Government of the People's Republic of Bangladesh

CONTINGENCY PLAN FOR EARTHQUAKE HAZARD
for Directorate of Fire Service and Civil Defence

Directorate of Fire Service and Civil Defence (FSCD)

Directorate of Fire Service and Civil Defence (FSCD)

Government of the People's Republic of Bangladesh

Contingency Plan for Earthquake Hazard

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

UNDP Bangladesh

DFID Department for International Development

CDMP Comprehensive Disaster Management Programme

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
DESA	Dhaka Electricity Supply Authority
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 the Directorate of Fire Service and Civil Defence (FSCD) 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:

- Activity I: Determine status of Contingency planning and design of interim Contingency Plan
- Activity 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.

Earthquake Threat in Bangladesh and Identification of Risk Scenario related to Fire Service and Civil Defence

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 have a significant influence in 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 the Fire Service and Civil Defence within major cities, divisions as well as national level. 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 by Fire Service and Civil Defence (FSCD) 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 where several earthquakes in the country that had 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 Cachen 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). Following is a list of major earthquakes in and around Bangladesh.

Table 1.1 List of Major Earthquakes in Bangladesh

Year	Description of the Earthquake
1548	The first recorded earthquake was a terrible one. Sylhet and Chittagong were violently shaken, the earth opened in many places and threw up water and mud of a sulphurous smell.
1642	More severe damage occurred in Sylhet district. Buildings were cracked but there was no loss of life.
1663	Severe earthquake in ASSAM, which continued for half an hour and Sylhet district was not free from its shock.

1762	The great earthquake of April 2, which raised the coast of Foul island by 2.74m and the northwest coast of Chedua island by 6.71m above sea level and also caused a permanent submergence of 155.40 sq km near Chittagong. The earthquake proved very violent in Dhaka and along the eastern bank of the MEGHNA as far as Chittagong. In Dhaka 500 persons lost their lives, the RIVERS and *JHEEL*S were agitated and rose high above their usual levels and when they receded their banks were strewn with dead fish. A large river dried up, a tract of land sank and 200 people with all their CATTLE were lost. Two volcanoes were said to have opened in the Sitakunda hills.
1775	Severe earthquake in Dhaka around April 10, but no loss of life.
1812	Severe earthquake in many places of Bangladesh around May 11. The earthquake proved violent in Sylhet
1865	Terrible shock was felt, during the second earthquake occurred in the winter of 1865, although no serious damage occurred.
1869	Known as Cachar Earthquake. Severely felt in Sylhet but no loss of life. The steeple of the church was shattered, the walls of the courthouse and the circuit bungalow cracked and in the eastern part of the district the banks of many rivers caved in.
1885	Known as the Bengal Earthquake. Occurred on 14 July with 7.0 magnitude and the epicenter was at Manikganj. This event was generally associated with the deep-seated Jamuna Fault.
1889	Occurred on 10 January with 7.5 magnitude and the epicenter at Jaintia Hills. It affected Sylhet town and surrounding areas.
1897	Known as the Great India Earthquake with a magnitude of 8.7 and epicenter at Shillong Plateau. The great earthquake occurred on 12 June at 5.15 pm, caused serious damage to masonry buildings in Sylhet town where the death toll rose to 545. This was due to the collapse of the masonry buildings. The tremor was felt throughout Bengal, from the south Lushai Hills on the east to Shahbad on the west. In Mymensingh, many public buildings of the district town, including the Justice House, were wrecked and very few of the two-storied brick-built houses belonging to ZAMINDARS survived. Heavy damage was done to the bridges on the Dhaka-Mymensingh railway and traffic was suspended for about a fortnight. The river communication of the district was seriously affected (BRAHMAPUTRA). Loss of life was not great, but loss of property was estimated at five million Rupees. Rajshahi suffered severe shocks, especially on the eastern side, and 15 persons died. In Dhaka damage to property was heavy. In Tippera masonry buildings and old temples suffered a lot and the total damage was estimated at Rs 9,000.
1918	Known as the Srimangal Earthquake. Occurred on 18 July with a magnitude of 7.6 and epicenter at Srimangal, Maulvi Bazar. Intense damage occurred in Srimangal, but in Dhaka only minor effects were observed.
1930	Known as the Dhubri Earthquake. Occurred on 3 July with a magnitude of 7.1 and the epicenter at Dhubri, Assam. The earthquake caused major damage in the eastern parts of Rangpur district.
1934	Known as the Bihar-Nepal Earthquake. Occurred on 15 January with a magnitude of 8.3 and the epicenter at Darbhanga of Bihar, India. The earthquake caused great damage in Bihar, Nepal and Uttar Pradesh but did not affect any part of Bangladesh.
	Another earthquake occurred on 3 July with a magnitude of 7.1 and the epicenter at Dhubri of Assam, India. The earthquake caused considerable damages in greater Rangpur district of Bangladesh.
1950	Known as the Assam Earthquake. Occurred on 15 August with a magnitude of 8.4 with the epicenter in Assam, India. The tremor was felt throughout Bangladesh but no damage was reported.
1997	Occurred on 22 November in Chittagong with a magnitude of 6.0. It caused minor damage around Chittagong town.

