



*A Doctoral Thesis*

*On*

**ASSESSING DISASTER RISK REDUCTION AT  
SCHOOL LEVEL: A STUDY OF DHAKA  
NORTH CITY CORPORATION AREA**

*Submitted to the Department of Geography and Environment, University of Dhaka  
for the fulfillment of the Degree of Doctor of Philosophy*

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# **Assessing Disaster Risk Reduction at School Level: A Study of Dhaka North City Corporation Area**

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## Certificate

I am pleased to certify that the dissertation entitled “**Assessing Disaster Risk Reduction at School Level: A Study of Dhaka North City Corporation Area**” submitted by Md. Abu Sayed to the Department of Geography and Environment under the faculty of Sciences, University of Dhaka as a requirement for Degree of Doctor of Philosophy in Geography and Environment is an original research work carried out by him under my direct supervision and guidance.

I consider that the thesis has reached the standards fulfilling the requirements of the rules and regulations relating to the nature of the degree. I also certify that I have gone through the draft and final version of the dissertation and found satisfactory for submission.

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## **Declaration**

I declare that the dissertation entitled “**Assessing Disaster Risk Reduction at School Level: A Study of Dhaka North City Corporation Area**” submitted to the Department of Geography and Environment, University of Dhaka, for the Degree of PhD is an original work of mine. No part of it, in any form, has been copied from other sources without acknowledgement or submitted to any other university or institute for any degree. Whenever I have quoted written materials from other sources, due credit is given to the sources by citing them. I bear the responsibility views and expressions mentioned in thesis with the exclusion of PhD for any errors and omissions to it.

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Dedicated to  
*all school going students*

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**Md. Abu Sayed**

## ABSTRACT

The present study investigates school vulnerabilities (physical, environmental and social) and level of stakeholders' (teachers, students, guardians, school management committee and school administration) awareness on disaster risk reduction measures at DNCC area. A mixed method approach was adopted while both primary (individual interviews with school heads with a semi-structured questionnaire, FGDs, KIIs) and secondary data (DNCC, Ministry of Primary and Mass Education, BANBEIS and published and unpolished materials) have been gathered. Epicollect5 apps and GIS arc software have been also used for field survey, data storage, analysis and map making. The study wards 20 were selected from a total of 54 wards of 10 zones following stratified sampling techniques. A total of 115 schools were selected randomly from 515 schools (20 primary schools out of 122, 20 English medium schools out of 87 and 75 secondary high schools out of 306). Study findings reveal that a significant number of schools (26%) are located in residential and commercial buildings, among them 44% schools are multistoried (> 6 storied) while 72% schools have single stair with no open space (54%). Around 30% schools were constructed without following BNBC and approval from concerned authority. Study schools are found vulnerable to different hazards (water logging, earthquake, building collapse, fire, environmental pollution etc.). Infrastructural vulnerabilities of the schools include very poor construction of building, poor accessibility to & from school, poor drainage condition, lack of fire compliance etc. Heavy rain induced water logging is common at schools; students face tremendous air and noise pollution and transport related problems while coming to school during rainy season. Highly vulnerable water logging schools are 42% while 23% and 25% schools are found highly vulnerable to fire and earthquake hazards respectively. Poor accessibility (20%), environmentally highly vulnerable (28%), while 85% schools with single exits and no emergency exits; 93% schools having no PWD stairs. Around 27% students do not have access to convenient transport facilities. The study also reveals that 52% of teachers are found aware of emergency number, operating procedure, evacuation route, alarm system, assembly point and first aid as DRR measures. Only 37% students and 16% school management members are aware on DRR. An overwhelming majority (75%) of the guardians are not aware on DRR. Regular awareness program/ mock drills on fire and earthquake are absent. After the year of 2015, most of the schools (92%) did not continue fire and earthquake drills. Absence of proper mindset regarding DRR is also found, while there is lack in preparedness initiatives and no emergency management system and no emergency operation plan in practice in the schools of the studied area in DNCC. Although disaster preparedness knowledge is included in the curricula, there is no legal policy and inadequate training facilities for the teacher and the staff of the schools. Earthquake preparedness exists in schools 51%; fire compliance 26%; drainage management (53%), sanitation level (80%), availability of safe drinking water (73%). The study explores that no structured evacuation and retrofitting system designed for the schools is in place. However, strengthening school safety measures through retrofitting, installation of fire compliance, improving drainage systems, awareness building activities like; regular mock drills, relocation of schools located/rented in residential buildings and ensuring DRR education in the curricula etc. are essentially required to ensure safety and resilience of schools at DNCC area.

