to ensure that the disaster preparedness is considered early on in the physical planning process. Review of existing legislations and present organizational structure for natural disaster reduction policy making is essential for addressing the need for simplification of procedures, identify future planning strategies and to identify immediate response actions for their effective implementation.

2.3 The Major roles assigned to DCC in relation to National Earthquake Contingency Plan

The major responsibilities of DCC with regards to earthquake Contingency planning are to ensure a quick and efficient management system which would enable speedy recovery of the city's normal functions after any earthquake incident. The main roles assigned to DCC in relation to National Earthquake Contingency Plan are to:

- Undertake city development projects to ensure safety of city dwellers
- Undertake urban crisis planning (*evacuation areas, pre-positioning of essential elements for response & recovery*)
- Prepare plans in advance for urban utilities (*telecommunication, Power supply, Gas lines, waste disposal etc.*)
- Maintain open areas, green areas, parks, recreation etc of city dwellers
- Operate emergency operation center during earthquake incident
- Provide emergency services during earthquake incident
- Ensure welfare, food and nutrition for the victims
- Ensure dissemination of authentic information to mass media

2.4 The support roles assigned to DCC under National Earthquake Contingency Plan

A strong National Earthquake Contingency Plan is considered to be a one that is built on a foundation for DRM. Support roles assigned to DCC under National Earthquake Contingency Plan are to:

- Provide assistance to Govt. agencies and AFD for ensuring the safety and welfare of victims during disaster events
- Provide assistance in cleaning and disposal of debris during disaster events
- Undertake measures to ensure Conservancy, sanitation within the city
- Provide assistance to DGHS for emergency health and medical care operations
- Provide assistance to utility service providers for quick restoration of services

2.5 Objectives of DCC in fulfilling the assigned roles under National Earthquake Contingency Plan

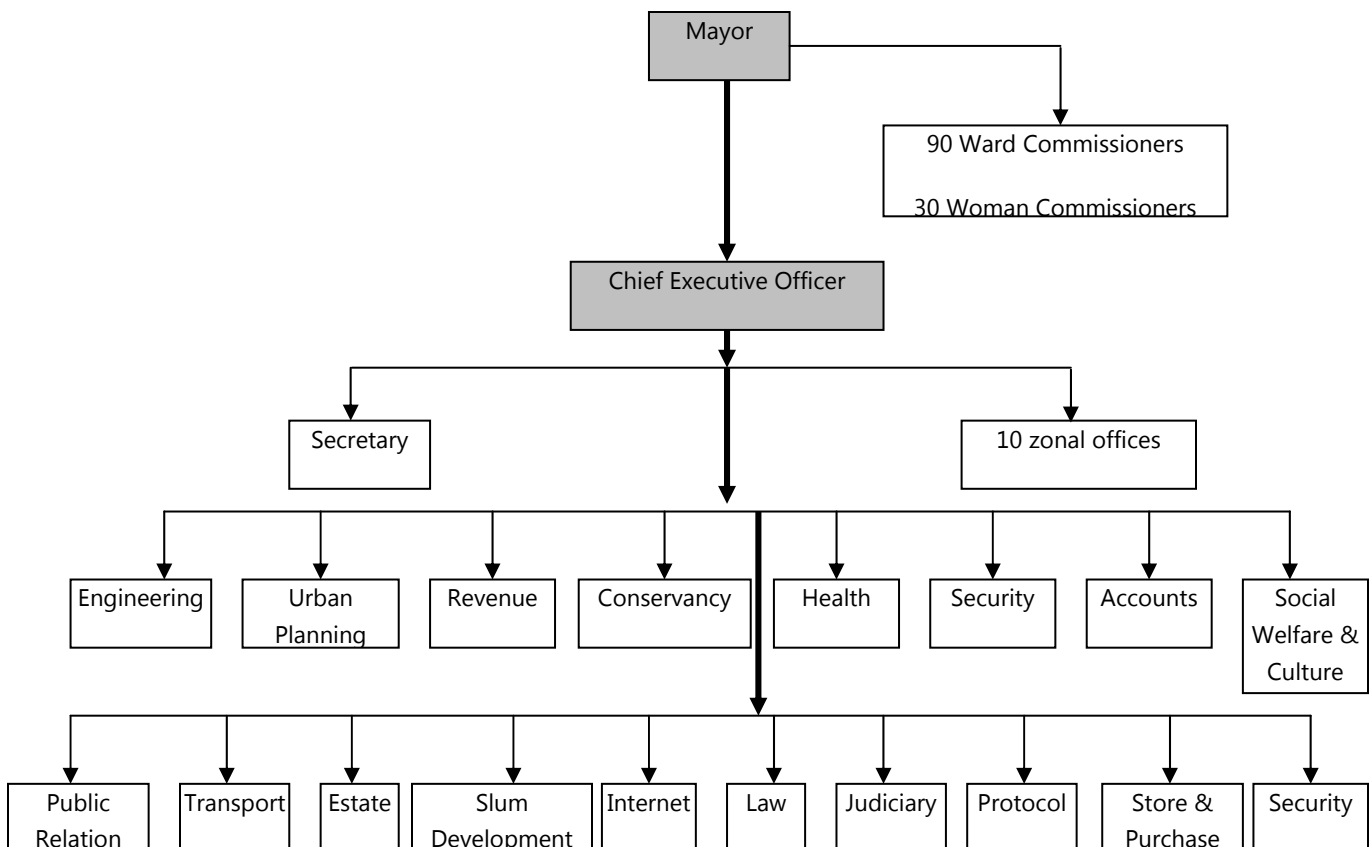
Objectives to be fulfilled by DCC to accomplish roles assigned to it under National Earthquake Contingency Plan are to:

- Identify the Earthquake Contingency Management roles and responsibilities with regard to DCC;
- Develop Contingency Plans for earthquake risk
- Conduct necessary training and capacity building for Plan update
- Carry out periodic reporting to authorities on readiness of the for responding to earthquake events
- Capacity building in community first responders in search and rescue operation and maintain data bases
- Formation of community based social volunteer networks as first responders
- Establish permanent 24/7 city level EOC and training of city level staff to serve in EOC
- Development of operation procedure guidelines
- Develop the capacity of city level officials for ICS operations
- Develop operation surveillance guidelines for city during earthquakes
- cataloguing /procurement of equipment for special search & rescue & develop procedure for ensuring access
- Promotion of informal education for earthquake disaster preparedness at all levels and conduct simulations
- Develop reporting mechanism for reporting readiness.
- Develop coordination mechanism to ensure supply of relief in time
- Identification of sites for pre positioning of essential emergency support units (boreholes for emergency water supply, fire hydrants, cutting tools etc.) and execution during emergency
- Assist identification of open areas suitable for emergency evacuation and to devise land use Plans to create open areas within urban areas, create more parks, recreational areas , green areas suitable for emergency evacuations, create essential facilities such as water electricity
- Identify evacuation routes in high risk areas (old Dhaka) and take actions to improve access to inaccessible areas for S&R action
- Develop database for resource pool of equipments & tools (trucks, cranes, dowers, etc.)
- Assist in effective enforcement and implementation of building codes to integrate earthquake vulnerability reduction
- Setting up triage management system for victims during earthquake emergency in various city wards and control points
- Conduct simulations
- Develop networks with hospitals within neighborhood for support during emergencies like earthquakes
- Develop inventory of agencies within the city who is willing to provide welfare , food and nutrition support in case of earthquake
- Reserve funds and other resources to undertake restoration of essential facilities in case of earthquakes
- Develop procedures for city level sector based assessment of loss and damage
- Develop guidelines for resettlement Planning within the city in case of earthquakes
- Develop guidelines for conducting vulnerability assessment of city authority buildings and all other important agencies are located and facilitate vulnerability assessment against earthquakes
- Study alternate transport arrangements in case of earthquakes and develop route maps

- Develop procedure for conducting vulnerability assessment and reporting by transport authorities within the city
- Conduct city wide Immunization programs
- Develop procedure for vulnerability assessment of water supply, sewerage & drainage systems within the city by respective managers
- Develop guidelines for temporary shelter sanitation management within the city during earthquakes
- Develop public awareness and advocacy material to support Contingency planning and implementation at city level
- Develop procedures for public information dissemination related to city level emergency declaration, announcements & warnings on after shocks
- Develop guidelines for media agencies within the city on reporting disaster events like earthquakes
- Develop procedure for reporting the readiness of utility managers to activate Contingency Plans in case of earthquakes
- Develop procedure for vulnerability assessment of all essential utilities within the city by utility managers
- Develop inventory of agencies outside the city who is willing to provide welfare , food and nutrition support in case of earthquake

2.6 Agency level structure for Command, Control and Coordination within the organization and with outside agencies

The Organogram of the Dhaka City Corporation (DCC) appended below shows the Command Control and Coordination mechanism of DCC for normal time activities



Suggested Command, Control and Coordination mechanism for DCC with regard to Earth quake emergency are as follows:

Overall Supervision	: Honorable Mayor, DCC
Policy formulation	: Mayor, all ward commissioners of DCC, Chief Executive Officer
Focal Point	: Chief Executive Officer, DCC
Management support	: Heads of all relevant departments of DCC
Monitoring	: Chief Executive Officer, DCC and Heads of all relevant departments of DCC

The Response Actions of DCC: upon getting information of earthquake disaster in city corporation area following response actions would be done

Initial Action: Mayor would call all officers and ward commissioners of DCC and would convene an emergency meeting

Continuing Action:

- Situation assessment
- Immediate establishment of EOC in city corporation
- Activate & deployment of corporations staff and community volunteers/first responders in search and rescue
- Coordination of requests for medical Transportation/Ambulance
- Coordination of requests for formal search & rescue by FSCD and AFD
- Coordination of requests for Medical Facilities through DGHS
- Coordination of requests for ensuring security in the affected area through Armed forces, Police and paramilitary forces
- Coordination of requests to utility service providing agencies for immediate restoration of basic services like water and electricity
- Coordination of triage operations
- Coordination of measures to establish field hospitals and medical operations
- Coordination of emergency appeals to the media for humanitarian help
- Coordination of proper and authentic dissemination of information to the media
- Coordination with DRR, NGOs and volunteer organizations for emergency relief operation
- Coordination of activities for establishing temporary shelter and maintain sanitation and hygiene

2.7 Plan Implementation Strategies by DCC

The following strategies are to be adopted in plan implementation:

- Setting up a strong organizational set-up to identify and assess earthquake hazards, analyze vulnerability, assess risk and loss estimation;
- Plan & development of institutional capabilities to translate earthquake risk reduction into preparedness and Response Plans;

- Establish a consistent, participatory approach to the management of earthquake emergency responses;
- Propose a mechanism to integrate Disaster Management concept into the Operational Plans of DCC;
- Undertake training and education programs on all phases of Disaster Management for all levels to build the capacity of professionals;
- Develop a mechanism to improve the relationships with non-government organizations to address mitigation, preparedness, response and recovery phase effectively;
- Transfer knowledge and state of the art of technologies necessary to support institutional operations and implement operation plans

2.8 Plan Limitations

- The Earthquake Contingency Plan will not, and cannot, address all circumstances (e.g. long-term recovery plans)
- The Plan assumes that the line agencies will have Mandatory provisions and national capacity to deal with assigned tasks. Mandatory provisions for line agencies, ministries, and local governments. District authorities can be granted through a gazette notification but Lines of authority need to be finalized and communicated to all levels.
- The Earthquake Contingency Plan requires similar planning at all levels of government and by a number of key ministries and line departments. While respective agencies need to have dedicated champions to undertake planning and implementation; Ministry of Food & Disaster Management will have a difficult task in coordinating and providing technical assistance.
- DCC may need additional resources in terms of qualified manpower, technical as well as financial resources to undertake assigned tasks under the Earthquake Contingency Plan.
- The Earthquake Contingency Management process will take some times to become fully functional as an integrated system.
- The Plan assumes that the Emergency Operations Center is to be established on priority basis to have service functions for a 24/7 schedule with duty officers in place with clearly identified notification protocols.
- The Plan cannot ensure that emergency assistance to communities will arrive in time following a rapid on-set disaster unless the government will have emergency declarations in time. It will depend on efficient reliable and accurate emergency management system, which depends on application of advanced state of the art technology.
- Capable and committed staff with appropriate financial resources, facilities, equipment and supplies is required to implement an effective, long-term program based on the plan.

2.9 Intended Users of the Plan within DCC

All relevant departments of DCC are the user of the plan.

