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AN ANALYSIS OF THE EARTHQUAKE CONTINGENCY PLANNING SYSTEM AMONG DISASTER MANAGEMENT STAKEHOLDERS FOR DHAKA CITY CORPORATIONS

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ABSTRACT

The purpose of this study is to analyze and determine the status of contingency planning systems for disaster management stakeholders for Dhaka City Corporations. The study also aims at determining the status and identifying the added value of contingency planning by public and private authorities. As prime movers of disaster risk management, public authorities can use the findings and recommendations of this study in planning for disasters or emergencies that may likely affect and bring enormous impact on people's lives, their livelihoods and property. The qualitative descriptive research design was found to be the most suitable design for this study capable of investigating a wider geographical area in a short period of time, capturing the respondents' views on common hazards, the status of earthquake contingency planning, the frequency of reviewing the plans, as well as their capacity and gap to engage into contingency planning. In this study a semi-structured questionnaire was used to reach out to all the twenty seven stakeholders who are regarded as a first responder of the earthquake contingency plan and a face-to-face interview were taken of the key informants. Based on the qualitative data a thematic analysis was done for findings. From the findings major gaps are identified and based on the findings recommendation are given. The findings and recommendations of this study might set the tone for "good practice" in dealing with disaster risk management in Dhaka City Corporation and globally, as well as influencing policy and practice.

KEYWORDS: Earthquake, Contingency Planning, Disaster risk management, Disaster mitigation.

1. INTRODUCTION

Being the capital of Bangladesh, Dhaka is the primal city in terms of its political, cultural and economic importance. It is the center of the country's all administrative and economic activities. The population of Dhaka city (areas under the jurisdiction of the Dhaka city corporation) stands at approximately 8.5 million (Population Review, 2017). The city, in combination with localities forming the wider metropolitan area, is home to an estimated 18 million as of 2017. The population is growing by an estimated 4.2% per annum, one of the highest rates amongst Asian cities.

In the generalized tectonic map of Bangladesh, Dhaka is near by the Modhupur Fault and Plate Boundary Fault- 3. The earthquake risk of the Dhaka City is growing with every passing moment because of the unabated growth of human settlement and industrial and other economic activities. The rapid increase in vulnerability of the city is evident from the rapid urbanization, population growth, population migration and development of major economic zones in and around Dhaka.

Major causes behind such ever increasing earthquake risk being the haphazard urbanization and sub-standard construction of buildings, residential houses and other infrastructures without any consideration of underlying earthquake hazards. Major reclamation efforts in and around Dhaka increases the potential for liquefaction. During sustained strong shaking, poorly consolidated, water saturated sediments can liquefy and lose their ability to support loads. The foundations and supports of structures built on liquefiable sediments can fail, causing damage or destruction during major earthquakes. Much of the country is of loose sandy soil and most of it remains in saturated condition round the year, thereby increasing the vulnerability to liquefaction in case of sustained ground motions. Possibility of fire outbreaks in an event of an earthquake as a secondary hazard is another source related to possible high economic losses.

On the Contrary, present capacities in disaster management in Bangladesh are largely centered on emergency response and post disaster recovery, which is evident from the flood and cyclone events of high magnitude. But there is a need for a comprehensive geo-hazard risk reduction "Contingency Planning" strategy for low frequency high magnitude events, which occur without warning. Such Contingency Planning efforts should be linked to an easy implementation framework to be able to address the related issues.

Comprehensive Disaster Management Programme (CDMP) under Ministry of Food and Disaster Management, an earthquake risk assessment of Dhaka City Corporation areas was carried out using HAZUS model for analyzing potential damages and losses from different earthquake scenarios. It was extremely necessary to assess the response needs and preparedness capacity of institutions, and to use the same databases for subsequent contingency planning processes for Dhaka City. Based on this study an Earthquake Contingency Plan (ECP) was prepared for Dhaka City Corporation (Former unified Dhaka City Corporation which was divided into Dhaka North and South City Corporation in 2011 respectively)

This study critically analyses the contingency planning systems for disaster management authorities in Dhaka City Corporation. Such contingency plans help policy and operational decision-makers to better prepare and respond to disasters, as well as putting in place policies that enhance and provide guidance in contingency planning.

2. RESEARCH QUESTION

The main purpose of this research is to analysis of the Earthquake Contingency Planning System for Disaster Management Authorities in Dhaka City Corporations. In this context, the main research questions of the study include:

i. How far the existing earthquake contingency planning is appropriate among disaster management authorities for Dhaka City Corporations?

These questions are exploratory in nature. To address the main research questions there are few secondary questions:

i. How far DCCs have proceeded to implement this earthquake contingency plan?

ii. What is the level of ownership of this plan by the DCCs?

iii. How much DCCs (DNCC and DSCC) are ready in terms of manpower, equipment and working groups formation?

iv. What about the status of coordination among the other agencies for emergency situation?
v. What are the gaps in existing policy framework and implementation of this plan?