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## ABBREVIATION ACRONYMS

ADB	Asian Development Bank
ADPC	Asian Disaster Preparedness Center
AFD	Armed forces Division
BANBEIS	Bangladesh Bureau of Educational Information and Statistics
BBS	Bangladesh Bureau of Statistics
BFSCD	Bangladesh Fire Service and Civil Defense
BNBC	Bangladesh National Building Code
BUET	Bangladesh University of Engineering and Technology
BURP	Bangladesh Urban Resilience Project
BWDB	Bangladesh Water Development Board
CDMP	Comprehensive Disaster Management Programme
DCC	Dhaka City Corporation
DDM	Department of Disaster Management
DDMP	District Disaster Management Plan
DeSHARI	Developing and Strengthening Humanitarian Assistance and Risk
DFID	Department for International Development
DG	Director General
DGHS	Directorate of Health Services
DINB	Dhaka Imarat Nirman Bidhimala (Dhaka Metropolitan Building Rules)
DIPECHO	Disaster Preparedness European Commission Humanitarian aid and civil protection programme
DMC	Disaster Management Committee
DMA	Disaster Management Act
DMB	Disaster Management Bureau
DMDP	Dhaka Metropolitan Development Plan
DMRD	Disaster Management and Relief Division
DNCC	Dhaka North City Corporation
DREE	Disaster Response Exercise and Exchange
DRR	Disaster Risk Reduction
DSCC	Dhaka South City Corporation
DSHE	Directorate of Secondary and Higher Education
DTE	Directorate of Technical Education
ECP	Earthquake Contingency Planning
EPI	Environmental Performance Index
ECHO	European Commission Humanitarian Aid and Civil Protection
EIE	Education in Emergencies
EPAC	Earthquake Preparedness and Awareness Committee
FAR	Floor Area Ratio
FFWC	Flood Forecasting and Warning Centre
FSCD	Fire Service and Civil Defence
GAD3RES	Global Alliance for DRR and Resilience in the Education Sector
GFDRR	Global Facility for Disaster Reduction and Recovery
GoB	Government of Bangladesh
GSB	Geological Survey of Bangladesh
HBRI	Housing and Building Research Institute
HFA	Hyogo Framework for Action
IAB	Institute of Architects Bangladesh
IMDMCC	Inter-ministerial Disaster Management Coordination Committee
INGO	International Non-Government Organization
IPCC	Intergovernmental Panel on Climate Change
LGED	Local Government Engineering Department
MoDMR	Ministry of Disaster Management and Relief
MOE	Ministry of Education

MoEF	Ministry of Environment and Forests
MoFDM	Ministry of Food and Disaster Management
MoHPW	Ministry of Housing and Public Works
MOPME	Ministry of Primary and Mass Education
NAEM	National Academy for Educational Management
NARRI	National Alliance for Risk Reduction and Response Initiatives
NDMAC	National Disaster Management Advisory Committee
NDMC	National Disaster Management Council
NEOC	National Emergency Operations Centre
NGO	Non-Governmental Organisation
NHA	National Housing Authority
NPDM	National Plan for Disaster Management
NPDRR	National Platform for Disaster Risk Reduction
NSMDCIID	National Strategy on the Management of Disaster and Climate Induced Internal Displacement
NWBPPA	Natural Water Body Protection and Preservation Act
PEDP	Primary Education Development Programme
PWD	Persons with disabilities
PWD	Public Works Department
RAJUK	Rajdhani Unnayan Kartripakkha
SDG	Sustainable Development Goals
SFDRR	Sendai Framework for Disaster Risk Reduction
SOD	Standing Orders on Disaster
SOP	Standard Operating Procedure
SSP	School Safety Plan
UDD	Urban Development Directorate
UDMP	Union Disaster Management Plan
UGC	University Grants Commission
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNICEF	United Nations Children's Emergency Fund
UN	United Nations
UNCRC	United Nations Convention on the Rights of the Child
UNISDR	United Nations International Strategy for Disaster Reduction
UNO	Upazila Nirbahi Officer
UzDMP	Upazila Disaster Management Plan
WASA	Water and Sewerage Authority
WHO	World Health Organisation

*Chapter I*  
**INTRODUCTION**

**1.1 General Background**

The earth continues to experience increasing impacts of both natural and man-made disasters. The loss of lives, injuries, economic loss etc. have also increased manifold in the recent years (GAR, 2018). In response to the increasing impacts of disasters round the world, there has been a paradigm shift from response based interventions to disaster risk reduction (DRR) approach in the field of disaster management. DRR emphasizes on systematic efforts to analyze and reduce the causal factors of disasters. It aims to reduce damage caused by natural hazards including earthquakes, floods, droughts and cyclones etc. Attempt to reduce hazard risk, reducing vulnerabilities of both physical, social, economic, wise-use of land and the environment, elevating preparedness and early warning for all sorts of events are all examples of DRR initiatives. However, DRR is progressively reported and established as a major factor in obtaining sustainable development goals by incorporating the risk reduction measures into the development process in a planned manner.

