Bangladesh's Preparedness to Manage Earthquake Disaster

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CIRDAP
October, 2021

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Disasters Affecting Bangladesh

Bangladesh is beset by a myriad of natural disasters

- **Tropical cyclones**
- **Tidal surges**
- **Tornados**
- **Floods**
- **Droughts**
- **Earthquakes**
- **Large-scale riverbank erosion and**
- **Man made**

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Collapse of 9-storied RANA Plaza at Savar Bazar: April 24, 2013

Out of **4000 person**, around **2500 rescued**, **1130 died** and rest are missing; Needed 21 days for debris removal

The Building was approved for **6-storied in 2005**, later the same authority approved it for **10 storied in 2008** without the signature of **an competent engineer**

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Savar Garments Factory Tragedy: April 11, 2005

Out of 200 person, Around 100 rescued, 65 died and few missing

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RECENT SEVERE FIRE INCIDENTS IN DHAKA

Fire engulfing the BSEC building <2005>

Fire engulfing the Bashundhara Mall <2008>

Fire engulfing the Nimtoli area <2010>

FR Tower Fire, Banani, Dhaka (2019)

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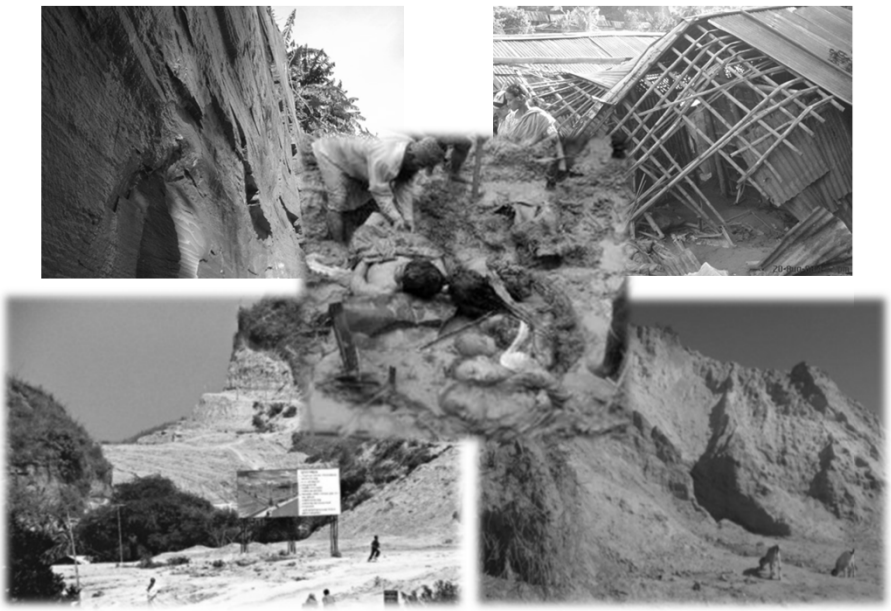
MANMADE LANDSLIDES



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Major Natural Disasters Affecting Bangladesh

Cyclones:

1970 - death 300,000 & loss over $2.5 billion

1991 – death 140,000 & huge loss $1.5 billion

(Tidal surge - 10 m)

Floods:

1988 and 1998 brought immense suffering to the population. Agricultural production was disrupted and the country's economy was severely affected in 1998, when nearly **two thirds** of the country was under water for three months.

Tornadoes:

2004 – Netrokona & Haluaghat killing 69 and injuring 1200 people

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MAJOR CYCLONES SINCE 18TH CENTURY

Year	Tidal Ht	Max Wind	Affected Population	People Killed
1822	-	-	-	40,000
1876	-	-	-	10,000
1898	-	-	-	175,000
Nov 1970	3-7 m	224 kph	4,700,000	300,000
April 1991	6-10 m	225 kph	10,000,000	140,000

1960, 1961, 1963, 1965, 1985: All these cyclones killed more than 10,000 pec

SIDR November 2007 3-5 m 240 kph 90,00,000 4000
AILA May 2009; Bulbul 2019; Amphan 2020 (USD 13B Loss); Yaas 2021

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Cyclone of November 1970 was the worst in living memory and the second worst was in April 1991