1999	Occurred on 22 July at Maheshkhali Island with the epicenter in the same place, a magnitude of 5.2. Severely felt around Maheshkhali island and the adjoining SEA. Houses cracked and in some cases collapsed.
2003	Occurred on 27 July at Kolabunia union of Barkal upazila, Rangamati district with magnitude 5.1. The time was at 05:17:26.8 hours.

Source: *Banglapedia, 2007*

However, it seems that Bangladesh did not experience 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).

Potential Damage in different Scenarios of Earthquake

Three different scenarios have been developed to identify the possible damage to buildings and other infrastructures and also to find out the number of casualties. The three scenarios are taken as least, moderate and high intensities cases as assumed based on different magnitude of earthquakes. The following are the different scenarios and lost estimation in the cities of Dhaka, Chittagong and Sylhet.

Scenario Earthquakes

Dhaka city

1. Madpur Fault (7.5 Mw)
2. Plate Boundary Fault-2 (8 Mw)
3. Earthquake under the city (6.0 Mw)

Chittagong city

1. Plate Boundary Fault-1 (8.5 Mw)
2. Plate Boundary Fault-2 (8.0 Mw)
3. Earthquake under the city (6.0 Mw)

Sylhet city

1. Dauki Fault (8.0 Mw)
2. Plate Boundary Fault-3 (8.3 Mw)
3. Earthquake under the city (6.0 Mw)

Buildings Damage

Dhaka City Corporation Area

During an earthquake of 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 Dhaka city. Among these buildings, it is estimated that about 75,218 buildings could not be repaired. 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.

Chittagong City Corporation Area

It is estimated that about 168,783 buildings will be damaged at 8.5 Mw Earthquakes. This is about 93.00 % of the total number of buildings in the Chittagong city. During this time about 135,647 buildings will be damaged beyond repair. About 38,953 buildings will be at least moderately damaged at Mw 8.0 earthquake. The earthquake at Mw 6.0 will damage about 110,782 buildings which are about 61.00 % of the total number of buildings. At the same time an estimated 37,617 buildings will be damaged beyond repair.

Sylhet City Corporation Area

It is estimated that about 30,392 buildings will be damaged at 8.0 Mw Earthquake. This is about 58.00 % of the total number of buildings in the Sylhet city. Among these, about 16003 buildings will be damaged beyond repair. About 7230 buildings will be at least moderately damaged at Mw 8.3 earthquake. The earthquake at Mw 6.0 will damage about 21960 buildings which are about 42.00 % of the total number of buildings. At the same time an estimated 4537 buildings will be damaged beyond repair.

Collateral Hazards

There might be several secondary hazards due to earthquake which may affect structures as well as damage to human life responsible for huge economic losses in the country. These collateral hazards include fire, debris generations etc. The following are the possible fire hazards and debris generation that may appear due to earthquake in Dhaka, Chittagong and Sylhet cities.

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires at the same time, lack of water and sufficient manpower and also due to inaccessible roads, the fire in the city could be out of control. For fire hazard scenario development, Monte Carlo simulation model was used. The number of ignitions and amount of burnt areas was estimated using this method.

Dhaka City Corporation Area

During an earthquake of 7.5 Mw originated from Madhpur 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.

Chittagong City Corporation Area

In Chittagong during an earthquake of 8.5 Mw originated from Plate boundary fault-1, there will be 699 ignitions that will burn about 6.54 sq. mi 11.49 % of the city area. It is also estimated that that the fires will displace about 315,408 people and burn about 441 (millions of dollars) of building value. On the other hand an earthquake originated from Plate Boundary fault-2 at 8.0 Mw will be responsible for 648 ignitions that will burn about 5.87 sq. mi 10.31 % of the city. It is also estimated that the fires will displace about 312,052 people and burn about 433 (millions of dollars) of building value. The earthquake if originated from under the city of 6.0 Mw will be responsible for 699 ignitions that will burn about 6.24 sq. mi 10.96 % of the city. The model also estimates that the fires will displace about 314,421 people and burn about 437 (millions of dollars) of building value.

Sylhet City Corporation Area

In Sylhet, during an earthquake of 8.0 Mw originated from Dauki fault, there will be 770 ignitions that will burn about 1.79 sq. mi 19.85 % of the city area. It is also estimated that that the fires will displace about 79,608 people and burn about 171 (millions of dollars) of building value. On the other hand an earthquake originated from Plate Boundary fault-3 at 8.3 Mw will be responsible for 769 ignitions that will burn about 2.22 sq. mi 24.62 % of the city. It is also estimated that the fires will displace about 98,905 people and burn about 221 (millions of dollars) of building value. The earthquake if originated from under the city of 6.0 Mw will be responsible for 770 ignitions that will burn about 2.17 sq. mi 20.06 % of the city. The model also estimates that the fires will displace about 96,967 people and burn about 204 (millions of dollars) of building value.