Since 1970s, the idea of DRR started but its practice has been evident since 1990s onward. It has been a gradually larger and deeper understanding of why disasters occur, and what could be undertaken to lessen their consequences. In 1989, the attempt of the United Nations effectively contributed in promoting the concept of DRR internationally as the UN International Decade for Natural Disaster Reduction (IDNDR). Immediate afterward, the first World Conference on Natural Disaster Reduction was organized in the City of Yokohama, Japan in May 1994, expressing the main target of the IDNDR. The conference shared a wider concern for increasing sufferings and damage of development occurred due to natural disasters. Later in 1999, the UN member states adopted the United Nations International Strategy for Disaster Reduction which is recognized as a formal shift from a traditional emphasis on disaster response to disaster reduction through adoption of a culture of risk reduction.

In the following years, some more devastating disasters occurred in Japan, one of which was the Indian Ocean earthquake. In the Second World Conference on Disaster Reduction (WCDR) in Kobe, Hyogo, Japan in 2005, the concern was widely raised by the global community. The WCDR started promoting all different international agencies and national governments for setting up police and targets and commitments for DRR. This is approved formally in the 2<sup>nd</sup> World Conference held at Hyogo, Japan in the Hyogo Framework for Action (HFA, 2005-2015). The HFA narrates the objectives sequentially with five priorities for action trying to cover major areas of DRR interventions. Later in Geneva in June 2007, in the first session of the biennial Global Platform for DRR of the United Nations opened avenue for all countries enlisted in the United Nations to initiate the process. Likewise the successive development of the HFA is the Sendai Framework for Disaster Risk Reduction (2015-2030) adopted in the 3<sup>rd</sup> UN World Conference on DRR in March 2015 in Sendai of Japan.

In the face of world's effective and successive development in the process of promoting and adopting DRR measures, communities globally at different corners of are increasingly emphasizing on disaster risk reduction as a major way of protecting their lives and properties. Meanwhile, ISDR started considering to initiate DRR education and developing management of the schools on DRR to disseminate ways on how societies can be resilient to disasters. In this connection, UNESCO (2007) reported that it is extremely important to anticipate, educate and inform are effective means to lessen the risk as well as the devastating damage of disasters.

In one hand, there has been a gradual development of risk reduction initiatives on earth and disaster risks are increasing rising round the world particularly the schools in the developing countries on the other hand. There has been records to massive destructions of school children and buildings being affected by all major disasters. In 2004, a massive fire incidence caused nearly hundred lives of school children at Sri Krishna Primary School in Kumbakonam of Tamil Nadu, India on 16 July 2004. Around 2000 school buildings were blown down and 6000 classrooms were devastated in the earthquake of Bhuj in 2016. Beforehand, a huge number of (17,000) children were killed and around 2500 school buildings collapsed in Kashmir earthquake in 2005 in both India and Pakistan. Typhoon Linda (1997) damaged over



2000 schools and devastated more than four thousand schools in Vietnam, while a colossal damage took place at a school function in Mandi Dhabwali (India) in 1995. The Great Sichuan Earthquake taking place on 12 May 2008 in China collapsed nearly 7,000 schools of which many were recently constructed and a couple of thousand school children died. In the town of Mianzhu, seven schools were collapsed while the death was around 2000 people. However, round the world, at least 1 billion children aged between 0-14 live in countries with high seismic hazard risks. Millions of them are at risk of different disasters when these children are attending schools.

In 2003, the Government of Bangladesh (GoB) launched the Comprehensive Disaster Management Programme (CDMP) as part of the international agreement and effort to initiate risk reduction measures at all levels. Accordingly the existing policy instruments of the country including plan for disaster management, standing order on disasters etc. have been being updated for their effective implementation towards risk reduction and enhancing resilience.

Like all different sectors, initiating DRR at school level is considered as a systematic approach to include analyzing all disaster risks and risk reduction activities in education sector. However, schools hosting the most important stakeholders are reported to be the priority of the country in terms of resilience building through adopting all DRR measures. Therefore mainstreaming DRR into school curricula is targeted to enhance awareness and support all stakeholders involved in schools (children, guardians, teachers, school management committee, and school administration) with effective means of lessening any disaster risks at schools. However, it has been widely recognized in the country that all involved in school education are increasing becoming aware and interested to promote DRR interventions at schools which are likely to disseminate and enhance awareness among all the communities.