CHAPTER 3

Functional Response Roles and Responsibilities Assigned for DCC

3.1 Emergency Response Tasks under Respective Functional Groups- Preparedness and Mitigation Phase (normal time activities)

To ensure this Contingency planning as a forward planning process, it is obvious to agree upon specific scenarios and objectives. An effective Potential Response System has to be put in place in order to prevent, or better respond to, an emergency or critical situation. In this regard, DCC needs to accomplish the following activities well-before the earthquake event.

3.1.1 Contingency planning by the City Corporation

- Develop Contingency Plans for earthquake risk
- Conduct necessary training and capacity building for Plan update
- Carry out periodic reporting to authorities on readiness of the (CC) for responding to earthquake events

3.1.2 OPERATIONS RESPONSE GROUP (emergency operation center, ICS)

- Capacity building in community first responders in search and rescue operation and maintain data bases
- Formation of community based social volunteer networks as first responders
- Establish permanent 24/7 city level EOC and training of city level staff to serve in EOC,
- Development of operation procedure guidelines
- Develop the capacity of city level officials for ICS operations
- Develop operation surveillance guidelines for city during earthquakes
- cataloguing /procurement of equipment for special search & rescue & develop procedure for ensuring access
- Promotion of informal education for earthquake disaster preparedness at all levels and conduct simulations

3.1.3 EMERGENCY SERVICES

- Develop reporting mechanism for emergency response groups, agencies, NGOs for reporting readiness.
- Develop coordination mechanism to ensure supply of relief in time
- Develop medicolegal procedure for Identification and tagging of bodies and develop guidelines

3.1.4 URBAN CRISIS PLANNING (evacuation areas, pre-positioning of essential elements for response & recovery)

- Vulnerability assessment of critical facilities (school buildings, theatres etc.) & city buildings
- Identification of sites for pre positioning of essential emergency support units (boreholes for emergency water supply, fire hydrants, cutting tools etc.) and execution
- Assist identification of open areas suitable for emergency evacuation

- Revise land use Plans to create open areas within urban areas, create more parks, recreational areas , green areas suitable for emergency evacuations, create essential facilities such as water , electricity
- Identification of evacuation routes in high risk areas (old Dhaka) and take actions to improve access to inaccessible areas for S&R actions
- Database for resource pool of equipments & tools (trucks, cranes, dowers, etc.)
- Efficient implementation of building codes to integrate earthquake vulnerability reduction

3.1.5 HEALTH GROUP (*health & emergency medical care*)

- Develop alert system for hospital staff including doctors to report for work during emergencies such as earthquakes
- Setting up triage management system in various city wards and control points
- Conduct simulations
- Organize vulnerability assessment of health infrastructure within the city, project teams
- Setting up 24/7 State of the art ambulance services
- Train medical first responders within the city and develop a database
- Conduct hospital emergency and preparedness training programs for city hospital staff
- Identify needs for propositioning of medicine, temporary hospitals etc and obtain the necessary resources
- Develop networks with hospitals within neighborhood for support during emergencies like earthquakes

3.1.6 WELFARE, FOOD AND NUTRITION

- Develop inventory of agencies within the city who is willing to provide welfare , food and nutrition support in case of earthquake
- Develop inventory of agencies outside the city who is willing to provide welfare , food and nutrition support in case of earthquake

3.1.7 PLANNING OF UTILITIES (*telecommunication, Power supply, Gas lines, waste disposal etc.*)

- Develop procedure for vulnerability assessment of all essential utilities within the city by utility managers
- Develop procedure for reporting the readiness of utility managers to activate Contingency Plans in case of earthquakes

3.1.8 MASS MEDIA COMMUNICATIONS AND PUBLIC INFORMATION

- Develop guidelines for media agencies within the city on reporting disaster events like earthquakes
- Develop procedures for public information dissemination related to city level emergency declaration, announcements & warnings on after shocks
- Develop public awareness and advocacy material to support Contingency planning and implementation at city level

3.1.9 WATER AND SANITATION GROUP

- Develop guidelines for temporary shelter sanitation management within the city during earthquakes

- Develop procedure for vulnerability assessment of water supply, sewerage & drainage systems within the city by respective managers
- Conduct city wide Immunization programs

3.1.10 TRANSPORT GROUP (road, railway, airports, ports & harbor)

- Develop procedure for conducting vulnerability assessment and reporting by transport authorities within the city
- Study alternate transport arrangements in case of earthquakes and develop route maps

3.1.11 RECOVERY GROUP

- Develop guidelines for conducting vulnerability assessment of city authority buildings and all other important agencies are located and facilitate vulnerability assessment against earthquakes
- Develop guidelines for resettlement Planning within the city in case of earthquakes
- Develop procedures for city level sector based Assessment of loss and damage
- Reserve funds and other resources to undertake restoration of essential facilities in case of earthquakes

3.2 Emergency Response Tasks under Respective Functional Groups – Response phase (activities during and soon after the disaster events)

3.2.1 Contingency planning by the City Corporation

- Compliance with Plan arrangements and reporting on the (CC)involvement in Contingency Plan implementation

3.2.2 OPERATIONS RESPONSE GROUP (emergency operation center, ICS)

- Mobilize support of community first responder groups to special teams of AFD, BFS and others
- Mobilize support of community first responder groups to special teams of AFD, BFS and others
- Expand the activities of EOC to cover all affected areas of the city
- Mobilize ICS teams
- Mobilize operation surveillance
- procurement of equipment for special search & rescue groups

3.2.3 EMERGENCY SERVICES

- Mobilize emergency service personnel to respond to earthquake
- Coordinate supply of relief assistance
- Follow the procedure for identification and tagging of bodies and make arrangements for disposal

3.2.4 URBAN CRISIS PLANNING (*evacuation areas, pre-positioning of essential elements for response & recovery*)

- Rapid damage assessment of critical facilities (school buildings, theatres, etc) & city buildings
- Mobilize pre-positioned facilities and allow usage by professional teams
- Set up evacuation centres
- Facilitate the process of setting up evacuation centers
- Facilitate safe evacuation of victims
- Assist mobilize resources
- Rapid assessment of buildings to prevent further damage to aftershocks and prevent usage by owners

3.2.5 HEALTH GROUP (*health & emergency medical care*)

- Activate the alert system for hospital staff and voluntary groups
- Mobilize trained Triage teams to affected city wards and control points.
- Set up temporary health care centers for victims who do not need urgent Medicare
- Organize project teams to conduct rapid damage assessment of all health infrastructure within the city and identify suitability for usage
- Mobilize ambulance services to transport sick and injured
- Mobilize medical first responders within the city
- Mobilize pre-positioned facilities
- Mobilize support from other hospitals if necessary