3. OBJECTIVES OF THE RESEARCH

The purpose of this study is to analyze and determine the status of contingency planning systems for disaster management authorities in Dhaka City Corporation. This study is anchored in the following sub-objectives:

i. To determine the existing status of Earthquake Contingency Planning within Disaster Management Authorities for Dhaka City Corporations.
ii. To identify the gaps that exists in the way Disaster management Authorities Plan for disaster or emergencies.
iii. To recommend some guidelines to make the earthquake contingency plan for DCCs vibrant.

4. RESEARCH METHODOLOGY

The approach of this research is qualitative, exploratory-descriptive and contextual. This research follows the qualitative method to obtain data. Primary data was collected through semi-structured interviews of key informants of relevant government and non-government officials and experts and researcher. The fieldwork for data collection stretched over a three months period from August 2017 to October 2017.

Selecting the study area for the research is very difficult as the area should offer an overall situation and represent other parts of the city. In terms of importance of the disaster risk reduction, Dhaka City is more vulnerable due to different hazards specially the earthquake. Dhaka is the capital city of Bangladesh and having a large number of populations within it. Moreover the growth of Dhaka is not fully systematic rather most parts of the city's growth are organic or unplanned. In the generalized tectonic map of Bangladesh, Dhaka is near by the Modhupur Fault and Plate Boundary Fault- 5. The earthquake risk of the Dhaka City is growing with every passing moment because of the unabated growth of human settlement and industrial and other economic activities. The rapid increase in vulnerability of the city is evident from the rapid urbanization, population growth, population migration and development of major economic zones in and around Dhaka. For having a clear idea about the Dhaka city (within the city corporation areas) this study feels the urges to look around all the city corporation area.

4.1 Selection of participants and sampling technique

The group of participants in the research is comprised of three clusters of people using the purposive sampling technique: 1. Key informant respondents i.e. 1. DSCC and DNCC, 2. The representatives from Private organization, NGOs and, practicing professionals, and 3.Officials from public authorities. Population size for this study was 27 participants. The sample size was determined through application of the standard error of proportions table (90 percent confidence level with 10 percent error). The list is given below:

Table 1: Profile of Participants (Face-to-Face Interview)

Organization Name	Participant	Gender	Organization Type	Designation
1. Dept. of Disaster Management (DDM)	P1	Male	Public	Director
2. Ministry of Disaster Management and Relief	P2	Male	Public	Secretary
3. Ministry of Local Government	P3	Male	Public	Secretary
4. DNCC (Dhaka North City Corporation)	P4	Male	Public	Project Director
5. DSCC (Dhaka South City Corporation)	P5	Male	Public	CEO
6. UDD	P6	Male	Public	Director
7. DWASA (Dhaka Water Supply and Sewerage Authority)	P7	Male	Public	Managing Director
8. DPDC (Dhaka Power Distribution Company Ltd.)	P8	Male	Public	Managing Director
9. DESCO (Dhaka Electric Supply Company Ltd.)	P9	Male	Public	Managing Director
10. FSCD (Bangladesh Fire Service & Civil Defense)	P10	Male	Public	Director General
11. RAJUK (Rajdhani Unnyan Kortipakha)	P11	Male	Public	Chief Town Planner
12. REHAB (Real Estate & Housing Association of Bangladesh)	P12	Male	Private	President
13. PWD (Public Works Department)	P13	Male	Public	Chief Engineer
14. Department of Architects	P14	Male	Public	Chief Architect
15. HBRI (Housing & Building Research Institute)	P15	Male	Public	Director
16. BIP (Bangladesh Institute of Planners)	P16	Male	Private	President
17. IAB (institute of Architects Bangladesh)	P17	Male	Private	President
18. IEB (Institute of Engineers Bangladesh)	P18	Male	Private	President
19. District Administration	P19	Male	Public	DRRO
20. Armed Forces Division	P20	Male	Autonomous	Officer
21. Ministry of Education	P21	Male	Public	Education Officer (Planning)
22. Ministry of Health	P22	Male	Public	Health Officer
25. Dhaka Medical Hospital	P23	Male	Public	Health Officer
24. Bangladesh Red Crescent Society	P24	Male	International NGOs	General Secretary
25. Media-President	P25	Male	Private	President
26. Bangladesh Police	P26	Male	Public	Officer
27. Telecommunication (BTRC)	P27	Male	Public	Officer

Source: Prepared by Authors, 2017

Source: Key Informants Interview, 2017

Figure 1: Key Informants Interview with the Participants

4.2 Analysis

In this study, the first step of thematic analysis is the transcribed conversations being carefully read and re-read to find out the emerging ideas. There were eleven prior themes, which were identified in relation to the research questions and objectives of the study. These themes could potentially provide meaningful insights to the research problem under study. The thematic analysis of the qualitative data is shown in Table: 1 and Table: 2 below:

Table 1: Development of Themes for Qualitative Data Analysis for Stakeholders Other Than DNCC and DSCC

	Research Questions & Sub Questions 1. How far the existing earthquake contingency planning is efficient for disaster management authorities in Dhaka City Corporation?				
Themes/Research Questions	How far DCC has proceeded to implement this earthquake contingency plan?	What is the level of ownership of this plan by the DCCs?	How much DCCs (DNCC and DSCC) are ready in terms of manpower, equipment and working groups formation?	What about the status of coordination among the other agencies for emergency situation?	What are the gaps in existing policy framework and implementation of this plan?
Acknowledgement	X	X		X	X
Completeness	X				X
Appropriateness					X
Manpower			X		X
Equipment			X		X
Training			X		X
Coordination				X	X
Readiness		X	X	X	X

Source: Modified from Begum. H., 2015

Table 2: Development of Themes for Qualitative Data Analysis

	Research Questions & Sub Questions 2. How far the existing earthquake contingency planning is appropriate among disaster management stakeholders for Dhaka City Corporations?				
Themes/Research Questions	How far DCCs have proceeded to implement this earthquake contingency plan?	What is the level of ownership of this plan by the DCCs?	How much DCCs (DNCC and DSCC) are ready in terms of manpower, equipment and working groups formation?	What about the status of coordination among the other agencies for emergency situation?	What are the gaps in existing policy framework and implementation of this plan?
Develop Contingency Plans, training and capacity building, and assessment regarding readiness of City corporation in responding to earthquake	x	x	x	x	x
Emergency Operation Centre for developing social volunteer	x			x	x
Emergency services to for reporting mechanism for emergency response			x	x	x
Urban Crisis Planning (evacuation areas, pre-positioning of essential elements for response & recovery)	x		x	x	x
Health Group (health & emergency medical care)			x	x	x
Welfare, Food And Nutrition				x	x
Planning of Utilities (telecommunication, Power supply, Gas lines, waste disposal etc.)	x			x	x
Mass Media Communications and Public Information				x	x

Table 2: Development of Themes for Qualitative Data Analysis (continoued)

	Research Questions & Sub Questions 2. How far the existing earthquake contingency planning is appropriate among disaster management stakeholders for Dhaka City Corporations?				
Themes/Research Questions	How far DCCs have proceeded to implement this earthquake contingency plan?	What is the level of ownership of this plan by the DCCs?	How much DCCs (DNCC and DSCC) are ready in terms of manpower, equipment and working groups formation?	What about the status of coordination among the other agencies for emergency situation?	What are the gaps in existing policy framework and implementation of this plan?
Water and Sanitation Group	x			x	x
Transport Group (road, railway, airports, ports & harbor)	x			x	x
Recovery Group	x		x	x	x

Source: Modified from Begum. H., 2015

5. EARTHQUAKE THREAT IN DHAKA CITY CORPORATIONS AND IDENTIFICATION OF RISK SCENARIO

Dhaka City Corporation (DCC) is the former self-governing corporation that is associated with the task of running the affairs of the city of Dhaka. The incorporated area was divided into several wards. Each ward has an elected ward commissioner. The mayor of the city is elected by popular vote every five years. The Corporation was dissolved by the Local Government (City Corporation) Amendment Bill 2011 on 29 November 2011, passed in the Parliament of Bangladesh, and formally ceased to exist on 1 December 2011, following the President's approval, making way for a Dhaka North and a Dhaka South city corporations. Each corporation will be a self-governing entity, thus giving the city of Dhaka two mayors. The government holds that bifurcation would ensure better quality of civic services to the denizens of the city. Dhaka North City Corporation consists of 36 wards and Dhaka South City Corporation consists of 54 wards. Total population of Dhaka City Corporation is about 8.5 million (Population Review, 2017). Thus, it is important to understand earthquake impacts to Dhaka and increase its resilience.

5.1 Potential damage in different scenarios of earthquake

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

Buildings damage

During an earthquake at 7.5 mw originated from Madhupur fault, about 166,570 buildings will be moderately damaged. This is about 51.00 % of the total number of buildings in the city. It is estimated that about 75,218 buildings that will be damaged beyond repair. If the magnitude of the earthquake is 8.0 mw, about 93,605 buildings will be at least moderately damaged which is about 29.00 % of the total number of buildings. During an earthquake originated from under the city at 6.0 mw will moderately damage about 136,434 buildings and about 53,989 buildings will be damaged beyond repair (ECP, 2009).

Collateral hazards

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

Fire following earthquake

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

During an earthquake of 7.5 mw originated from Madhupur fault, there will be 920 ignitions that will burn about 4.12 sq. mile 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. mile 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 mw will be responsible for 920 ignitions that will burn about 4.22 sq. mile 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 (ECP, 2009).