Debris Generation

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

a) Brick/Wood

b) Reinforced Concrete/Steel.

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

Dhaka City Corporation Area

During an earthquake of 7.5 Mw originated from Madhpur Fault, a total of 30,599 million tons of debris will be generated. Out of this amount, Brick/Wood comprises 22.00% and Reinforced Concrete/Steel with 78%. If the debris tonnage is converted to an estimated number of truckloads to remove, 1,223,960,000 truckloads are required (@25 tons/truck). 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). The earthquake originated from under the city of 6.0 Mw, will be responsible for generation of a total of 21,059.00 million tons of debris. Out of this amount, 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 it.

Chittagong City Corporation Area

During an earthquake of 8.5 Mw originated from Plate boundary fault-1, a total of 13,350.00 million tons of debris will be generated. Out of this, Brick/Wood comprises 32%, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 534,000,000 truckloads (@25 tons/truck) to remove it. On the other hand an earthquake originated from Plate Boundary fault-2 at 8.0 Mw will be responsible for 2,079.00 million tons of debris of which Brick/Wood comprises 29%, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 83,160,000 truckloads (@25 tons/truck) to remove it. The earthquake if originated from under the city of 6.0 Mw, will generate an estimated 5,423.00 million tons of debris. Out of the total amount, Brick/Wood comprises 31% 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 217,160,000 truckloads (@25 tons/truck) to remove the debris generated by this earthquake.

Sylhet City Corporation Area

During an earthquake of 8.0 Mw originated from Dauki fault, a total of 18,93.00 million tons of debris will be generated. In this amount, Brick/Wood comprises 27%, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 75,720,000 truckloads (@25 tons/truck) to remove it. On the other hand an earthquake originated from Plate Boundary fault-2 at 8.3 Mw will be responsible for the generation of 256.00 million tons of debris of which Brick/Wood comprises 25%, and the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 10,240,000 truckloads (@25 tons/truck) to remove it. The earthquake if originated from under the city of 6.0 Mw, will generate an estimated 949.00 million tons of debris. Out of the total amount, Brick/Wood comprises 25% 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 37,960,000 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

General Aspects of Agency Level Plan

2.1 Legal Provisions, Authority and National level DM Functions of the Agency

Under the Ministry of Home Affairs, the Fire Service and Civil Defence (FSCD) has an important role to play in search and rescue, relief operations and Information management. This Directorate under the control of Ministry of Home Affairs is generally deployed in the affected areas and their services are placed under the control of Deputy Commissioners or Thana Nirbahi Officers.

Ordinarily this Directorate assists the local administration in the preparation of Action Plans, preparedness arrangements and local standing orders with regard to natural disasters. The Ministry is responsible for regularly reviewing the following disaster related issues of FSCD under its control:

- Action Plan for disasters
- Necessary equipment, transports and other materials to combat disaster.
- Telecommunication facilities in possible disaster affected areas.
- Training in Disaster Management.
- Disaster preparedness drills
- Preparation of the necessary legislation

In reference to National level Disaster Management functions, the Agency level responsibility of FSCD with regards to Earthquake Contingency Management is to ensure search and rescue operations and management of fire outbreaks as a result of Earthquakes and major aftershocks.

2.2 The Major roles assigned to the agency in relation to National Earthquake Contingency Plan

The major role assigned to FSCD is to operationalize Search and Rescue, First Aid, Fire Safety etc. activities by ensuring inter-agency coordination at National level, capacity building and developing National guidelines in the light of best practice. With regard to National Earthquake Contingency Plan, some of the pivotal roles for FSCD are identified as under:

- Capability assessment of search & rescue operations
- Ensure fire safety (through pre-positioning of fire hydrants, fire stations, land use planning, Capacity building for creating special units for Urban search and rescue from collapsed buildings, infrastructure, Medical First Response
- Developing data base of sources of water, storage of material etc
- Fist aid & First Medical Response to provide emergency medical treatment
- Mobilize special units for search and rescue from collapsed buildings and other infrastructures
- Compliance to guidelines for logistic supply management and deployment of resources

- Triage, stabilization of victims before treatment
- Operation surveillance

2.3 The support roles assigned to agency under National Earthquake Contingency Management Plan

A strong National Earthquake Contingency Plan is considered to be a one that is built on a foundation for FSCD that promotes:

- Conduct scenario based need assessment survey for emergency services for earthquake prone urban areas and report to authorities
- Capacity building of community first responder groups in search and rescue operations
- Procurement of necessary tools and equipment for urban S&R operations
- Prepare resource inventory (equipment, tools, manpower etc)
- Develop a Database for resource pool of equipments & tools (trucks)
- Facilitate mobilization of earthquake Incident Command System where necessary under the command of AFD
- Facilitate emergency supply distribution and ensure safety of victims
- Mobilize community based social volunteer networks as first responders)
- Make arrangements to access resource inventory items for S&R operations preparation
- Facilitate evacuation to suitable open areas and set up camps.
- Facilitate safe evacuation of victims and the process of setting up evacuation centers
- Assist Utility agencies to restore and rehabilitate supply of power, gas, etc to critical agencies(hospitals, AFD, Police, evacuation camps so on)
- Conduct rapid damage assessment survey of power supply systems(generation, distribution, supply) and restoration of supply to critical facilities(such as hospitals, police, AFD, Fire Service etc)
- Obtain periodic situation reports and review the progress on activation of Contingency Plans
- ICS system development at various levels
- Command, Control, Coordination arrangement among first responder organizations
- Readiness reporting

2.4 Agency level Objectives in fulfilling the assigned roles under National Earthquake Contingency Plan

The agency level responsibility of FSCD with regards to Earthquake Risk Management is to ensure management of fire outbreaks as a result of Earthquakes and major aftershocks.

- Minimize the casualties
- Minimize the property losses
- Reduce the interruptions to services, utilities, lifelines facilities

2.5 Agency level structure for Command, control and coordination within the organization and with outside agencies

The Organogram of the Fire Service and Civil Defence (FSCD), its Divisional Offices, DD Offices and Local Level stations are given in the following.

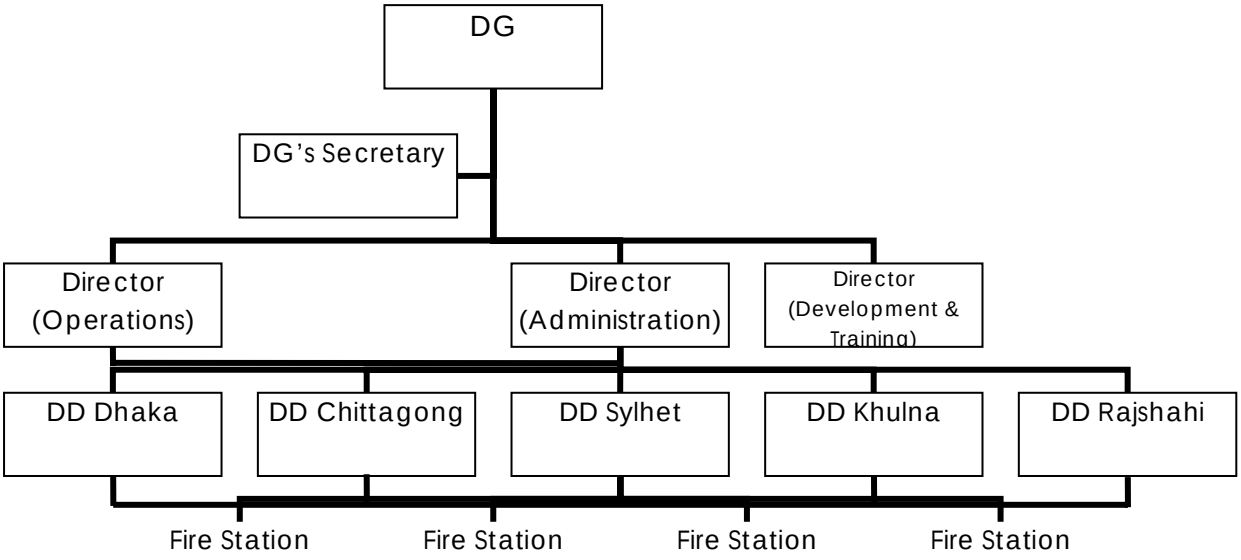

Figure 2.1 Organogram of Fire Service and Civil Defence

Command, Control and Coordination mechanism for FSCD with regard to Disaster Management are as follows:
Overall Supervision: Director General, Directorate of Fire Service and Civil Defence (FSCD)
Focal Point: Director, Operations
Management support: Director (Operations), Director (Administration), Director (Development, Training and Procurement)

The FSCD implements its Disaster Management-oriented decisions in different levels that are given below:
Divisional Level: Deputy Director
Station level: Station in charge Officer

2.6 Plan Implementation Strategies by the Agency

The following strategies are to be adopted in plan implementation:

- Setting up a strong organizational framework to identify and assess earthquake hazards, analyze vulnerability, assess risk and loss estimation with regards to relief and rehabilitation;
- 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 FSCD at all levels;
- 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;

2.7 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.
- FSCD 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 onset 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.

2.8 Intended Users of the Plan within the agency

The direct users of the Agency level Earthquake Contingency Plan will be the management personnel of Directorate of Fire Service and Civil Defence (FSCD) in order to provide humanitarian assistance during earthquake emergencies.

In addition to FSCD, the others including line Ministries, Departments, City Authorities, NGOs/ INGOs, electronic and paper Media, Community Based Organizations (CBOs), Civil Society Organizations (CSOs), Academia, Development Partners will be the passive users of the plan as they will be providing support services for plan implementation with regard to emergency relief distribution and other welfare activities. The ultimate beneficiaries would be the communities at risk to bring normalcy within a fastest possible time.