## **1.2 Problem Statement**

UN (2014) reported that over 6 billion people will be living in the urbanized region. This is how, cities are increasingly becoming the most desired places for living for the majority of the population. It is also reported that rural to urban influx has been playing a vital role in this regard (Stott and Nadiruzzaman, 2014). One of the major challenges for the cities of particularly third world countries is providing supports to

the children in terms of their quality educational environment. Bangladesh, a country with less than currently 40% level of urbanization has been struggling to provide housing facilities to the city dwellers. Meanwhile it has been upgraded from low income to middle income country (Raihan, 2016). In addition, it has been a huge challenge to ensure safe and sound school education in the city given its rapid growth of human population and thereby loss of open spaces.

In addition to rapid urban population growth, Bangladesh has to struggle to continue its development with existing enormous natural calamities. The country being located in the floodplains of the three major rivers the Ganges, Brahmaputra and Meghna is highly vulnerable to various natural hazards, such as- cyclone, flood, riverbank erosion, drought, landslide, etc. Millions of people have been living in the remote rural areas with the risk of such disasters (Shaw et al. 2013). The country has already been identified as one of the top most disaster prone countries on earth, while it ranked 5<sup>th</sup> in the top fifteen countries as reported in Shaw et al. (2013) and Rahman et al. (2016). The country had faced a total of 225 disasters within last two decades and nearly 10 disasters occurred in the country on an average (UNICEF, 2010; BBS, 2016). Another report by UNICEF (2010) reveals that during 1970-2009, the country had lost over half a million people including men, women and children. On the other hand, climate is becoming gradually a rising concern that is reported to trigger the occurrence and frequency of the natural disasters in Bangladesh.

In Bangladesh, two major natural disasters flood and cyclones have already severely affected schools. A significant number of school buildings in the city of Dhaka do not comply with fire incidence and other disasters due to lack of many things, one of which is insufficient open space. A huge number of schools in the coastal region were devastated in the cyclone of 1970 while a total of nearly half a million people were killed. Later in 1991 (April 29), another devastating cyclone caused deaths of around 140,000 people and 9,300 schools were destroyed. In addition, in the flood of 2007 in Bangladesh, a total of 50,000 educational institutions were damaged in ten years (2000-2010), while altogether a total of 13,000 educational institutions experienced fully or partially damaged (UNICEF, 2010). In the floods of 1998 and 2004, a total of over 13,718 and 17,853 schools were partially affected or fully damaged respectively (ECHO, 2010). The 2007 cyclone *Sidr* and associated floods caused around 4,000

deaths and a total of 13,362 schools were fully or partially affected. Nearly 95% of schools experienced some level of impact and around 84% of schools were closed for an average of 26 days; about 65% of schools were used as shelters for cyclone affected people and 35% of schools were used to accommodate community members. In 2009, as a result of cyclone *Aila*, around 5,000 educational institutions were damaged. This alternative use of schools resulted in a 3% school drop-out (Save the Children, 2017; Alam et al. 2010).

Dhaka, the Capital City of the country hosts more 20 million people. It was 11<sup>th</sup> largest megacity in 2000; 10<sup>th</sup> in 2007; 6<sup>th</sup> in 2010 and has already been the 3<sup>rd</sup> largest megacity of the world since 2020 (Islam, 2005; World Bank 2007; UN, 2008). With rapid growth of population the city embraces increasing disaster risks (flooding/water logging, earthquake etc.) and the city has already experienced massive disasters in the past particularly floods in 1988, 1998 etc. as it expands due to unplanned and unregulated urban expansion. The city suffers from drainage and stagnation of rainwater, leading to flooding/water logging during monsoon. City dwellers are under threat of fire, earthquake and infrastructure collapse. Dhaka experienced destructive flooding events in 1987, 1988, 1998 and 2004 mainly due to excessive rainfall (FFWC, 2004). In 1998 flood, nearly 300 relief camps were set up in Dhaka, most of which were established in educational buildings especially schools (Alam et al. 2010; Islam, 2005; Ahmad, et al. 2000). The number of days school closure (flood or water-logging situation in Dhaka) is 10-12 in primary school, 5-7 days in secondary school and 3-4 days in college (MoPME, 2017). Students were displaced from their schools for a period of 10 to 12 days and thus teaching hour reduction in school is 60- 90 hours per year approximately.

Dhaka Megacity like the rest of the country is also prone to various hazards (both natural and man-made), such as- earthquake, fire, infrastructure collapse, flood/water logging, severe environmental pollution (e.g. water, air and noise pollution etc.). Among them earthquake is very alarming that has been one of the main contemporary topics of environmental issues of urban Dhaka. This world populous mega city is growing through unplanned urbanization and industrialization. At present, population growth rate of this city is 6% and density is 23234 per sq km. People are experiencing complicated problems through various pollutions and disaster. This city is under high risk threat from earthquake disaster.