3.2.6 WELFARE, FOOD AND NUTRITION

- Mobilize support of agencies within the city who is willing to provide welfare, food and nutrition support.
- If needed seek outside assistance

3.2.7 PLANNING OF UTILITIES (*telecommunication, Power supply, Gas lines, waste disposal etc.*)

- Organize project teams to conduct Rapid damage assessment of all essential utilities within the city by utility managers
- Obtain periodic situation reports and review the progress on activation of Contingency Plans

3.2.8 MASS MEDIA COMMUNICATIONS AND PUBLIC INFORMATION

- Facilitate media coverage by media agencies on reporting disaster events within the city
- Facilitate public information dissemination related to city level emergency declaration, announcements & warnings on after shocks
- Obtain support of Media for implementation of Contingency Plans and agency level coordination within the city]

3.2.9 WATER AND SANITATION GROUP

- Implement citywide temporary shelter sanitation Management system for the benefit of victims
- Organize project teams to conduct rapid damage assessment of water supply, sewerage & drainage system and initiate actions for restoration
- Close surveillance in epidemic outbreak
- Close Surveillance in epidemic outbreak
- Arrangements for quality check of water sources and disposal of waste

3.2.10 TRANSPORT GROUP (road, railway, airports, ports & harbor)

- Organize project teams to conduct rapid damage assessment and reporting by transport authorities within the city
- Mobilization of resources for activation of alternate transport arrangements

3.2.11 RECOVERY GROUP

- Assist all city level agencies to undertake restoration of essential services within the city

3.3 Emergency Response Tasks Under Respective Functional Groups – Recovery phase (activities following a disaster event)

3.3.1 Contingency planning by the City Corporation

- Compliance with Plan arrangements and reporting on the (CC) involvement in Contingency Plan implementation

3.3.2 OPERATIONS RESPONSE GROUP (emergency operation center, ICS)

- Mobilize support of community first responder groups
- Mobilize support of community first responder groups to special teams of AFD, BFS and others
- Continue operations of city level EOC
- Continue operations of ICS
- Mobilize operation surveillance
- procurement of equipment for special search & rescue groups

3.3.3 EMERGENCY SERVICES

- Facilitate emergency response actions by response agencies
- Coordinate supply of relief assistance
- Issue of death certificates for disposed and inventorying

3.3.4 URBAN CRISIS PLANNING (evacuation areas, pre-positioning of essential elements for response & recovery)

- Rapid damage assessment of critical facilities (school buildings, theatres, etc) & city buildings
- Mobilize pre-positioned facilities and allow usage by professional teams
- Set up evacuation centres
- Facilitate the process of setting up evacuation centers
- Facilitate safe evacuation of victims
- Performance evaluation

3.3.5 HEALTH GROUP (health & emergency medical care)

- Facilitate treatment to injured at all local hospitals and medical centers.

- Set up mobile hospitals if necessary
- Facilitate transportation of sick and injured to hospitals if necessary.
- Organize project teams to conduct detail damage assessment of all health infrastructure within the city and prepare for recovery program implementation
- Mobilize ambulance services to transport sick and injured
- Mobilize medical first responders within the city
- Evaluate hospital preparedness & performance during emergency
- Mobilize pre-positioned facilities
- Mobilize support from other hospitals if necessary

3.3.6 WELFARE, FOOD AND NUTRITION

- Assist all agencies providing welfare , food and nutrition support to distribute supplies to victims

3.3.7 PLANNING OF UTILITIES (*telecommunication, Power supply, Gas lines, waste disposal etc.*)

- Assist in restoration of all essential utilities within the city by utility managers
- Obtain periodic situation reports and review the progress

3.3.8 MASS MEDIA COMMUNICATIONS AND PUBLIC INFORMATION

- Facilitate media coverage by media agencies on reporting disaster events within the city
- Facilitate public information dissemination related to city level emergency declaration, announcements & warnings on after shocks
- facilitate accurate reporting on implementation of Contingency Plans and agency level coordination during earthquake and M&E

3.3.9 WATER AND SANITATION GROUP

- M&E of performance
- Rehabilitation of water supply, sewerage & drainage system within the city
- Close surveillance in epidemic outbreak
- Conduct periodic Quality check of water sources and disposal of waste

3.3.10 TRANSPORT GROUP (*road, railway, airports, ports & harbor*)

- Assist actions by transport authorities for restoration of transportation facilities and infrastructure

3.3.11 RECOVERY GROUP

- Facilitate conduction of damage assessment to city buildings and all other important agencies are located and make arrangements to reinstate functioning of such agencies
- Undertake city level assessment of resettlement needs after earthquakes
- Conduct preliminary sector based Assessment of loss and damage within city
- Assist all city level agencies to undertake rehabilitation and restoration of services within the city

CHAPTER 4

Operating Procedure Guidelines

4.1 Planning Assumptions

- The agency level responsibility of City Corporations of Dhaka, Chittagong, and Sylhet with regards to Earthquake Risk Management is to facilitate plan development process by city level departments with other First Responder Agencies operational within the city. It is also important that City Corporations provide feed back and technical inputs to the DMB in order to report the progress of National Earthquake Contingency Plan implementation to
 - National Disaster Management council(NDMC)
 - Inter-ministerial Disaster Coordination Committee(IMDCC) and
 - Secretary, MoFDM to assist them in decision making