Debris generation

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

a) Brick/Wood

b) Reinforced Concrete/Steel.

This distinction is made because of the different types of material handling equipment required to handle the debris. During an earthquake of 7.5 mw originated from madhpur fault a total of 30,599.00 million tons of debris will be generated. Out of this, brick/wood comprises 22.00% of the total, with the remainder being reinforced concrete/steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 1,223,960,000 truckloads (25 tons/truck) to remove the debris generated by the earthquake. Similarly an earthquake originated from plate boundary fault-2 will generate a total of 19,147.00 million tons of debris of which brick/wood

comprises 19.00% of the total, with the remainder being reinforced concrete/steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 765,880,000 truckloads (25 tons/truck) to remove the debris generated by the earthquake. The earthquake if originated from under the city of 6.0 mw, will be responsible for generation of a total of 21,059.00 million tons. Out of this, brick/wood comprises 23.00% of the total, with the remainder being reinforced concrete/steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 842,360,000 truckloads (25 tons/truck) to remove the debris generated by the earthquake (ECP, 2009).

Essential facilities damage in dhaka city corporation area

The following table-3 shows the potential damage of the essential facilities like hospitals. Schools, police station, fire stations based on the earthquake magnitude. In addition to this table-4 shows the utility damage like Potable Water, Waste Water Natural Gas, Electrical Power, Communication. Furthermore, Table-5 shows the Expected Utility System Pipeline Damage in Dhaka City Corporation Area based on the magnitude.

Table 3: Expected Damage to Essential Facilities in Dhaka City Corporations Area

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

Source: Earthquake Contingency Plan for Dhaka City Corporations, 2009

Table 4: Expected Utility System Facility Damage in Dhaka City Corporation Area

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

Source: Earthquake Contingency Plan for Dhaka City Corporations, 2009

Table 5: Expected Utility System Pipeline Damage in Dhaka City Corporation Area

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

Source: Earthquake Contingency Plan for Dhaka City Corporations, 2009

6. RESULTS AND DISCUSSION

This analysis is divided into two parts. The first and second part of the chapter contains analyses of data obtained through interviews. The first section provides the findings from thematic analysis one which address the research question and contributory questions and this findings

was drawn from the other stakeholders responsible for the earthquake disaster management except the Dhaka North and South City Corporations respondents.

The second section presents the qualitative results from the interviews of DNCC and DSCC authorities and the findings were based on the thematic analysis two which was presented in research methodology. Thus, the findings from the study are summarized under themes that are drawn from the responses provided by the participants in the individual interviews. The themes were developed in relation to the questions being explored. These findings are intended to provide understanding of present status of the development of earthquake contingency plan, policy environment, facilitators of and barriers to implementation of contingency plan, and the structure and process of future participation. However, throughout the chapter, quotes from participants are provided to illustrate key thematic areas and conceptualizations of problems and prospects to address the research questions.

6.1 Results and discussion based on the thematic analysis one

The result of the interviews of participants from stakeholder organizations other than Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC) based on the theme one which is discussed below:

Acknowledgement

From the interviews it is evident that most of the participants are not acknowledged about the Earthquake contingency plan which was developed in 2009 for Dhaka City Corporations. In the earthquake contingency plan these stakeholder are recognized as a first responder for disaster management. From the interview it is found that only 24% stakeholders are known about the plan and the rest 76% are not known about the plan that are exist for earthquake management. From the discussion, it is clear that DCC has not yet preceded the implementation of the earthquake contingency plan, 2009.

Completeness

From the interviews it is clear that majority of the participants of different organizations have no idea about the contingency plan which is developed for Dhaka City Corporations in 2009. Among the participants who have the idea about the earthquake contingency plan 36% think that the contingency plan is incomplete and 64% have no opinion about completeness of the plan. From the percentage it is clear that the Earthquake Contingency Plan is not fully complete to mitigate the earthquake disaster without any warning and gives a warning to update the earthquake contingency plan based on the current threat.

Appropriateness

From the interviews it is experienced that not a single participants think that the earthquake contingency plan is appropriate in terms of detail guideline provide for the first responders who are responsible for the management of the emergency situation. When the question was asked about the appropriateness of the contingency plan, eleven participants think that the plan is not appropriate. Majority of the stakeholders thinks that this ECP is only a guideline, so it is very much crucial to convert the guideline into a full prove plan to mitigate the disaster.

Manpower

From the interviews it is found that the number of manpower available for emergency situation is not sufficient. In most of the organization there is lack of manpower to deal the earthquake emergency situation in Dhaka North and south city corporations. The organizations have no plan to increase the manpower for emergency. Only few organizations like Arm Force Division, Fire Service and Civil Defense, Ministry of Disaster and Relief, Ministry of Local Government have some manpower which is also less required to manage the emergency situation. The left organizations have not so much manpower which can be remarked. Besides this, most of the manpower has not given so much training which is required to response quickly during the emergency. From the interview it is evident that 68% stakeholders said that the manpower is insufficient and the remaining 32% have no opinion about the manpower of their organizations.