Dhaka has also been recognized as one of the most vulnerable cities on earth. The Stanford University, California has identified Dhaka among the 20 most vulnerable cities on earth. A low to moderate level of earthquake might have severe destructions to the city dwellers and the situation might go beyond the capacity of the city corporations to tackle the devastation. In December 2001, an earthquake with magnitude of 4.5 and focal depth of 10 km located very close to the city of Dhaka resulted in the collapse of a four storied building and 100 prisoners injured in the central jail of Dhaka. Rana Plaza tragedy happened in 2013 near at Dhaka (Savar) caused more than a thousand people's death, while many institutions (Bangladesh Army, Fire Service Civil Defense etc.) struggled in the search and rescue operation. This incidence can be considered as an indicator of the existing capacity of the city to deal with disasters.

It is also widely discussed in Dhaka that in the occurrence of an earthquake during day time, when children are at schools might be worse affected and injured. School properties are expected to be badly disrupted. Moderate earthquakes can cause serious damage to the existing physical infrastructure, huge damage to other stakeholders staying at schools and ultimately disruption is evident in the operation process. On other hand, major earthquakes will certainly cause devastating damage, such as structural collapse and huge loss of lives. The reasons of death in a school to earthquake may include, absence of awareness among students, teachers, school authorities and guardians, lack of emergency plan for school safety at pre, during and post-earthquakes, lack of regular awareness programmes at school level such as lessons or mock drills in the schools, possibility of more loss of lives during on-going classes. In 2011 earthquake and tsunami of Fukushima in Japan, a total of 3000 school children of elementary and middle-high schools managed to evacuate safely (Mimura, 2011).

In addition to all infrastructures, school buildings of Dhaka City are the most vulnerable to earthquake, fire and other disasters due to very faculty construction, absence of regular and effective maintenance. As mentioned earlier, with rapid population growth in Dhaka, there has been a huge demand of schools for children. Therefore in order to support the enormous number of children, schools are being established elsewhere by the concerned government ministry. On the other hand,

private schools are also rapidly constructed to offer school education to the children for profit maximization. In most cases, these schools are constructed maintaining no safety compliances in an unplanned manner. This is how, fire incidence in these schools, threat to road accident and stampede have been very common.

Schools located in the rural areas of Bangladesh are also having many other disaster risks but there is a common risk between urban and rural schools which is the absence of culture of safety in schools to ensure minimum standards or measures to safeguard students and teachers from any natural or man-made hazard risks, teaching equipment and property. Culture of safety in schools includes children's right, DRR related education policies and overall very supportive and friendly atmosphere of education in the school ultimately to lessen the consequences of any possible risks to children. As a result, the school children are progressively having risks not only from natural disasters but also from other sources.

There has been record of how schools have been impacted in disaster events in different parts of the world. For example- in Haiti earthquake in 2010, around 4000 schools were destructed, while in Nepal earthquake in 2015, more than 27,000 classrooms were fully damaged (Paci-Green et al., 2015). Cities along with Dhaka have also had such experiences in different disasters as mentioned earlier. In the recent monsoon flooding 2016, more than 1500 schools were severely affected in northern Bangladesh. More than 300 schools were made flood shelters in 1998 flood in Dhaka, while the schools faced tremendous devastation during this flood. Dewan (2015) reported that damages happened to public buildings such as- hospitals, educational buildings, and significant cultural sites may lead to further consequences. The disruption to education ultimately influences to disruption of all academic sessions leading to even drop out from the schools compounding the problem of low literacy. Another study by the Save the Children (2010) reported that nearly 5000 schools in Bangladesh are impacted by different disasters every year (PEDP 3, 2015).

As mentioned, Bangladesh has produced the National Plan for Disaster Management 2010-2015 and later updated for 2016-2020 in which a paradigm shift in disaster management from traditional response and relief practice to a more include risk reduction culture has been introduced (DMB and Relief Division, 2010). In addition, the National Adaptation Programme of Action (NAPA) addresses the incorporation of

climate change issues in the secondary and tertiary curricula (Ministry of Environment and Forest, 2005). However, the National Education Policy of 2010 emphasizes the development of students' awareness so that they can exploit opportunities to learn issues concerning climate change and both natural and social environment (Aktar, undated).