- Respective City Corporations should develop its own Agency level Earthquake Contingency Plan to define roles and responsibilities of various units, officials within City Corporations. CEO of City Corporations should nominate an officer from the City Corporations as the "NODAL OFFICER – (of respective city)"
- The City Corporations will be responsible for dissemination of technical information related to earthquake hazard, vulnerability and potential loss assessment data for different earthquake scenarios in the City. There are many Wards and urban communities within the respective cities are vulnerable to earthquake hazard as per the seismic zonation of Bangladesh and likelihood of a serious earthquake is inevitable. It is expected that there will be a large number of deaths as well as casualties, displaced persons, damages and destructions, economic impacts etc in most of the highly urbanized areas within cities such as Dhaka, Chittagong, and Sylhet. It is the responsibility of City Corporations to acquire all such information from relevant institutions for undertaking suitable measures to reduce the impacts. This determines the level of response capacity needed by City Corporations to respond to any Earthquake disaster situation within respective City.
- Operating procedures for mobilizing the support (Command, Control and Coordination structure before/during/post earthquake event) for the City Corporations area need to be developed with the participation of relevant officials of respective First Responder institutions within the city. The City Corporations are required to study their existing capacity against the required capacity for identified Earthquake emergency scenarios and adopt appropriate measures to ensure that all the institutions/relevant officials participate substantially in the Process of Contingency planning and Plan Implementation.
- The City Corporations should report on routine basis the readiness through DMB to the Secretary, MoFDM for onward transmission of information to National Disaster Management council(NDMC) and to Inter-ministerial Disaster Coordination Committee(IMDCC)
- For effective earthquake preparedness, City Corporations must take the lead role in development, review periodic revision of City level Earthquake disaster Contingency Plan and defining the City level Earthquake disaster response procedures as roles and responsibilities of City officials as well as relevant city level First Responder Institutions covering bottom to top level in order to avoid confusion and improve efficiency in cost and time.
- The City Corporations should follow the "Preparedness Planning Guide for Earthquake Contingency planning" issued by DMB to ensure that City Corporations follow the same guide. The plan should be specifically developed considering the needs in terms of facilities, equipment and staff of the City Corporations.

- Orientation and training for Earthquake disaster Contingency Plan and procedures, accompanied by simulated exercises, will keep the City Corporations prepared for such eventualities. Special skills required during earthquake disaster situations need to be imparted to the officials and the staff of respective institutions and City Corporations should facilitate the same. Those capacity building programs should consider not only mass casualties due to direct impact of earthquakes but also aspects of treatment of people affected due to collateral hazards such as burning injuries, injuries due to hazardous spills etc.
- City Corporations should facilitate the conduct of Vulnerability assessment to the extent possible, to assess the structural as well as non-structural vulnerability of critical facilities and buildings of First Responder institutions and Its own buildings in order to reduce the Structural vulnerability of buildings to ensure safety of staff as well as to ensure uninterrupted functioning of City Corporations and other First Responder institutions.

4.2 Earthquake Contingency Plan Objective in an Earthquake Disaster Situation

The agency level responsibility of the City Corporations with regards to Earthquake Emergency Management is to facilitate smooth implementation of the Earthquake Contingency Plan, assistance in management of Emergency situation after major Earthquakes within the City Corporation area.

The specific objectives are as follows;

- Provide technical guidance, coordination of the plan development process and provide necessary assistance to ensure maximum readiness of the City Corporation. City Corporations also responsible for Assisting the First Responder Institutions within the City Corporation to secure necessary resources (man-power, equipment, material etc)to respond to emergencies.
- Reporting Impacts, damages, loss of lives etc as well as the progress of Earthquake Contingency Plan implementation within City Corporation area during earthquake events through the DG-DMB and Secretary, MoFDM to
 - National Disaster Management council(NDMC)
 - Inter-ministerial Disaster Coordination Committee(IMDCC) and assist them in decision making
- Follow the "Preparedness Planning Guide for Earthquake Contingency planning" of DMB to ensure that the City Corporation follow the same guide
- Through relevant national level agencies if required obtain support for national level agencies including NGOs, INGOs support for managing the earthquake emergency situation
- Through relevant national level agencies if required obtain external support of UN agencies, Donor agencies, NGOs, Development partners to fulfill the tasks and functions of the Earthquake Contingency Plan at all levels

Normal Time Activity

- Develop a City Corporation level earthquake Contingency Plan through participation of all city departments and relevant national level First Responder agencies present within the City Corporation area

- Assess preparedness level of the City Corporation as per the routine reporting process to National EOC every six months and report the outcome to the Secretary MoFDM through DG-DMB.
- Undertake, facilitate or assist in conducting Routine Capacity building programs for city level departments and First Responder Organizations in selected areas of competency.
- Conduct necessary training and capacity building for plan update by city level departments by following instruction manual "Preparedness Planning Guide for Earthquake Contingency planning" issued by DMB
- Provide Assistance to AFD in Setting up city level earthquake incident command systems in place(establishment, training and capacity building)where appropriate
- Provide assistance in Establishment and routine operations of City level 24/7 Emergency operation center (EOC) to report to National EOC
- Develop a Disaster event response reporting system by the City Corporation (impacts, resource needs, actions by them for reducing the impact, difficulties, opportunities etc) during earthquake/any other disaster event
- Conduct discussions with City level Urban Crisis planning sub-committee to have necessary urban physical planning solutions(pre-positioning of facilities, open areas for setting up camps for displaced etc)
- Facilitate conducting vulnerability assessment of buildings of City Corporation and other buildings within the city where all important agencies are located and assist mobilization of project teams for conducting vulnerability assessment against earthquakes .Facilitate vulnerability assessment of critical city buildings, facilities, and infrastructure and make arrangements for strengthening the highly vulnerable facilities or make arrangements for relocating them.
- Networking with Various city level stakeholders and development of system for reporting the resources availability for welfare of potential victims (funding agencies, NGOs & INGOs for identification of resources, improved coordination relief material distribution)
- Conduct meetings with City level Utilities sub-committee for enhanced preparedness measures
- Follow procedures for public information dissemination related to emergency declaration, announcements & warnings on after shocks within City Corporation area
- Undertake public awareness within City Corporation and distribute advocacy material to support Contingency planning and implementation
- Follow alternate systems for emergency water supply within the city such as rain water harvesting, water softening & SODIS techniques for water purification with WASA and other relevant agencies
- Review and revise Operating Procedure Guidelines for all First Responder Organizations within city to support the Earthquake Contingency Plan implementation within City Corporation area.
- Review mandatory provisions in relation to City Corporation to support the National Earthquake Contingency Plan implementation and report the recommendations on changes to the National Disaster Management council (NDMC) and to the Inter-ministerial Disaster Coordination Committee (IMDCC) through the DG-DMB and Secretary MoFDM for necessary Policy level changes.