Functional Response Roles and Responsibilities Assigned for the Agency

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, FSCD needs to accomplish the following activities well-before the earthquake event.

Contingency planning by Directorate of Fire Service and Civil Defence (FSCD):

- 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 (FSCD) for responding to earthquake events

Operations Response Activities:

- Reporting to EOC on the readiness of the FSCD
- Attend ICS training and nominate representatives to participate ICS established at various levels

Emergency Services:

- Capacity building in special Search and rescue operation
- Formation of community based social volunteer networks as first responders
- Prepare Resource inventory (equipment, tools, manpower etc.)
- Develop inventory of other institutions(local & International) capable of assisting in search & rescue operations
- Develop a Database for resource pool of equipments & tools
- Prepare guidelines for Logistic supply management and Deployment of resources
- Prepare guidelines for Operation surveillance

Urban Crisis Planning:

- Develop procedure for Vulnerability assessment of buildings of fire service and make arrangements for conducting assessment and strengthening of vulnerable buildings
- Conduct training on medico legal procedure for Identification and tagging of bodies
- Conduct training on guidelines for meeting of INSARAG and International USAR Guideline requirements
- Identification & pre positioning of essential emergency support units (boreholes for emergency water supply, fire hydrants, cutting tools etc.)

Recovery:

- Develop guidelines for integrating fire hazard management techniques in recovery projects especially concerning temporary shelter, Government buildings, human settlement & utilities

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

Contingency planning by Directorate of Fire Service and Civil Defence (FSCD):

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

Operations Response Activities:

- Periodic reporting to EOC on FSCD involvement in Earthquake event management and for necessary assistance
- Participate in functioning of ICS systems at all levels as required

Emergency Services:

- Mobilize teams in Search and rescue operation
- Mobilize community based social volunteer networks as first responders)
- Make arrangements to Access Resource inventory items for S&R operations preparation
- Networking with organizations and mobilize support for search & rescue operations
- Mobilize resource pool of equipments & tools, trucks cranes, dowsers etc
- Compliance to guidelines for Logistic supply management and Deployment of resources
- Operation surveillance

Urban Crisis Planning:

- Assist project teams involved in rapid damage and suitability assessment for usage of buildings of fire service
- Follow medico legal procedure for Identification and tagging of bodies
- Follow guidelines for meeting of INSARAG and International USAR Guideline requirements
- Mobilize positioned essential emergency support units (boreholes for emergency water supply

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

Contingency planning by Directorate of Fire Service and Civil Defence (FSCD):

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

Operations Response Activities:

- Periodic reporting to EOC on FSCD involvement in Earthquake event management and for necessary assistance

- Participate in functioning of ICS systems at all levels as required

Emergency Services:

- Mobilize teams in Search and rescue operation
- Mobilize community based social volunteer networks as first responders
- Make arrangements to Access Resource inventory items for S&R operations preparation
- Networking with organizations and mobilize support for search & rescue operations
- Mobilize resource pool of equipments & tools , trucks cranes, dowsers etc
- Compliance to guidelines for Logistic supply management and Deployment of resources
- Operation surveillance

Urban Crisis Planning:

- Assist project teams involved in rapid damage and suitability assessment for usage of buildings of fire service.
- Follow medicolegal procedure for Identification and tagging of bodies
- Follow guidelines for meeting of INSARAG and International USAR Guideline requirements
- Mobilize positioned essential emergency support units (boreholes for emergency water supply

Recovery:

- Assist in compliance with fire hazard management techniques in all type of recovery projects

Operating Procedure Guidelines

4.1 Planning assumptions

- The agency level responsibility of FSCD with regards to Earthquake Risk Management is to ensure management of fire outbreaks as a result of Earthquakes and major aftershocks. There is no substitute for maintaining standard provisions and norms for fire safety to be adhered to by building codes and regular maintenance during normal times by concerned agencies which expects the services of FSCD. This determines the level of response capacity of the FSCD should possess during any disaster situation.

- Operating procedures for mobilizing community participation during various stages of Earthquake disaster response is stated in the National Contingency Plan for Earthquakes. The FSCD is required to study these and adopt appropriate measures to ensure that community participates substantially in first responder activities.

- For effective preparedness, the FSCD must have an Earthquake Contingency Plan or disaster response procedures clearly defined, in order to avoid confusion and improve efficiency in cost and time.

- Orientation and training for Earthquake Contingency Plan and procedures accompanied by simulated exercises, will keep the department prepared for such eventualities. Special skills required during emergency operations need to be imparted to the officials and the staff. Select personnel can be deputed for training as "NODAL OFFICER - FSCD", Officer –in-charge- FSCD -District and "Officer-In-Charge – FSCD-City level" at the District and City level respectively.

- To the extent possible, preventive measures as recommended in the National Earthquake Contingency Plan should be undertaken to improve the departmental capacity to respond to an earthquake disaster.

4.2 Normal time activities

- Assess preparedness level of the FSCD and report the same as per the format given to National EOC every six months.