However, considering immense risks of schools given the rapid rise of human population, it is extremely important to initiate disaster risk reduction measures in the schools for study on DRR in schools of Dhaka to ensure a complete safe school for the children and ultimately for the future of the country. Keeping the importance of children as the future for our society, schools need to be prepared for disseminating knowledge on DRR in one hand and the school buildings where children spend a significant time need to be made safe for them. Though many interventions are proposed in the different policy guidelines in Bangladesh, school safety and preparedness are still in the form of choice not as a much-needed requirement for schools in the country. Given this situation, undertaking effective risk reduction measures through investigating the vulnerabilities (physical/infrastructural, social, environmental etc.) of schools at Dhaka is almost absent. Therefore, it is pragmatic to investigate/explore disaster risks at schools in Dhaka and thereby to adopt risk reduction measures to ensure resilient school education in the city.

### **1.3 Research Questions**

- To what extent, the schools of Dhaka North City Corporation area are at risk due to various disasters?
- What is the level of key stakeholders' (students, teachers, school management committee, administration etc.) awareness of the disaster risk reduction?
- How can risk reduction measures be effectively initiated to ensure resilient school education in DNCC?

## **1.4 Research Objectives**

### ***1.4.1 Broad Objective***

The study is an attempt to investigate school vulnerabilities (physical/infrastructural, environmental and social) at Dhaka North City Corporation area and to evaluate possible risk reduction measures as perceived by stakeholders (students, teachers, guardians, school management committee, and school administration).

### ***1.4.2 Specific Objectives***

Keeping in the mind state of the problems the main objectives of the study are as follows:

- To identify and evaluate vulnerabilities (physical/ infrastructural, environmental and social) of schools at DNCC area.
- To assess school stakeholders' awareness/ perception on disaster risks at schools and
- To evaluate disaster risk reduction measures at schools as perceived by stakeholders.

## **1.5 Chapter Organization**

This research paper consists of seven chapters. The first chapter highlights the introduction of the research with contextual background, research problem, research questions and objectives of the study. Relevant concepts and issues are presented in the second chapter was concern with the prior research in this field that combined the theoretical state of the field and the analytical framework. Chapter II is basically a review of the existing state-of-the art on DRR, school safety issues from global to local contexts and also highlights the impacts of major disaster events on schools in different geographic regions especially in Bangladesh and Dhaka. Chapter III describes the study area, selection process of the study schools using scientific and justified sampling methods.

Chapter IV presents a brief discussion of findings of DRR at school from the expert interviews in study area. The key statements from the interviews are analyzed based on each interview questions in this chapter. The analysis of the expert interviews as well as the literature review are integrated and discussed based on the findings. Chapter V deals with the awareness on DRR of school stakeholders of the study area

while chapter VI deals with preparedness measures on DRR of school stakeholders and institutions. Finally, chapter seven presents the conclusions and recommendations based on the findings and also suggests for further research.

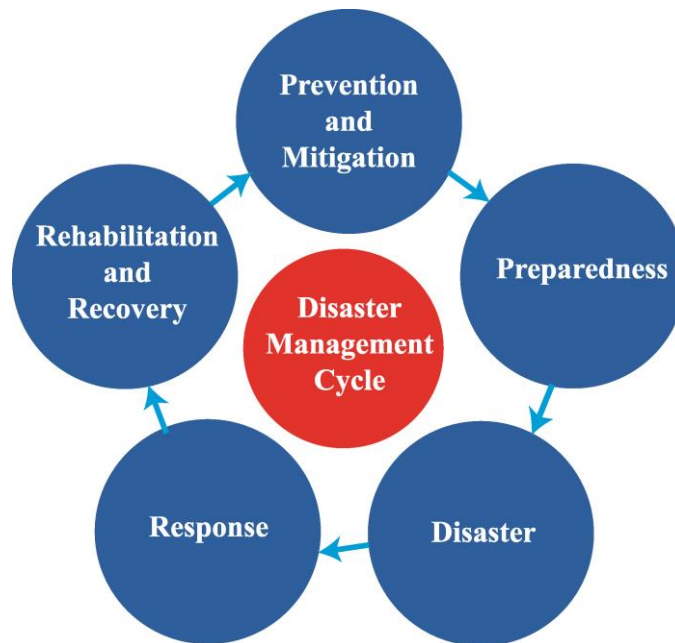


*Chapter II*  
**LITERATURE REVIEW**

The following section presents conceptual aspects of disasters, disaster risk reduction approach and its evolutionary development on earth and Bangladesh, the existing hazard risk in Dhaka City and more specifically in the school buildings and the need for a comprehensive school safety through initiating disaster risk reduction interventions in schools of Dhaka North City Corporation area along with other areas.