Activities on receipt of notice of Activation if National Earthquake Contingency Plan

- Assist the DG-DMB and Secretary, Ministry of Food & Disaster Management in issue of declaration notices for Activation and De-activation of City level Earthquake Contingency Plan
- Coordinate operations of City Corporation level Emergency operation Center (EOC) and provide necessary assistance through facilitating supply of resource needs (man-power, equipment, facilities) to respond to the needs of the Earthquake event

- Facilitate conducting city level Rapid survey of Damages and need analysis, conduct of analysis of primary data and provision of routine analysis to the DG-DMB and Secretary MoFDM and to the National Disaster Management Council (NDMC) as well as to the Inter-ministerial Disaster Coordination Committee (IMDCC)
- Implement City level Earthquake Contingency Plan operations through City departments and all the First Responder Organizations by providing necessary support in undertaking Earthquake response activities through arrangements of additional manpower, equipment, vehicles etc
- Ensure efficient response process involving all relevant city departments and other agencies. Obtain support from other local government institutions and other government agencies, NGOs if required to control the situation.
- Obtain if required External assistance with the approval of relevant authorities for bringing the normalcy to affected areas of the city within a short time
- Monitoring of progress of rescue, relief and recovery operations and provide assistance to involved agencies to move in to all the affected areas
- Obtain and disseminate information relevant to losses and damages, casualties etc and external support needs for victims so that Ministry of F&DM will be able to disseminate the information through Government, national and other International media portals, Provide information to foreign missions and UN agencies regularly through issue of daily news bulletins.

CHAPTER 5

Readiness Checklist

(To be filled by the CEO- City Corporation and submitted to the National EOC before May and November every year)

Preparedness measures taken	Details/Remarks
The City Corporation Management staff is familiar with all the aspects of the National Earthquake Contingency Plan and ready to coordinate Plan development by City Corporation.	
Relevant City Corporation staff is familiar with all the aspects of the City Corporation level Earthquake Contingency Plan, Command, Control and Coordinating structure	
Orientation and training for Earthquake Contingency Plan and procedures undertaken within the City Corporation and each relevant officer understands earthquake disaster response procedures he has to follow during any earthquake event.	
Staff has been appointed and designated for undertaking Training and capacity building activities for relevant departments of City Corporation and for other agencies to facilitate the plan development process	
Seismic hazard Information related to City Corporation has been obtained and disseminated to relevant city level departments. Vulnerability assessment data relevant to following wards have been carried out and disseminated to respective staff and elected members, community leaders etc	
<ul style="list-style-type: none"> ▪ Following Methodologies have been disseminated to relevant institutions. The capacity building process has been completed inNo of Wards with high seismic hazard/risk levels <ul style="list-style-type: none"> • handling of dead and missing during earthquakes and emergencies • estimation of casualty and human injuries • Estimation of livestock casualties • Epidemic surveillance and control • Emergency healthcare • Hospital preparedness planning guidelines 	
<p>Additional Sources of supply of materials, manpower, and equipment required to support Earthquake response operations have been identified for the City Corporation area. Data related City Corporation area has been collected and included in the following databases. the information related to</p> <ul style="list-style-type: none"> • Additional Equipment for undertaking search and rescue operations • <i>Trained Professional S&R staff, Medical First Responders</i> • Volunteer organizations with trained man-power to undertake S&R operations 	

<p>Reviewed, disseminated and updated:</p> <ul style="list-style-type: none"> ▪ Preparedness measures and procedures that City Corporation should undertake to reduce the earthquake damages and losses. ▪ The methodology for vulnerability assessment of buildings ,critical facilities, infrastructure ▪ The precautions to be taken to protect equipments and material belong to City Corporation, in case of earthquake. ▪ Post earthquake disaster recovery procedures to be followed by City Corporation <p>No of critical Buildings and facilities of City Corporation were strengthened to have high standard of safety</p>	
<p>An officer has been designated as Nodal Officer for Earthquake Disaster Response- City Corporation Name, designation and contact details of the officer are as follows;</p>	
<p>Respective officers from city departments have been designated as Ward level/Department level Officer in charge for Earthquake Disaster Response Name, designation and contact details of the respective officers are as follows;</p>	

Reported By:

Designation:

Signature:

Date:

CHAPTER 6

Agency Level Actions for Training & Capacity Building of Staff, Awareness Creation, Reporting, Pre-positioning of Emergency Facilities, Resource Mobilization for Purchase of Equipments

6.1 Assessment of Existing Capacity (Man power, equipment and material)

Organizational structure

For day-to-day work, the Mayor is assisted by a Chief Executive Officer who is appointed by the Government. All files are routed through the CEO to the Mayor from the 12 departments in the Corporation. Whereas the Mayor exercises overall control of some matters, some powers have been delegated to the heads of departments.

DCC has just over 12,000 staff out of which 5,092 are regular staff. The remainder is working on a Master Roll basis engaged for conservancy work on a daily attendance basis. At present 1,594 posts on the revenue budget are vacant. At present about 32% of the posts in DCC are lying vacant and reportedly affecting the work output. However, DCC has taken steps to recruit some staff to fill the existing vacancies. It is worth mentioning that posts are filled on the basis of recruitment rules in which educational qualifications and experience are well defined.

Table: List of Professional staff in DCC

Name of the Post	Number	Name of the Post	Number
Engineer	166	Sanitary Inspector	130
Medical Technologist	45	Vaccinator	20
Urban Planner	2	Cleaner	7156
Sanitary Inspector	130	Cleaning Supervisor	124
Economist	1		
Sociologist	2		
Geographer	1		
Research Officer	7		
Public Health Officer	16		
Social Welfare Officer	11		
Magistrate	3		

Table: Equipments available to DCC for conducting Rescue Operations during earthquake and other Disasters

Sl. No.	Name of Equipment	Qty.	Capacity (Heavy/Light)	Present Status	
				Active	Inactive
1	Bull Dozer(Chain Mounted)	12	Heavy	5	7
2	Bull Dozer (Wheel Mounted)	8	Heavy	4	4
3	Pay-loader (Wheel Mounted)	8	Heavy	4	4
4	Excavator (Chain Mounted)	4	Heavy	3	1
5	Excavator (Wheel Mounted)	2	Heavy	1	1
6	Hydraulic Crain (20 Ton Capacity)	1	Heavy	1	-
7	Hydraulic Crain (8 Ton Capacity)	1	Heavy	1	-
8	Road Roller	22	Heavy	17	5
9	Dump Truck	33	Heavy	20	13
10	Mobile Generator	3	Heavy	2	1
11	Forklift (8 Ton Capacity)	2	Heavy	1	-
12	Forklift (5 Ton Capacity)	2	Heavy	1	-
13	Water Tanker (Sprinkler Type)	10	Heavy	7	3
14	Power Trailer (30 Ton Capacity)	1	Heavy	1	-
15	Septic Tank Dislodging Truck	1	Light	1	-
16	Drain Gully Sweeping Truck	2	Light	1	1
17	Tractor	1	Heavy	1	-
18	Toilet Van	3	Light	2	1
19	Air Compressor	3	Light	2	1

6.2 Gap analysis and consultant's recommendations for addressing the gaps

Followings are the key elements identified to enhance the emergency preparedness for a sustainable response.