Equipment

From the interviews it is found that the number of equipment available for emergency situation is not sufficient. In most of the organization there is no equipment to deal the earthquake emergency situation in Dhaka North and south city corporations. Few of the organization have some plan to increase the equipment's for emergency. Only few organizations like Arm Force Division, Fire Service and Civil Defense, Ministry of Disaster and Relief, Ministry of Local Government have some training which is less required to manage the emergency situation. The left organizations have not so much training which can be remarked. Besides this, most of the organizations have no training how to operate the equipment and this equipment are getting damaged due to not used by the organization. From the training graph it is evident that 68% stakeholders said that the training is insufficient and the remaining 32% have no opinion about the training of their organizations. Besides the number of training for earthquake management some stakeholders said that they have lack of space to keep the instrument safe. P19 organization said that "Due to lack of space we are not able to buy new training for earthquake emergency situation. The participants also mention that they have lack of financial resources to buy the new training equipment's, the allocation of budget to buy new training equipment's during emergency situation is not sufficient to purchase new training equipment's."

P19 participants also stated that "For buying new equipment's they are involved with the Fire Service and Civil Defense and provide cooperation as much as possible to increase the number of equipment's to manage the emergency situation"

Training

From the interviews it is discovered that the number of training available for emergency situation is not sufficient. In most of the organization there are no frequent training facilities available to deal the earthquake emergency situation in Dhaka North and south city corporations. Few of the organization have some plan to increase the training facilities for emergency. Only few organizations like Arm Force Division, Fire Service and Civil Defense, Ministry of Disaster and Relief, Ministry of Local Government have some training which is less required to manage the emergency situation. The left organizations have not so much training facilities which can be remarked. Besides this, most of the organizations have no any plan to facilitate these training facilities. From the training graph it is evident that 66% stakeholders said that the training is insufficient and the remaining 34% have no opinion about the training of their organizations. In

the perspective of training P21 organization said that "Teachers and managing committee of their organizations are getting trained under the program of – 'Education in Emergency and Disaster Risk Reduction' and the participants also added that supplementary reading materials will be provided under the Standing Operating Procedure (SOP) with the help of MOCME."

P20 participants responded about the training facilities that "They tried to increase the training facilities among the different public, private, NGOs, and other international Donor organization to increase the capability of the responsible person and also make skilled volunteer to deal the earthquake disaster. The participants also mentioned that under their organization they tried to give training near about 60,000 volunteers."

P1 participants stated that, "They are trying to increase the workshop, seminar, and training facilities as much as possible with the collaboration of Public, Private, NGOs, and International Donor Agencies. The focused of training is on do exercise, drill on earthquake."

Coordination

From the interviews it is found that all the participants who are regarded as a first responder in Earthquake Contingency Plan, 2009 thinks that coordination's is must to cope up with the emergency situation effectively. From the coordination graph it is clear that every participant in the key informant's interview think that coordination is needed for emergency situation. From the previous disasters example it is evident that we have lack of coordination's among the organizations due to lot of reasons but it is not too late that coordination cannot be increased. In this perspective P15 participants told that "Coordination should be multi-tasking and there should be proper arrangement to meet up regularly and finds the gaps we have and tried to solve the gaps so that we can make our community more resilient."

Another P17 participants said about coordination that "All stakeholders should meet regularly, take part in the meeting spontaneously and tried to find out the loophole of our system and make us more competent to face the earthquake disaster."

Readiness

From the interviews it is found that most of the organizations are ready in spite of they have lack of manpower, equipment, and training. From the interview it is shown that 52% stakeholders are ready and 48% stakeholders are not ready to face the earthquake emergency situation.

Database

From the interview it is ascertain that only three organizations have their database in terms of manpower, equipment, and other staff and twenty five organizations have no database of their own. But all the organizations feel the importance of database to ensure the transparency among the organizations and by this database gaps of requirement can be identified. In this perspective P1 participants stated that, "At this moment we have no such database but we have an aim to develop a database which clarify the situation clearly."

From the discussion, it is clear that DNCC and DSCC has not yet able to success in the implementation of the Earthquake Contingency Plan, 2009 due to lack of acknowledgement, completeness, appropriateness, manpower, equipment, training, coordination, readiness.