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AREAS AFFECTED BY CYCLONE

HIGH RISK AREA

WIND RISK AREA

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MAJOR FLOODS

Event	Impact
1954 floods	Affected 55% of country
1974 flood	Moderately severe, over 2,000 deaths, affected 58% of country, followed by famine with over 30,000 deaths
1984 flood	Inundated 52,520 sq-km, cost estimated at **US$ 378 million**
1987 floods	inundated over 50,000 sq-km, estimated damage **US$ 1.0 billion**, 2055 deaths
1988 floods	Inundated 61% of country, estimated damage **US$ 1.2 billion**, more than 45 million homeless, between 2,000-6,500 deaths
1998 floods	Inundation 68%, 1,100 deaths, inundated nearly 100,000 sq-km, rendered 30 million people homeless, damaged 500,000 homes, heavy loss to infrastructure, estimated damage **US$ 2.8 billion**
2004 floods	Inundation 38%, damage **US$ 6.6 billion**, deaths 700, affected people nearly 3.8 million

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MAJOR TORNADOS

YEAR	MONTH	LOCATION	TOTAL DEATH OF PEOPLE	TOTAL AFFECTED PEOPLE
1996	May	Tangail and Jamalpur,Barisal	500	1000
1997	October	Tongi	50	5000
1998	July	Sirajganj	-	25
1998	April	Nilphimari	21	0
1999	March	Panchagarh	2	60
2000	September	Savar and Gazipur	2	5
2001	October	Nilphamary,Lalmonirhat,Gaibandha,Rangpur district	11	463
2004	April	Moulvi Bazar	-	60
2004	April	Haluaghat of Mymensingh,Netrokona,Purbadhala	69	1200
2005	March	Gaibandha,Rangpur	46	5223
2006	March	Bagerhat, Khulna	4	100

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TORNADO OF APRIL 14, 2004 AT NETROKONA

69 killed & 1200 injured

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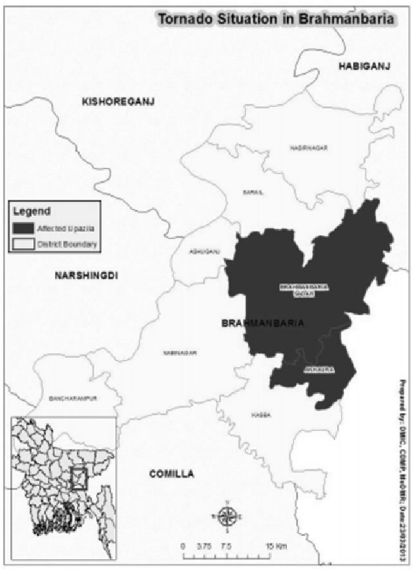
TORNADO OF MARCH 22, 2013 AT BRAHMANBARIA

32 killed & 400 injured



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MAJOR EARTHQUAKES

- Bangladesh is susceptible to damaging earthquakes
- No large earthquake has occurred in this region recently
- Several large catastrophic earthquakes struck this area in the past few hundred years

Event Name	M	I_{Dhaka}	Distance
1762 Chittagong	8.5 (?)	-	350 km
1869 Cachar	**7.5**	**V**	**250 km**
1885 Bengal	**7.0**	**VII**	**170 km**
1897 Great Indian	**8.7**	**VIII+**	**230 km**
	8.1 Ambraseys, 2000		
1918 Srimangal	**7.6**	**VI**	**150 km**
1930 Dhubri	**7.1**	**V+**	**250 km**

❖ During the **1897** earthquake **1542** people were killed

❖ The 1993 Killari and 2001 Gujarat earthquakes in India worked as eye openers for Bangladesh