Issue	Description	Recommendation
In adequate attention to earthquake issue in SODs	Difficulties for compliance to standing orders since Earthquake aspect is not covered adequately in the SODs.	Some of the Standard Operation Procedures, emphasizing earthquake issue need to be included in agency level plan operations and also have to be incorporated in to General SOP of Bangladesh.
Lacks in Management	Serious lack of management exists in DCC breaking the chain	Chain of command in DCC

Issue	Description	Recommendation
	of command.	operations need to be established
	There is a lack of supervision by senior members of the administration and an absence of accountability at different levels of management.	Supervisory role by the top management should be enhanced and accountability of actions should be established at all level
	The decision-making and financial authority is concentrated in a few hands resulting in delays in the decision making process. Consequently actions required to address an urgent problem cannot be taken in time.	Both operational decision making role and financial authority needs to be decentralized at 'zonal/ divisional' management levels
	Job descriptions of various posts of DCC are not clearly defined. As a result confusions arise very frequently among the staff as to who is supposed to do what.	There should be clear job description for DCC staffs at all levels
Unnecessary interferences	Both internal and external interferences frequently create obstructions in the proper discharge of mandated functions by DCC.	Strict measures should be taken to remove unnecessary interferences in day to day business of DCC.
		Mayor and ward councilors should be fully aware of the level of their involvement in the day to day activities of the corporations
		Un wanted interference in the normal activities of the corporation by the trade/ labour unions should be strictly controlled

Issue	Description	Recommendation
Lack of mandate	There is no special or direct Disaster Risk management responsibility or functions that DCC is mandated to fulfill under its current functional responsibilities. Absence of Mandates for DM related functions; DCC participate in the process without agency mandates because of organization missions, concern for safety, community responsibilities etc.	DCC should be duly mandated to carry out DM related activities
Out dated ordinance	<p>DCC Ordinance, 1983 is not enough to provide legal support to DCC to include Disaster Risk Management activities in its routine activities.</p> <p>The DCC Ordinance of 1983 needs to be reviewed and upgraded as some of its provisions have no or very little relevance to the actual conditions prevailing at present. This situation has provided an opportunity and created excuses for some people to avoid compliance with the existing rules and regulations.</p>	DCC Ordinance needs revisions and updating to appreciate contemporary changes in city management
Lack of coordination	There is a lack of coordination within the Departments of DCC and also with other organizations	Coordination mechanisms among both internal departments and external agencies should be developed
In appropriate Organogram	Present Organogram of DCC is inadequate to accommodate DM related professionals	Organogram of DCC requires revision to accommodate DM related professionals in its rank

Issue	Description	Recommendation
Shortage of manpower	Due to the extreme shortage of technical staff and lack of funds, DCC cannot implement the Master Plan. As a result, controlled and planned development of new areas in Dhaka has not been effective.	and profile Qualified professionals are needed to be recruited in DCC
Lack of Training	DCC staffs have had very little training. There is no proper training program or plan for capacity building of the staff. At present, training is imparted through the Government program for both local and foreign training. In order to provide training to the staff of all Local Government bodies (such as City Corporation, Zila Parishad, Upazila Parishad, Pourashava and Union Parishad), a training institute named National Institute of Local Government (NILG) was set up in 1965. However, due to insufficient budget allocation and limited physical facilities, NILG can only meet about 10% of the total training needs of staff of all the local bodies. As a result most of the lower level staffs of many agencies do not receive any training whatsoever. This applies to DCC as well, where junior and newly appointed staff learns about their jobs through learn-as-you-do method and not through formal training.	More training opportunities for DCC junior staffs should be explored and DCC should also develop their own methodologies for training its junior staffs

Issue	Description	Recommendation
Non-existence of database and MIS	There is no database or management information system in DCC. They do not have a GIS for roads, drains and footpaths etc.	DCC should develop an up to date data base and state of the art MIS for the organization
Insufficient logistic	There is insufficient logistic support to carry out DM activities during disaster	More vehicles and equipments for DM activities should be procured for DCC

6.3 Process for addressing the gaps

a. Capacity Assessment of DCC

A capacity assessment of DCC has to be conducted to see the possibility of addressing the needs of a large scale earthquake. The lessons learned from previous emergencies can be used for enhancement of the existing capacity of DCC. A comprehensive assessment is needed for identifying areas of improvement and it will be useful to identify probable scenarios due to earthquakes in order to carry out an analysis of the existing capacity of DCC.

b. Methodology development for conducting assessments

Often DCC needs to carry out Damage Assessment and Need Analysis surveys after the disaster events. In order to have consistent and comprehensive methodology developed and utilized in future disaster events, services of a suitable consultant should be obtained for methodology development, training and conducting analysis. The methodology can be based on the methodology used in one of the SAARC countries and that should be modified to suit the situation in Bangladesh. The Gujarat State Disaster Management Authority has developed such a methodology and that may be one of the methodologies that can be studied.

c. Training and capacity building.

In order that all the field level staff conduct the Assessment maintaining a consistent level of performance it is suggested to have routine Capacity building programs for DCC staff. In a large scale emergency such as Earthquakes it will be necessary for DCC staff to manage Relief and Recovery operation in coordination and collaboration with many other government and non-government institutions. Therefore it is advisable to impart such training to other institutions also for possible assistance during large scale disaster events.

d. Developing standards for Welfare camps, welfare items, food stocks etc.

The International humanitarian community has developed standards for various operations during disaster events and post disaster period. It is necessary to compile such standards and provide field operation manuals for DCC staff and other stakeholder institutions. It is necessary to translate such material in to Bangla language.

e. Develop forums for better coordination with NGOs, INGOs, and Donor agencies

It is necessary to have a better coordination mechanism as well as a reporting mechanism about the readiness of responder institutions to respond to large scale disasters. This will include developing databases of stocks (of food, welfare items etc), preparation of inventory of materials & equipment such as temporary shelter, shelter material, latrines, water purification plants, generators, and man-power. There should be a continuous reporting process and routine review process to have a analysis of status. In order to achieve this sort of objectives better to organize a standing committee of responder institutions responsible for relief supply, welfare of displaced people etc and have routine meetings to share the level of readiness and to take up appropriate solutions for improvements.