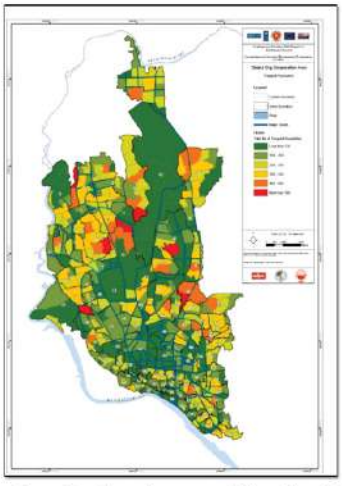
6.2 Results and discussion based on the thematic analysis two

From the interview it is found that according to the Earthquake contingency plan, 2009 Dhaka North and South City Corporations have not yet developed their Earthquake Contingency Plan. In the both city corporations there is lack of capacity building and training facilities available. There is no regular assessment regarding the readiness of the both city corporation in responding to earthquake.

Operations Response Group (Emergency Operation Center, ICS)

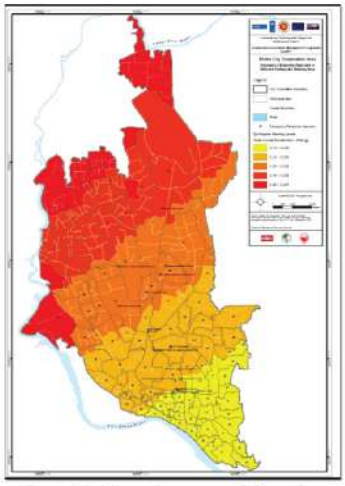
From the interview it is evident that both the city corporations are trying to increase the capacity in community first responders in search and rescue operations and maintain data bases, identified possible population trapped location (See Map-.1) and proposed emergency fuel station, fire station etc. But none of the city corporations have yet develops their own database regarding all information needed. Dhaka North City Corporation is trying to format community based social volunteer networks as first responders. In this perspective P4 participants said that, "Now they are concern about formatting community based social volunteer networks as first responders and the number of volunteers under the program is 20,000". (Interviewed on 12th September 2017)

From the discussion it is further found that the both city corporations have not yet develop the permanent 24/7 city level Emergency Operation Centre (EOC). So that training and development of operation procedure guidelines of the city level staff to serve in EOC is not possible. From the contingency plan, it was mentioned that both city corporations have to develop the capacity of city level officials for Incident Command System (ICS) operations but in reality, the city corporations have failed develop the ICS operation system. The city corporations have not yet develop the surveillance guideline for city during the earthquake. Later in the cataloguing/procurement of equipment P4 participants stated that, "We are trying to develop cataloguing/ procurement of equipment for special search and rescue and develop procedure for ensuring access. The participants further added that we are also focused on promoting informal education for earthquake disaster preparedness at all levels and conduct simulations." (Interviewed on 12th September 2017).



Source: Earthquake Contingency Plan for DCCs, 2009

Map 1: Potential Trapped Population in Different Locations

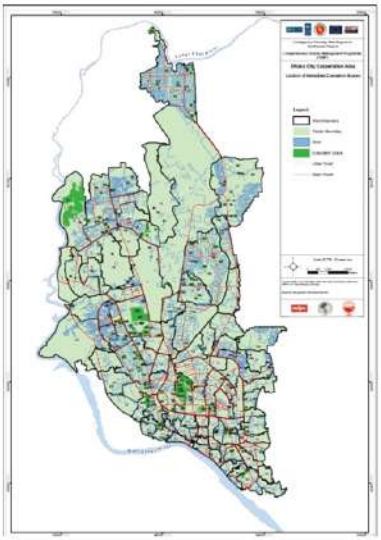


Source: Earthquake Contingency Plan for DCCs, 2009

Map 2: Location of Key Emergency Response Agencies in Different Hazard Areas

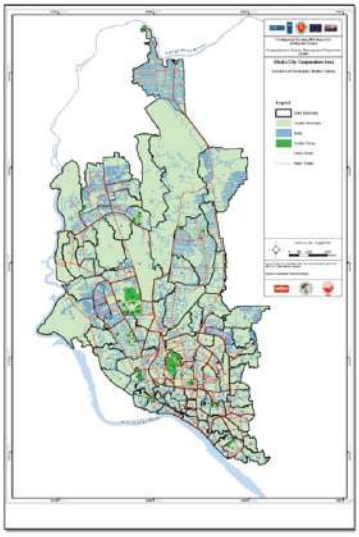
Emergency services

From the interview it is discover that both the city corporations is trying to develop reporting mechanism for emergency response groups, agencies, NGOs for reporting readiness and develop coordination mechanism to ensure supply of relief in time. For the emergency services the two city corporations proposed key emergencies response agencies, open space for immediate evacuation and location for temporary shelter camps (See Map: 2, 3, & 4). In the perspective of medico-legal procedure one of the participants from city corporation told that " During Earthquake, to manage the emergency situation they are trying to develop medico-legal procedure for identification and tagging of bodies and develop guideline with the help of both public and private medical authorizes." From the discussion it is clear that for emergency services the coordination among different organizations is not build up yet and lot of initiatives is still pending.