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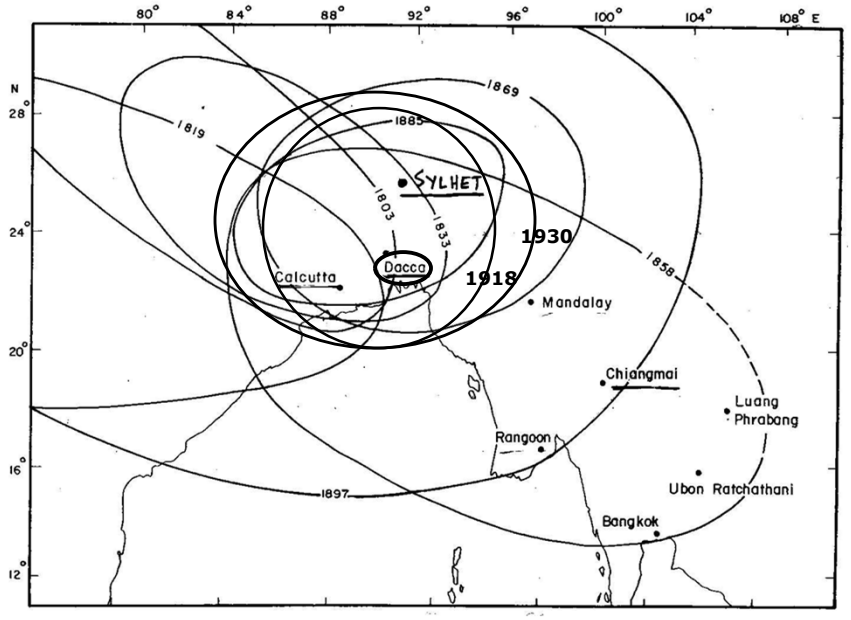
Damage Boundaries of Large Indian Earthquakes



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Where we stand on Preparedness ??

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Preparedness

- Legal Framework
- Risk Assessment
- Contingency Plan
- Awareness Raising
- Trainings
- Mitigation

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Earthquake related Legal Framework

- Disaster Management Act, 2012
  (EQ Preparedness and Awareness Raising Committee)
- Disaster Management Policy, 2015
  (EQ risk management is mentioned)
- Standing Order on Disaster, 2019
  (EQ component has been expanded)
- Bangladesh National Building Code, 2020
  (EQ part has been significantly modified)
- Dead Body Management Guideline, 2016
- Debris Management Guideline, 2016
- Incident Management Guideline, 2016

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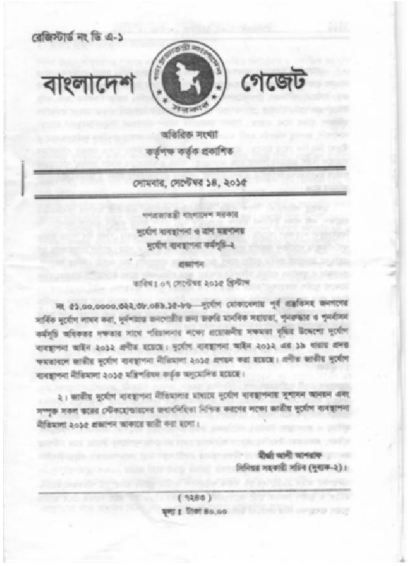
Legal Framework (contd.)


গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

দুর্যোগ ব্যবস্থাপনা আইন ২০১২

দুর্যোগ ব্যবস্থাপনা ও ত্রাণ মন্ত্রণালয়
বাংলাদেশ সচিবালয়, ঢাকা
সেপ্টেম্বর ২০১২


রেজিস্টার্ড নং ডি এ-১

বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা
কর্তৃপক্ষ কর্তৃক প্রকাশিত