6.4 Action Plan for Enhancement of Capacity

- Establishment of core group at periphery level including all stakeholders (DMB, CDMP, LGRD/Civil Admin./Fire Service & Civil Defence/Army/NGOs/CBOs and other relevant ministries)
- Enhancement of capacity of disaster mitigation in respect of planning and responding to disasters, like Earthquakes and Tsunamis by preparing Earthquake/Tsunami Response Plan
- Conduct and assess field based survey to find out vulnerability of the area for their capacity building by table-talk & simulation exercise.
- Provide more training – capacity building and regular Mock drill for preparedness for any impending disasters and post-disaster health care management.
- Procurement of emergency life- savings drugs for maintaining buffer stock in order to organize case management in emergency situations for zonal and ward level as preparedness for disaster
- Provision of emergency transport like country boat, speed boat, emergency ambulance etc and increase reserve fund for emergency response
- Ensuring adequate supply of logistics like life-jacket, rain-coat, umbrella, gum boot, and others essential materials during response activities.
- Ensuring adequate fund for conducting emergency operations during any disaster situation

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GLOSSARY OF TERMS

Capacity A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster.

Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management. Capacity may also be described as capability.

Capacity building Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk.

In extended understanding, capacity building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society.

Disaster A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.

A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk.

Disaster risk management The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.

Disaster risk reduction (disaster reduction) The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

The disaster risk reduction framework is composed of the following fields of action, as described in ISDR's publication 2002 "Living with Risk: a global review of disaster reduction initiatives", page 23:

- *Risk awareness and assessment including hazard analysis and vulnerability/capacity analysis;*
- *Knowledge development including education, training, research and*

information;

- *Public commitment and institutional frameworks, including organisational, policy, legislation and community action;*
- *Application of measures including environmental management, land-use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments;*
- *Early warning systems including forecasting, dissemination of warnings, preparedness measures and reaction capacities.*

Earthquake An earthquake is a series of vibrations on the earth's surface caused by the generation of elastic (seismic) waves due to sudden rupture within the earth during release of accumulated strain energy.

Emergency management The organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation.

Emergency management involves plans, structures and arrangements established to engage the normal endeavors of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. This is also known as Disaster Management.

Emergency Preparedness Consists of all activities taken in anticipation of a crisis to expedite effective emergency response. This includes Contingency planning, but is not limited to it: it also covers stockpiling, the creation and management of standby capacities and training staff and partners in emergency response. (Source: ODIHPN Contingency planning Review Paper 2007)

First Responder The term 'first responder' refers to those agencies/ individuals who in the early stages of an incident are responsible for the protection and preservation of life, property, evidence, and the environment, including emergency response providers as well as emergency management, public health, clinical care, public works, and other skilled support personnel (such as equipment operators) that provide immediate support services during prevention, response, and recovery operations.

Source: Homeland Security Act of 2002 (6 U.S.C. 101, Washington, U.S.A.)

Geographic information systems (GIS) Analysis that combine relational databases with spatial interpretation and outputs often in form of maps. A more elaborate definition is that of computer programmes for capturing, storing, checking, integrating, analyzing and

displaying data about the earth that is spatially referenced.

Geographical information systems are increasingly being utilized for hazard and vulnerability mapping and analysis, as well as for the application of disaster risk management measures.

Hazard A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydro meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity, frequency and probability.

Hazard analysis Identification, studies and monitoring of any hazard to determine its potential, origin, characteristics and behavior.

Land-use planning Branch of physical and socio-economic planning that determines the means and assesses the values or limitations of various options in which land is to be utilized, with the corresponding effects on different segments of the population or interests of a community taken into account in resulting decisions.

Land-use planning involves studies and mapping, analysis of environmental and hazard data, formulation of alternative land-use decisions and design of a long-range plan for different geographical and administrative scales.

Land-use planning can help to mitigate disasters and reduce risks by discouraging high-density settlements and construction of key installations in hazard-prone areas, control of population density and expansion, and in the siting of service routes for transport, power, water, sewage and other critical facilities.

Mitigation Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

Natural hazards Natural processes or phenomena occurring in the biosphere that may constitute a damaging event.

Natural hazards can be classified by origin namely: geological, hydro meteorological or biological. Hazardous events can vary in magnitude or intensity, frequency, duration, area of extent, speed of onset, spatial dispersion and temporal spacing.

Planning The key elements of a scenario that form the basis for developing a

Assumptions Contingency Plan (for example, projected caseloads) (Source: IASC Contingency planning Guidelines 2001)

Preparedness Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Prevention Activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters.

Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters. In the context of public awareness and education, related to disaster risk reduction changing attitudes and behavior contribute to promoting a "culture of prevention".

Recovery Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.

Recovery (rehabilitation and reconstruction) affords an opportunity to develop and apply disaster risk reduction measures.

Relief / response The provision of assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration.

Resilience / resilient The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Risk The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions.

Conventionally risk is expressed by the notation:

Risk = Hazards x Vulnerability. Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability.

Beyond expressing a possibility of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important

to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes. (Source: ISDR)

Risk assessment/analysis A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend.

The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability; and also the analysis of the physical, social, economic and environmental dimensions of vulnerability and exposure, while taking particular account of the coping capabilities pertinent to the risk scenarios.

Scenario An account or synopsis of a possible course of events that could occur, which forms the basis for planning assumptions (for example, a river floods, covering a nearby town and wiping out the local population's crop) (Source: IASC Contingency planning Guidelines 2001)

Scenario-building The process of developing hypothetical scenarios in the context of a Contingency planning exercise. (Source: IASC Contingency planning Guidelines 2001)

Seismic Hazard Seismic hazard in the context of engineering design is defined as the predicted level of ground acceleration which would be exceeded with 10% probability at the site under construction due to occurrence of earthquake anywhere in the region, in the next 50 years.

Sustainable development Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs. (Brundtland Commission, 1987).

Sustainable development is based on socio-cultural development, political stability and decorum, economic growth and ecosystem protection, which all relate to disaster risk reduction.

Vulnerability The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

For positive factors, which increase the ability of people to cope with hazards, see definition of capacity.