Source: Earthquake Contingency Plan for DCCs, 2009

Map 3: Open Spaces for Immediate Evacuation (Bigger than 100m2 area)



Source: Earthquake Contingency Plan for DCCs, 2009

Map 4: Proposed Locations for Temporary Shelter Camps (Bigger than 25,000 m2 area)

Urban crisis planning (evacuation areas, pre-positioning of essential elements for response & recovery)

From the interview it is experienced that vulnerability assessment of critical facilities (school buildings, theatres etc.) & city buildings are done by RAJUK. Both the city corporations are trying to identify sites for pre- positioning of essential emergency support units (boreholes for emergency water supply, fire hydrants, cutting tools etc.) and execution with the help of the relevant organization. In this perspective P5 participants said that, "We are trying to increase the cooperation among the inter-agencies so that urban crisis planning can make some fruitful result."(Interviewed on 24th September 2017)

From the discussion it is further found that in regards of Revise land use Plans to create open areas within urban areas, create more parks, recreational areas, green areas suitable for emergency evacuations, create essential facilities such as water, electricity both the city corporations follow the revised Detailed Area Plan for identification of open areas suitable for emergency situation. In

spite of the revised detail area plan DCCs proposed some open space for emergency situation. For earthquake emergency situation Dhaka north and South City Corporation identified some evacuation routes and take actions to improve the access to inaccessible areas for Search and Rescue actions. But none of the city corporations have database for resource pool of equipment's & tools (trucks, cranes, dowsers, etc.). In the case of efficient implementation of building codes to integrate earthquake vulnerability reduction they have depend on RAJUK.

Health group (health & emergency medical care)

From the interview it is clear that for health and emergency medical care services both the city corporations are depended on public and private medical both at neighborhood and national level. In the Earthquake contingency plan several things are said to develop by the city corporations like develop alert system for hospital staff including doctors to report for work during emergencies such as earthquakes, setting up triage management system in various city wards and control points, conduct simulations, organize vulnerability assessment of health infrastructure within the city, project teams, setting up 24/7 State of the art ambulance services, train medical first responders within the city and develop a database, conduct hospital emergency and preparedness training programs for city hospital staff, Identify needs for propositioning of medicine, temporary hospitals etc. and obtain the necessary resources, develop networks with hospitals within neighborhood for support during emergencies like earthquakes but nothing are developed by the city corporations.

From the Earthquake contingency plan it is also discover that city corporations have to develop many things like methodology development for epidemic surveillance and control conduct operation surveillance training for all first responder organization for quick mobilization in earthquake events, train community medical first responders within the city and develop a database , methodology development for estimation of casualty and human injury , methodology development for estimation of livestock casualty, establishing counseling centers, continue assistance to authorities in mortuary services(such as identifying dead & missing, issue of death certificates for disposed and inventorying and maintenance of records etc.), follow medico-legal procedure for identification and tagging of bodies, disposal of dead bodies ,conduct evaluations of the level of preparedness & performance during emergency by all hospital and medical institutions, conduct review of the contingency plan for the health cluster agencies and revise to integrate the improvements etc. but yet both city corporations have not taken initiatives about the matters. Only few hospitals names both public and private are enlisted by the city corporations and the city corporations proposed locations of major hospitals and probability of functionality of major hospitals. In this perspective P5 participants stated that, "We are trying to divide the responsibility in Cluster Group including mention the responsible authority name so that all things can be carried out easily and smoothly."

Welfare, food and nutrition

According to the Earthquake contingency plan the main aim of Welfare, Food and Nutrition is to damage Analysis and Need Assessment surveys to identify external needs, ensure provision of necessary essential facilities for displaced after emergencies, provision of food and nutrition , logistic supply to displaced based on need assessment, efficient coordination with UN Agencies, international and local NGOs, Donor agencies to supplement the government welfare assistance to IDPs, Intersection/ Coordination. From the interview it is found that none of the city corporations

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

Planning of utilities (telecommunication, power supply, gas lines, waste disposal etc.)
From the interview it is found that both the city corporations have not yet develop procedure for vulnerability assessment of all essential utilities within the city by utility managers, develop procedure for reporting the readiness of utility managers to activate Contingency Plans in case of earthquakes.

Mass media communications and public information
From the interview it is found that both the city corporations have not yet develop guidelines for media agencies within the city on reporting disaster events like earthquakes, develop procedures for public information dissemination related to city level emergency declaration, announcements & warnings on aftershocks. From the discussion with the participants it is found that they are trying to develop public awareness and advocacy material to support Contingency planning and implementation at city level.

Water and sanitation group
From the discussion with the participants it is found that they are trying to develop guidelines for temporary shelter sanitation management within the city during earthquakes, develop procedure for vulnerability assessment of water supply, sewerage & drainage systems within the city by respective managers, conduct city wide Immunization programs.