সোমবার, সেপ্টেম্বর ১৪, ২০১৫

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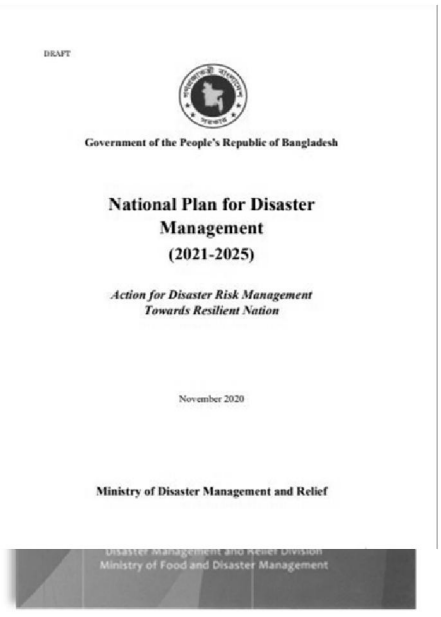
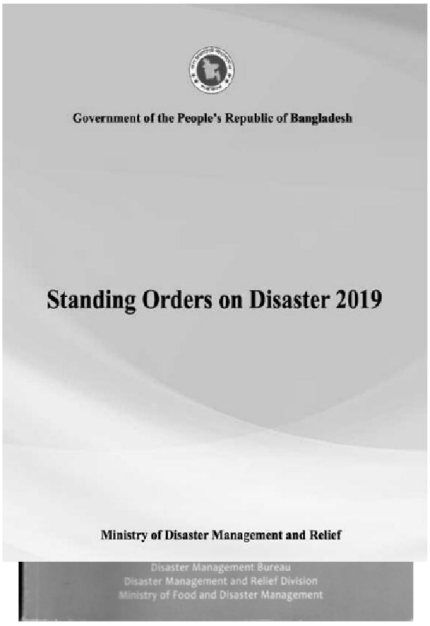
Legal Framework (contd.)





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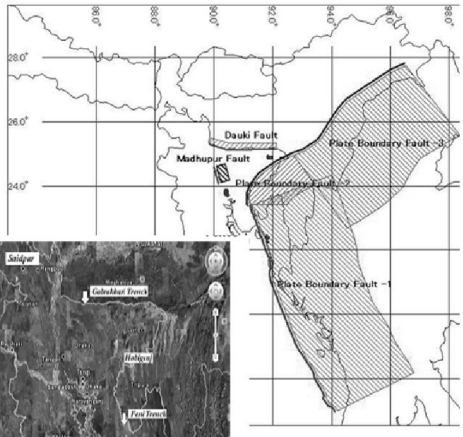
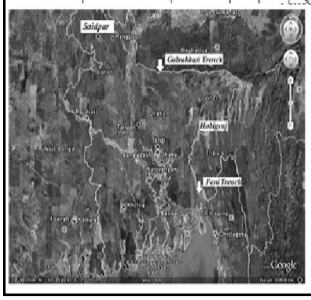
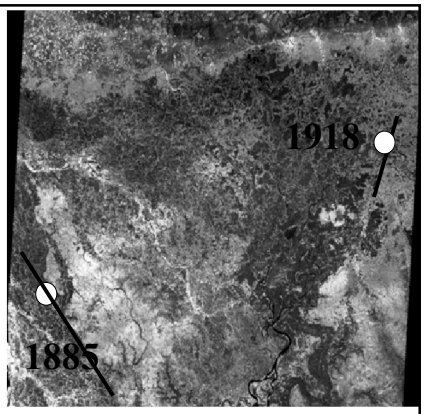
Risk Assessment

Active Faults Mapping







- **Gabrakhari, Haluaghat site across Dauki Fault**
- **Dharmapur, Feni Site across PBF1**
- **Hobigonj, Saestagonj site across PBF2**
- **Saidpur**

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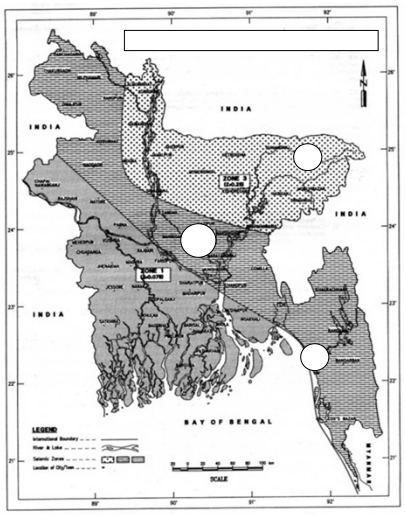
Assessment (Cont.)

Seismic Microzonation (2009-2012)



Benefit of Microzonation

- ❖**Prior simulation of damages**
- ❖**Damage distribution**
- ❖**Loss Assessment**
- ❖**Preparedness plan for risk management**

Microzonation: **Dhaka, Chittagong and Sylhet City**

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Assessment (Cont.)

Seismic Zoning Map for Bangladesh (BNBC 2020)

BNBC divided Bangladesh into 4 seismic zone, based on the earthquake risk. Zone 4 stands highest risk.