- Undertake Routine Capacity building of FSCD cadre in special Search and rescue operations, Medical First Responder functions and station them within Earthquake high risk areas.

- Making arrangements to have simulations and drills, refresher courses to retain the capacity for special Fire fighting & USER operations.

- Establishment of community based social volunteer networks at each highly vulnerable city to activate as first responders during earthquakes in

partnership with Red Cross and Red Crescent Societies, other responsive NGOs and CBOs.

- Prepare Resource inventory (equipment, tools, manpower etc) belongs to FSCD and make arrangements to augment the resource base through additional procurements
- Obtain the inventory maintained by other institutions(local & International) capable of assisting in search & rescue operations and develop partnerships
- Prepare guidelines for Operation surveillance of FSCD staff
- Conduct training on guidelines for meeting of INSARAG and International USAR Guideline requirements and convert the material in to Bangla language
- Develop procedure for Vulnerability assessment of buildings of Fire Service and make arrangements for conducting assessment and strengthening of vulnerable buildings
- Identification & pre positioning of essential emergency support units (boreholes for emergency water supply, fire hydrants, cutting tools etc.)
- Develop guidelines for integrating fire hazard management techniques in recovery projects especially concerning temporary shelter, Government buildings, human settlement & utilities

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

- Within the affected City/District/Electoral ward, all FSCD personnel will be made available to the Response Commander. If more personnel are required, then out-of-station officers or those on leave may be recalled.
- All personnel required for Earthquake Response should work under the overall supervision and guidance of Response Commander
- Establish radio communications with National Emergency Operations Centre, district control rooms and FSCD departmental offices within the division.
- All District/City level officials of the department would be asked to report to the pre-agreed Fire station
- Appoint one personnel as “NODAL OFFICER – FSCD” at the National level
- Appoint one personnel each as “Officer-In-Charge – FSCD” at the City/District level
- Review precautionary measures, procedures of operations through daily review with relevant senior staff, to improve the Response services by officials of FSCD and make arrangements for necessary back up support if needed

- Assist the authorities to make arrangements for stand by Resources (Man-power, Material, Equipment)
- Make arrangements for special care and services to critical facilities such as
    - AFD
    - Hospitals
    - Water Supply/electricity/gas authorities
    - Police stations
    - Telecommunications buildings
    - DMB and DRR
- Fill department vehicles and park them in protected area
- Check emergency tool kits, assembling any additional equipment needed
- Review the total extent of the damage to FSCD buildings, equipment, installations
- Review the total extent of the damage and fire outbreaks within major cities by a reconnaissance flight, if possible.

On the recommendations of the Response Commander "Officer-In-Charge – Power Supply/Gas Supply/" of the relevant institutions in the affected areas,

- Instruct City/District staff of the relevant institutions to disconnect the main supply for the affected area
- Dispatch emergency response teams of FSCD to affected areas but unattended.

Readiness Checklist

5.1 Readiness Checklist and Reporting Formats

The Preparedness Checklist and Reporting Template for FSCD with regard to Earthquake hazard is given below:

(To be filled by the Department head and submitted to the EOC at the end of May and November in every year)

Preparedness measures taken	Details/Remarks
The FSCD staff is familiar with of the FSCD	
Orientation and training for Earthquake Contingency Plan and procedures undertaken. Each relevant officer understands earthquake disaster response procedures he has to follow during earthquake event.	
Special skills required during Earthquake emergency operations imparted to the officials and the staff. FSCD posses No of Master Instructors for CSSR No of master Instructors for MFR No of specially trained FSCD cadre of First Responders for CSSR and MFR	
Reviewed and updated: ▪ Precautionary measures and procedures. ▪ The vulnerability assessment of buildings ▪ The precautions to be taken to protect equipments and material have been undertaken. ▪ Post earthquake disaster procedures to be followed. No of Buildings were strengthened to have high standard of safety	
An officer has been designated as Nodal Officer for Earthquake Disaster Response Name, designation and contact details of the officer is as follows;	
Additional Sources of supply of Materials, Manpower, Equipment required to support FSCD in Earthquake response operations have been identified.	

Reported By:

Designation: FSCD Signature: Date:

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)

There are nearly 6,500 people working in the FSCD, Bangladesh. There is one DG having the equality of Brig. General. Also have 3 posts for directors, 9 Deputy Directors, more than 20 Asst Directors and 80 DADs.