**2.1 Hazard, Disaster Risks, Vulnerability and DRR**

Hazard is a potential threat or latent condition that can cause a disaster while disaster is defined as an event that has taken place and has caused severe damage to lives and properties (UNISDR, 2009). It also hampers the regular functioning of a community or a society while the need for external support is extremely required since the community with its available resources cannot overcome the situation. There is a close relationship among the terms hazard, vulnerability and capacity. There is practically no communities on earth without natural hazard risks but at the same time people have adjustment capacities of varied levels. Communities at different geographic contexts are habituated with disasters using available resources and indigenous knowledge and if possible available technologies. As mentioned in the previous chapter, communities round the world have been facing natural disasters and somehow coping with them but traditionally they used to depend on nature's toll. They used to wait for the disaster to happen and if affected, in the post disaster period tried to rehabilitate and restore their livelihood, infrastructure, settlement etc. Since there has been a shift in the paradigm from response based disaster management to risk reduction culture (as shown in Fig. 2.1, communities are to enhance preparedness in all relevant sectors to better and effectively withstand disasters.



**Fig. 2.1: Disaster Management Cycle**

Risk refers to the probability of impacts to a specific hazard (UNISDR, 2009). As mentioned above, communities living in any geographic contexts are with hazard risk in terms of their lives, health, livelihood, properties and overall human environment.

Very often risk denoted with the following equation:

$$\text{Risk} = \text{Probability of Hazard} \times \text{Degree of Vulnerability.}$$

In other report, UNISDR (2017) defines risk as the potential threat of life, serious injury, economic loss and environmental degradation. Risk depends on existing hazards, communities' exposure to the hazards and finally existing capacities of the people.

In order to understand risk, the most important aspect is to conceptualize vulnerability. IPCC (2012) defines vulnerability as the susceptibility to be adversely impacted. The characteristics and real conditions are described in vulnerability assessment. As mentioned, the various characteristics of a community including social, economic, physical, environmental etc. influence the community positively or negatively. Vulnerabilities can be of different types, such as- situational or inherent, social, economic, emotional, physical or infrastructural and environmental. In the

following section, an introduction of the concepts of different vulnerability is presented.

- a. **Physical Vulnerability:** determined by various aspects including population density, type and structure of settlements, building design, and materials used, site condition, accessibility etc.
- b. **Social Vulnerability:** includes different characteristics of human beings of the communities, such as- demographic characteristics, interaction among people, social capital, networks, social resources, association etc. All these characteristics influence the level of people's vulnerability.
- c. **Economic Vulnerability:** Economic aspects and characteristics of the community are very important in denoting people's vulnerability. Livelihood pattern and status, access to resources, income and sources etc. influence the impact of a disaster. People having different alternative livelihood options are better adapted to natural disasters than people having only one source. Access to resources is extremely important for communities to withstand disasters.
- d. **Environmental vulnerability:** existing state of environmental components, resource degradation etc. are the major features of environmental vulnerability. In case of disaster risks, the existing state of water bodies, vegetation cover, soil condition etc. also influence the susceptibility to hazards.

**Vulnerability Assessment:** Very often assessment of vulnerability of community to natural hazards is required to evaluate risks and later proposed disaster risk reduction.

**Disaster Risk Reduction (DRR):** The concept of DRR and its propagation has been presented in the very first chapter. The major focus of the concept is to enhance preparedness of the communities and early warning systems which ultimately targets in enhancing societal resilience (UNISDR, 2009). In order to promote DRR interventions, there is an urgent need to integrate stakeholders at different levels. The grass root level users or community are the primary stakeholders. Agencies or institutions involved in local level disaster management and other service providers are the secondary stakeholders. Therefore DRR involves all relevant stakeholders and their activities to reduce losses of disaster risks prior to the occurrence of any natural

disasters given the social, economic, environmental and political fabrics. It is also defined in other ways, for example- it is a systematic approach to include disaster risk assessment and risk reduction measures in a planned manner. The ultimate goal is to lessen disaster impacts. As mentioned earlier, DRR allows or gives opportunities to the stakeholders to initiate preventive or mitigation measures prior to the occurrence of disasters and therefore it is widely recognized and proved that it involves significantly less expense than to respond to disasters in the post disaster phase.

The term resilience is intended to refer to the capacity of the community to quickly recover from disaster, better withstand and to get back to the previous state after any disaster strikes (IPCC, 2012). The concept of DRR and resilience is more or less tied in the same direction. DRR measures not only lessen the impact of disasters but also enhance the level of community resilience. In the current world, to effectively withstand disasters, the most important focus is to reduce risks and enhance community resilience.

**Adaptive Capacity:** The communities living round the world in any disastrous conditions are inherently adaptive and therefore they are accustomed to those conditions. To some extent, adaptive capacity of communities refers to how they cope with adverse situations (Smit and Wandel, 2006). Adaptive capacity is influenced by the characteristics of the communities.