* Z represents the maximum considered earthquake (MCE) ground acceleration (g) in these zones. Probabilistically it is considered to have a return period of 2475 years i.e., 2% probability of exceedance in 50 years.
The Design Basis motion is taken as 2/3 of maximum considered motion.

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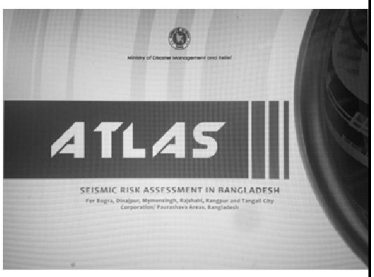
Assessment (Cont.)

Risk Assessment at Major Cities/Town (2014-2017)

-6 cities /town risk assessment are conducted and developed Risk ATLAS (Rangpur, Dinajpur, Tangail, Mymensingh, Bogra and Rajshahi)



-Urban Community Risk Assessment (CRA) developed and published

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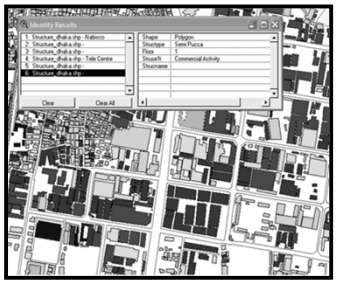
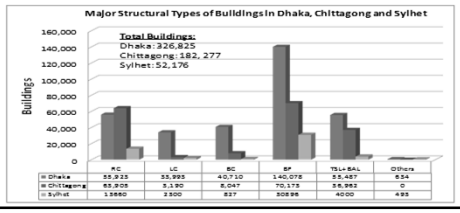
Assessment (Cont.)

Building Inventory for Seismic Vulnerability Assessment



Dhaka : 326,825 **Chittagong : 185000** **Sylhet : 52, 000**



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Assessment (Cont.)
Building Damage and Corresponding Casualties

City Corporation	Fault Name	Exten.-moder. Building Damage	Com. Building Damage	Casualties
Dhaka	Madhupur Fault (Mw=7.5)	≈86000	≈72000	88000 (2 AM) 61000 (2 PM)
	Plate Boundary Fault-2 (Mw=8.0)	≈47000	≈45000	59000 (2 AM) 36000 (2 PM)
Chittagong	Plate Boundary Fault-1(Mw=8.5)	≈25000	≈142000	95000 (2 AM) 73000 (2 PM)
	Plate Boundary Fault-2 (Mw=8.0)	≈40000	≈18000	14000 (2 AM) 10000 (2 PM)
Sylhet	Dauki Fault	≈16000	≈25000	10000 (2 AM) 6000 (2 PM)
	Plate Boundary Fault-3 (Mw=8.0)	≈10000	≈2000	1000 (2 AM) 700 (2 PM)

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Assessment (Cont.)
Expected Lifeline Damages in Dhaka City Area

Life-line System	Total number of poles and pipelines length	Damages/Breaks
Electricity	55000	16000
Gas	834 km	191
Portable Water	1118 km	272
Waste Water	630 km	360

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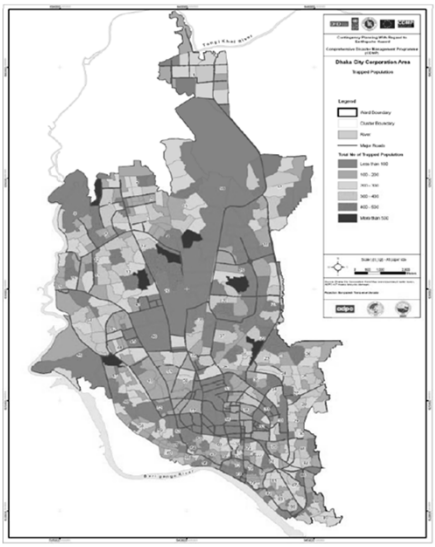
Assessment (Cont.)

Trapped Population Maps



- ~40% of people in collapsed structures can self-evacuate
- 60% of people in collapsed structures need search and rescue (50% by local community)
- General population will need safe shelter (aftershocks)

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Assessment (Cont.)