6.2 Gap Analysis (Man power, Equipment and Material)

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

Table: Gap Analysis Matrix for FSCD

Type of gap	Description
General gaps;	• Difficulties for compliance to standing orders since Earthquake aspect is not covered adequately in the SOPs. Some of the Standard Operation Procedures which will be drafted for agency level plan operations have to be incorporated in to General SOP of Bangladesh.
Management gaps	• The Fire Service personnel will be called upon to provide services in fire fighting and in some occasions in S&R in case of emergencies. But there is no clear coordination and command structure in place. It will become a difficult task for discharge of services without a proper management structure for obtaining such services during earthquakes.
Gaps in Mandatory provisions	• Absence of Mandates for DM related functions; some of the mandates provided under SOPs for FSCD are not adequate or earthquake scenario is not addressed properly. In some cases FSCD participate in First Responder missions because of organization missions, concern for safety, community responsibilities etc. But it is necessary to evaluate the status and make provisions to regularize such shortcomings.
Gaps in Planning	• Resource concerns for planning and capacity building should be addressed. • A comprehensive long term plan need to be developed for increasing the capacity in terms of USER and other special services expected to be delivered by FSCD during a large scale earthquake based on such scenarios.
Gaps in man-power and capacity building	• Financial resources for addressing the Shortage of skilled manpower for specialized services during earthquakes • There is a need for advance courses for fire service staff considering the earthquake risk as fire hazard is evident as a collateral hazard in case of earthquakes. They need to have periodic rehearsals, simulations etc so that Fire service personal can be efficient and good responders in case of earthquake events. Additional funding and training facilities need to be provided for Training centers outside Dhaka for training of Specialized Urban S&R parties. The PEER program has trained Instructors for such training and their services can

	be utilized for training of Specialized Urban S&R teams
Gaps in equipment	• Financial resources for addressing the Shortage/absence of Equipment for execution of Urban S&R operations.
Gaps in Monitoring and Evaluation	• The CFS staffs are under the administrative regulations of the government and are on transferable service. There should be an M&E mechanism to trace the trained staff in order to obtain their services when earthquake happens. • They also should be placed in larger cities so that they will be able to attend to Urban S&R needs quickly • The trained staff needs refresher courses and simulations to retain the skills acquired by them.
Gaps in Provision of technical services	• It is the general practice of city authorities to request **additional approval of the Fire service before granting approval for construction** of high-rise buildings above 60 ft(more than 6 floors) .This is necessary to facilitate fire fighting requirements in case of fire and owners of such buildings need to have fire escapes integrated in the design and also they have to have own arrangements for fire fighting(trained staff, equipment, fire exits, escapes, fire hydrants , water sources etc).This has to be considered as a policy to be included in new ordinances and Bye-laws of main cities if not included now. • There are many obstructions including **poor access for fire fighting** observed within main cities. Since this is a matter controlled by city authorities and development corporations, Fire service has no or little control over such issues. So in order to have conducive environment for fire fighting and safer build up it is necessary to have a proactive approach and Fire service can have joint inspections in such areas to recommend improvements for reducing the risk due to fire. • The Fire service has to play a major **role in land use planning in urban areas**. The land use planning regulations should consider provision of fire escapes, corridors etc in order to control or illuminate spread of mass fire events in case of earthquakes within urban built up areas. There are special requirements for industry buildings, factorises, garments etc where there is a possibility of fire outbreaks and mass casualties due to same during earthquake events. This sort of regulations have to be integrated in land use control regulations and guidelines and also they have to consider providing fire escapes and corridors(wider roads, parks, open areas to serve this purpose) in city planning .

6.3 Process for addressing the gaps

In March 2003, Bangladesh was included as one of the partner countries in the USAID/OFDA-funded Program for Enhancement of Emergency Response (PEER).PEER implements activities in Bangladesh under the coordinating authority of the **Ministry of Food and Disaster Management,** with which the program has a Memorandum of Understanding. The designated training institution for **Medical First Responder (MFR) and Collapsed Structure Search and Rescue (CSSR)**

training is the Bangladesh Fire Service & Civil Defence (FSCD). Up to date PEER program was able to produce 59 graduates and 34 Instructor Workshop graduates for MFR, 48 graduates and 34 Instructor Workshop graduates for CSSR, 53 graduates of the course on Training for Instructors (TFI).

In order to increase the man-power and Urban Search & Rescue (USER) capacity of Bangladesh, It is suggested to create a special Unit/Division under a separate Director(Special Emergencies) with following Roles in order to broaden the resource base created under the PEER project in FSCD;

- Training of Special Urban Search & Rescue (USER) teams to create a large pool of Professional First Responders within FSCD. The PEER instructors can be used in training but it is necessary to create more field level training centres with equipment and training facilities outside Dhaka to create a larger pool of trained staff within FSCD Fire Stations of other cities. It will be necessary to translate PEER training material to Bangla language. INSARG methodology also needs to be translated in to Bangla language for easy reference by trained USER Groups.
- Procurement of Special equipment to be used by USER teams.
- Develop series of advance training programs for trained USER teams to refresh their skills and knowledge.
- Identify the special skills and knowledge acquired by the trained staff and make it a mandatory provision for some of the Grade promotions of fire fighters attached to FSCD.
- Provide Incident Command System(ICS) training to selected FSCD Senior staff Grades
- In Addition there is a need to provide additional knowledge and skills through some of the recommended courses below to PEER-trained instructors and end users. Types of short courses include:
    - Disaster Risk Management & Contingency planning
    - Advanced CSSR
    - Advance Urban SAR
    - Technical Search Operations
    - Heavy Lifting / Rigging
    - Road Accident Rescue
    - Swift Water Rescue
    - Damage Assessment & Need Analysis (DANA)
    - **Building Vulnerability Assessment**. It is a requirement for those agencies involved in first Responder activities to have a safer environment. In order to create that it is advisable to carry out building vulnerability assessment for all the buildings and critical infrastructure belongs to Fire Service and Civil defence. If such buildings are found to be highly vulnerable it is necessary to plan for a retrofitting program for at least critical buildings and infrastructure.
    - **Database for Equipment, Manpower, Water hydrants** etc. It will not be possible to have all necessary equipment for USER activities in all the urban areas of Bangladesh within FSCD. Therefore it is necessary to develop a database so that FSCD will be able to borrow equipment from