Transport group (road, railway, airports, ports & harbor)
From the discussion with the participants it is found that they are trying to develop procedure for conducting vulnerability assessment and reporting by transport authorities within the city. They proposed alternate transport arrangements in case of earthquakes and develop route Maps.

Recovery group
From the discussion with the participants it is found that they are trying to develop guidelines for conducting vulnerability assessment of city authority buildings and all other important agencies are located and facilitate vulnerability assessment against earthquakes, develop guidelines for resettlement planning within the city in case of earthquakes, develop procedures for city level sector based assessment of loss and damage, reserve funds and other resources to undertake restoration of essential facilities in case of earthquakes.

7. RECOMMENDATIONS

Based on the findings of this study the researcher is justified in proposing the following recommendations:

- A new updated, appropriate, complete and detailed earthquake contingency plan should be prepared by DNCC and DSCC.
- More acknowledgements should be obtained by sharing the earthquake contingency plan with the first responders who are responsible for the mitigation of the earthquake disaster.

- The number of manpower should be increased of the first responders' stakeholders' organization to response the emergency situation.
- Modern equipment should be increased and adequate training should be provided on how to operate the equipment during any emergency. Beside this, this equipment should be well maintained by the responsible organization. In addition to this, sufficient space should be provided in the organization so that this equipment can be kept in a well manner.
- Budget allocation should be increased for buying new equipment, for the capacity building of the manpower, volunteers of the responsible organization.
- The number of training, mock drill, seminar, workshop on earthquake disaster mitigation should be increased on regular basis by the responsible organization in the community level which ensure the reduction of losses during any emergency and increase the awareness of the general people.
- Regular coordination meeting should be arranged between the first responders' stakeholders of earthquake disaster. This coordination meeting should be based on multi-tasking and should find out the loophole of the existing system so that more competent organizations will be developed to face the earthquake disaster.
- A detailed database should be developed in terms of manpower, equipment, trainings, vulnerable building, staffs and other information relevant to earthquake should be included in the database. This database should be developed by DNCC and DSCC and make sure it is available for all.
- A 24/7city level Emergency Operation Centre (EOC) should be developed. In addition to this, the capacity of the city level officials for Incident Command System (ICS) should be increased.
- Cooperation should be increased in the urban crisis planning (Evacuation Areas, Pre-positioning of Essential Elements for Response and Recovery).
- The DNCC and DSCC should follow the detailed area plan for identification of open space suitable for emergency situation.
- A special health group (Health and Emergency Medical Care) should be prepared to response any emergency situation.
- A good planning of utilities (Telecommunication, power supply, gas lines, waste disposal etc.) should be ensured.
- A mass media communication and public information center should be developed in ward level.
- Capacity building programs are recommended to facilitate a shift from a reactive firefighting approach to a more proactive culture in disaster risk management. This could be achieved through consultancy, second-men of staff, working with the academia through participatory action research or organizing regional or country level participatory contingency planning programs.
- Disaster Inventory/ Information Management System is to be institutionalized into a simple disaster risk information system/disaster inventory management system in the official administration at the ground level.
- Ministry of Education should develop National Society for Earthquake Technology to implement the Disaster Risk Reduction through School Program in Dhaka City Corporations. The overall goal of the project is to reduce people's vulnerabilities to disasters by contributing towards the implementation of the DRR Framework whereas the objective is to make schools in higher disaster risk area, safer and enabling them to act as a locus for disaster risk reduction

and to engage the education sector in the Framework of Action. Schools are source of education (awareness) and also a tool to make people aware about safety from hazards. Students, teachers, parents and the members of the management committee are the active agents who help widen the outreach of the earthquake safety measures.

- Most of the buildings of Dhaka City corporations does not follow the building code. During design approval they show that they are following the building code but during construction they ignore the implementation of the building code. So that to improve the condition corruption among the inter-agencies should be removed and the building code should be reviewed and updated frequently according to demand.
- Strengthening Risk Sensitive Land Use Planning and Implementation (RSLUP) in DNCC and DSCC

8. CONCLUSION

Contingency planning is comparatively new approach in Bangladesh which can be an important tool in disaster management policy of Bangladesh. So appropriate contingency plan and implementation of the plan should be a helpful tool to make Dhaka City a more resilient community. The study concluded that the frequency of reviewing contingency plans varied from a monthly to an annual basis. This implies that the socio-economic, political and environmental pressures, as well evolving dynamic changes in the scenarios, determine the frequency of review to ensure that the contingency plan remains contextually relevant. The findings have important implications for future research and practice. Contingency Planning is an important aspect for the management of the Earthquake disaster. A simple contingency plan can minimize the losses of all sectors. Different gaps are exists in existing planning system. But solving the existing problem will contribute a lot in the future. By this research a new way is open. There is scope of further research for many researchers.

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