Open Spaces and Capacities Survey

Open Space ID	Area of Open Space (square meters)	Population Holding Capacity (@45m² / family for temporary shelter)	Total Deficit (families requiring further space for temporary shelter)
1	64,157	1,425	**Total Families needing Evacuation shelter are: 159,120** **So the deficit is: 159,120 – 50,640=108,480** **Temporary Shelter> 25,000 square meters** Spaces: >100 m²
2	59,836	1,330	
3	81,509	1,810	
4	677,244	15,050	
5	60,265	1,340	
6	128,245	2,850	
7	119,715	2,660	
8	809,639	17,995	
9	31,132	690	
10	25,125	560	
11	145,079	3,225	
12	32,601	725	
13	44,054	980	
Total	**2,278,600**	**50,640**	

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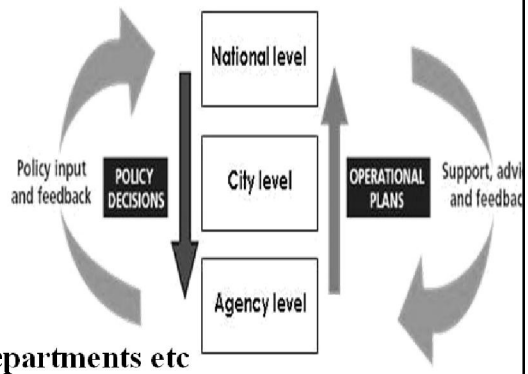
Contingency Planning (Scenario-based) for National, City Corporations and Agencies

Key Actors (Sectoral team):

- **DDM**
- **FSCD**
- **AFD**
- **City Corporations**
- **Health Directorate**
- **Bangladesh Police**
- **Life line Authorities**
- **Different Engineering Departments etc**

And, <u>160 Wards in 3 Major Cities</u>



Key Strategy:

- **Saving lives**
- **Providing humanitarian assistance**
- **Restoration of facilities and services**

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Awareness Raising Initiatives

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Awareness (Cont.)

Youth Campaign for EARTHQUAKE PREPAREDNESS

- MoDMR and UNDP conduct Youth Campaign to bring youth into the conversation on earthquake preparedness

Task:

- Develop an idea for a smart phone app on EQ Preparedness .

Key Message/Info for Campaign :

- What people should do before an earthquake
- What people should do during an earthquake
- What people should do after an earthquake

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Training

School Safety and Evacuation Drills

- Guidelines, manuals, Video developed
- ToT organized in divisions/district level to conduct drill
- Drills equipment procured and distributed for school
- 6,000 school conducted EQ drill
- Included content and initiate to add drill information into the curriculum

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Training (Cont.)

Development of Urban Volunteers

- Government plan to develop 62,000 urban volunteers
- So far, 32000 volunteers received training on search, rescue and first aids with the support of Fire Service and Civil Defense
- Light equipment procured for the volunteers

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Training (Cont.)

Training for Masons/ Bar binders and EQ resilient construction materials

• Masons and bar binders are receiving training through house building research institutions
• Safety gears are being provided to the masons and bar binders
• Development of earthquake resilient building materials(eg light brick) and working on retrofitting technology by HBRI

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Training (Cont.)

Training on Risk Reduction & Response

- Training through Islamic foundation on non-structural vulnerability
- Plan to include training in the regular training programme of Islamic foundation
- Plan to support other religions with their formal institution

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Training (Cont.)

Disaster Response Training and Earthquake Camp for Bangladesh Scouts

- Organized 1st National Disaster Response Scout Camp Scouts by MoDMR with UNDP and JICA in June 2016

- MoDMR and UNDP conducted training at 40 districts and trained 1,400 scouts with special focus on Earthquake preparedness and response

- Conducted 5 TOT and developed 200 Master Trainer from Scout

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Exercise

Disaster Response Exercise and Exchange (DREE)

- AFD & USARPAC with MoDMR are organizing DREE by last 10 years

- This is aimed to enhance knowledge and the practices of national disaster response and to enhance partnership

- This year DREE will be organized in 3 places (Dhaka, Chittagong and Sylhet) which cover wider geographical area for professional development with particular focus on EQ

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Exercise (Cont.)