the Government institutions, private contractors so on during earthquake disaster event.

- **Fire cut off systems for utilities**. Fire cut off systems for utilities such as gas and electricity. Generally Fire outbreaks are common in developing countries in case of earthquakes due to gas leaks, power short cuts etc. Since there is no warning time in case of earthquakes there is a necessity for fixing auto-cut off arrangements for power lines, gas lines etc. This should be a requirement under building bye laws and utilities projects. Routine inspections are needed for verification of the effectiveness of such systems.
- **Special assistance to utilities during emergencies.** During emergencies like earthquakes there is a necessity for sharing of resources, manpower equipment etc and it has to be done through pre-arranged agreements for sharing of resources. FSCD has to identify such resourceful agencies and have agreements with private parties and government agencies for sharing of resources during emergencies.

6.4 Action Plan for Enhancement of Capacity

Present capacities of Directorate of Fire Service and Civil Defence (FSCD) in Disaster Management are largely centered on emergency response and post-disaster recovery; there is a need for a comprehensive geo-hazard risk reduction "Contingency planning" strategy that is linked to an easy implementation framework to be able to address these issues.

Ensuring clear delineation of contingency plan preparation and implementation within local government and institutional structures is vital. This is high time to take immediate step towards longer-term investment and effective implementation. Ensuring that appropriate spatial planning at all levels of implementation is needed to ensure disaster preparedness is considered early on in the decision planning process. This should review existing response mechanism and address the simplification of procedures, future planning and immediate response actions with regard to earthquake hazard.

A clearer view on current public and private sector disaster Contingency planning strategies needs to be compiled. Focus needs to be placed on as wide a business cohort as possible, including (though not exclusive to) food and water supply, and other humanitarian assistance. In addition, consideration should be given to gender, children and disability issues post geo-hazard disaster episode.

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Glossary of Terms

Building Codes Ordinances and regulations controlling the design, construction, materials, alteration and occupancy of any structure to insure human safety and welfare. Building codes include both technical and functional standards.

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.

Cluster A "cluster" is essentially a "sectoral group" and there should be no differentiation between the two in terms of their objectives and activities; the aim of filling gaps and ensuring adequate preparedness and response should be the same. (IASC Guidance Note on Using the Cluster Approach Nov 2006)

Cluster Approach The Cluster Approach aims to strengthen humanitarian response capacity and effectiveness in five key ways: i) ensuring sufficient global capacity is built up and maintained in key gap sectors/areas of response; ii) identifying predictable leadership in the gap sectors/areas of response; iii) facilitating partnerships and improved inter-agency complementarity by maximizing resources; iv) strengthening accountability; and 5) improving strategic field-level coordination and prioritization in specific sectors/areas of response by placing responsibility for leadership and coordination of these issues with the competent operational agency. (IASC Guidance Note on Using the Cluster Approach Nov 2006)

Cluster Leads A "cluster lead" is an agency/organization that formally commits to take on a leadership role within the international humanitarian community in a particular sector/area of activity, to ensure adequate response and high standards of predictability, accountability & partnership. (IASC Guidance Note on Using the Cluster Approach Nov 2006)

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 endeavours 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

Consists of all activities taken in anticipation of a crisis to expedite effective emergency response. This includes contingency planning,

Preparedness 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, analysing and displaying data about the earth that is spatially referenced.

Geographical information systems are increasingly being utilised 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, hydrometeorological 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 characterised by its location, intensity, frequency and probability.

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

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, hydrometeorological or biological. Hazardous events can vary in magnitude or intensity, frequency, duration, area of extent, speed of onset, spatial dispersion and temporal spacing.*
Planning Assumptions	The key elements of a scenario that form the basis for developing a 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 behaviour 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.

Retrofitting (or upgrading)	Reinforcement of structures to become more resistant and resilient to the forces of natural hazards. *Retrofitting involves consideration of changes in the mass, stiffness, damping, load path and ductility of materials, as well as radical changes such as the introduction of energy absorbing dampers and base isolation systems. Examples of retrofitting includes the consideration of wind loading to strengthen and minimize the wind force, or in earthquake prone areas, the strengthening of structures.*
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 that meets the needs of the present without

development 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.