Earthquake Simulation

- Organized Modern Digitalized Community Simulation at Sylhet by MoDMR with JICA in February, 2016

- MoDMR and WFP conducted 2 EQ Simulations at Dhaka and Sylhet (150 Local Government institutions, and relevant stakeholder participated)

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Experience Sharing on Nepal EQ

- 3 different team led by FSCD, AFD and Bangladesh Scout participated in rescue Nepal EQ affected area
- The Team organized feedback session, which reflected on:
  - Real experience gathered on the affected area
  - Practical knowledge and experience on response and rebuilding
  - Way out the lessons to incorporate country preparedness on earthquake in future

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Institutional Development & Engagement

-MoDMR established **Disaster Management Research and Training Institute** in 2016

-17 Universities and training institutes incorporated and deliver disaster management courses included EQ content significantly

- **MOU** has done between **IDMVS-DU and MoDMR** to support intern for graduate and post graduate level students – major areas of research are Earthquake preparedness and response

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Procurement of Necessary Equipment

- Government has taken project that procured heavy search and rescue equipments and handed over to Armed Forces, FSCD , DCC (project worth of BDT 159 core , procured worth of 89 BDT core)
- Procurement of more search and rescue equipments are in process (worth of BDT 39 core)
- Procured tent worth of BTD 100 core for temporary shelter
- Modern earthquake research equipments have been procured

Honorable PM is handing over search and rescue equipment

Advanced training on earthquake research

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Mitigation and Preventive measures for risk mitigation

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Launching of Three New Projects

The "**Urban Resilience Project**" is a US$ 179.5 million investment, US$ 173 million financed by the World Bank and US$ 6.5 million by the Government of Bangladesh. The project aims to strengthen the capacity of Government of Bangladesh agencies to respond to emergency events and to strengthen systems to reduce the vulnerability of future building construction to disasters in Dhaka and Sylhet.

The "**Urban Building Safety Project**" is a US$ 116 million investment, US$ 100 million financed by JICA and US$ 16 million by the Government of Bangladesh. The project aims to strengthen the building safety in Urban Cities by financing loans for building safety for private buildings through Participating Financial Institutions (PFI), and by improving the building safety for public buildings, thereby contributing to improvement of the social vulnerability of urban cities.

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National Resiliency Project (US$ 3 million investment): Unique Partnership

4 Ministries, and 4 Agencies:

- MoDMR - Department of Disaster Management
- MoCWA - Department of Women Affairs
- MoP - Programming Division
- MoLGRDC - Local Government Engineering Department

3 Funders:

- SIDA
- FCDO
- GoB

3 UN Agencies:

UNDP	- with DDM and Prog. Div.
UNWOMEN	- with DWA
UNOPS	**- with LGED**

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The components of the Bangladesh Urban Resiliency Project of WB

Component A: Emergency Response Systems Improvements

Component B: Addressing Risks in the Built Environment

Component C: Supporting Improved Construction, Urban Planning and Development

Component D: Project Implementation, Monitoring, and Evaluation

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The components of the Urban Safety Project of JICA

- Strengthening Garment Factories
- Introduce Seismic Proof Building
- Retrofitting of 12 Fire Stations in Dhaka
- Construction of Fire Headquarter with Japanese Technology

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NRP: Theory of Change

Goal: To sustain the resilience of human and economic development in Bangladesh through inclusive, gender responsive disaster management, and risk informed development

Outcome

Substantial increase in resilience to disaster and reduction in disaster risk, loss of lives, livelihoods and health of men, women, girls and boys; and protection of the health of persons, businesses and communities in Bangladesh.

- Output 1: Improved capacities for risk informed and gender responsive development planning.
- Output 2: Strengthened, disability inclusive, gender-responsive national capacities to address recurrent and mega disasters .
- Output 3: Improved capacity of selected public institutions to achieve resilience outcomes through designing and constructing risk-informed and gender-responsive infrastructure.
- Output 4: Enhanced women's leadership capacities for gender-responsive disaster management decisions, investments and policies at national and local levels.
- Output 5: Strengthened disability inclusive, gender responsive community preparedness, response and recovery capacities for recurrent and mega disasters.

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Earthquake Resilience Public Buildings under JICA support with PWD

Tejgaon Fire Station

Before Retrofitting

After Retrofitting

Bangladesh Betar Building retrofitting work also on-going

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Earthquake resilience Private Buildings under JICA support with PWD-BB

Combination of Japan's Technical and Financial Assistance

2 more RMG factories' retrofitting work also on-going

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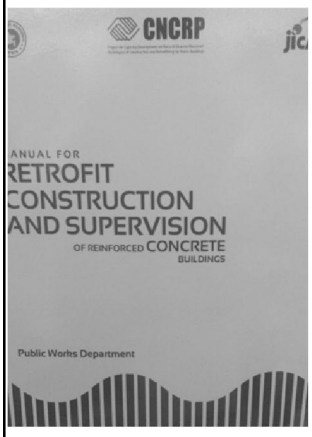
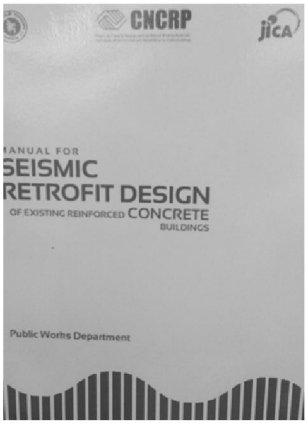
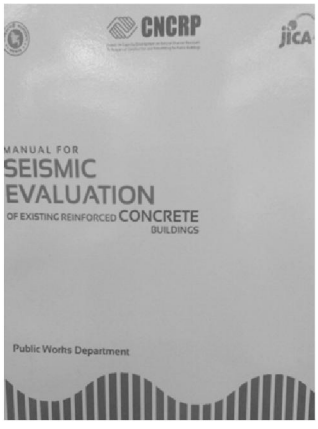
Retrofitting Manuals and Guidelines were prepared under JICA Support







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New FSCD HQ under JICA support For Base Isolation Technology (First Initiative in Bangladesh)

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Community Based Disaster Management: UNDP Pilot Project in Mymensingh

- Earthquake preparedness planning
- Alternative building designs, suitable construction technologies
- Building structure research
- Building Code Implementation (testing innovative incentive models)
- Urban search and rescue training
- Education at major public sites
- Drills, Exercises, Training
- Earthquake resilient housing demonstration

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NDMC's Decision (May, 2015) and Progress

Action points (EQ)	Progress so far
Awareness building on earthquake through print and electronic media	Print and Electronic media widely coverage on EQ M/O Information initiated to disseminate awareness programme through media
Conducted Earthquake drill at educational institutions twice a year	Ongoing
Drill countrywide on EQ in a specific time	On process

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NDMC's Decision (May, 2015) and Progress

Action points (EQ)	Progress so far
Enforcement of building code	MoHPW working
Set auto circuit breaker on Gas and Electric line to reduce the risk of earthquake	Ministry of Energy and Power formed Technical Committee for introducing auto circuit breaker
Put red sign on the vulnerable buildings to earthquake	Meeting held with MoHPW and Working on
Establishment NEOC	Draft framework prepared Site already selected

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What Next

- CPP volunteer will be trained on Earthquake Emergency Response
- District & Upazila Level Earthquake Simulation for Awareness Raising and Capacity Building will be done
- Capacity Assessment of Airports for constructing National Humanitarian Staging Area(HAS) will be done by WFP
- Establishment of National Emergency Operation Center (NEOC) funded by JICA (location selected)
- Emergency Disaster Response Fund will create under JICA support (Disaster Risk Management Enhancement Project)

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Way Forward

- Whole of government approach
- Mass Awareness Raising
- Enforcement of Building Code
- Sensitization of the GoB, NGOs, CSOs agencies and Strengthening Coordination Mechanism
- Private sector engagement on Earthquake preparedness, risk reduction & response
- Provide necessary professional trainings for Engineers, Practitioners and Academicians
- Hospital Preparedness including mobile hospital
- Consider Temporary shelter for EQ response

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Way Forward

- Create Earthquake Cell/Center of Excellence
- Establish Earthquake Simulation Hall/Centre
- Commissioning research and bridging with practices
- Institutionalization of volunteers
- Continuous practical training for stakeholders and updating related data and guidelines for earthquake

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Thank You

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