## **2.2 School and Related Aspects**

School can be characterized as an institution, a building, a community or a public establishment where a group of teachers and students learn together at a given time. School communities include people involved in teaching-learning activities: students, teachers, education practitioners and all concerned. In the present study, school stakeholders refer to stakeholders including teachers, students, school management committee, guardians and school administration interested in both school communities and community institutions surrounding the school.

On the other hand, school preparedness refers to activities and measures undertaken before the occurrence of any disasters and to ensure schools' safety. In this case, school safety measures round the world are carried out to enhance awareness among the key stakeholders (for example- students, teachers) and to prepare them to better

handle any disaster shocks. There are exceptionally effective examples from some nations like; Japan, China etc. School preparedness is highly prioritized in disaster risk management.

### **2.3 Evolution of DRR**

It has been stated earlier that DRR is intended to allow adoption of strategies and practices by all relevant stakeholders including concerned institutions to dwindle risks but those activities are required to be accomplished in a systematic manner. The term is defined by UNISDR (2009) to refer to a systematic application of the relevant and required policies, actions and practices to minimize community's exposure to hazards. In other words, it is also intended to address people's vulnerabilities and thereby to undertake actions or effective interventions (DFID, 2005b).

DRR has been promoted since long back even the initiation of risk reduction activities in Japan in 1990s. Publications of the 1970s and early 1980s used to focus the limitations of post disaster response based interventions and started promoting vulnerability approach to disasters and emphasized that disasters are natural and normal in their occurrence but the impacts are influenced by the social fabric. Wisner et al. (2004) reported that disaster risks were seen from the social framework on how the society was affected by natural disasters rather putting less importance on the social environment. This is how global communities are becoming more vulnerable with increasing impacts and losses due to disasters. It is true that the existence and frequency of occurrence of natural disasters remain constant but human actions play role in triggering the occurrences. In this connection, UNISDR (2002) reported that disasters losses depend on a number of factors, such as- development culture, environmental conservation, growth of cities and how people and wealth are distributed and finally the structure of the government. In the current world, due to immense development of information system and globalization, disaster information and impacts get rapidly spread all over the world. This is how, there has been a growing importance on the need for comprehensive risk reduction approach and gradually the endeavor to reduce disaster risks and losses by strengthening preparedness round the world was being promoted in the late 1980s (UNISDR 2010).

As a result the widespread and gradual promotion of DRR, in the last couple of decades, it has been able to achieve a huge recognition from round the world, given

the increased loss and damage of human lives and economy (properties) caused due to the impact of natural hazards and through the evolution of the international attentions on DRR (Yodmani, 2001). The conception of the DRR is reported to vary (Twigg, 2007) but the general conception is established among stakeholders from all levels that DRR refers to the application of the existing policies and strategies given nation's social, economic and political framework to reduce disaster losses and enhance societal resilience (Matsuoka, 2013). At the same time, a number of literatures supported DRR as an accelerated paradigm shift from response based disaster management to risk reduction in different parts of the world (Shaw and Okazaki 2004, Yodmani, 2001). Twigg (2007) emphasized that all DRR issues might be addressed by a single institution. In 2006 in the City of Jakarta, Indonesia, there had been a review of the role of education and know-how in DRR (Wisner, 2006). Good practices were all examined on how they could effectively contribute to risk reduction in schools, while it looked into the issues critically and strategically highlighting on how gaps and opportunities are identified while providing the background for future new ideas on DRR and schools. In addition to various sectors, school DRR has been being promoted by different organizations. Meanwhile, Action Aid started promoting DRR in schools through promoting community engagement and action in seven countries most of which are in Africa but includes South Asian countries including Bangladesh, India and Nepal. Around the same time in 2006, a very effective and focused campaign entitled disaster risk reduction begins at schools was also initiated by the ISDR secretariat, Geneva by promoting teaching and learning on disaster risks at schools and improving school safety.

However, all required tasks to promote DRR include reduction of people's exposure to natural hazards, dwindling vulnerability of community and property, ensuring wise-use or optimum exploitation of land and the environment, and upgrading/elevating preparedness and early warning for any worse/adverse conditions. However, it is to be noted that the concept of DRR is initiated with broader domain while encompassing governance, technical, education and awareness, infrastructure, mitigation and preparedness issues (Shaw et al. 2013). It was also discussed in the beginning that DRR has been being promoted through different world conferences that took place in Japan, while putting five priorities for action (a) ensuring that disaster risk reduction is a country's national and a local priority with a strong institutional basis for

implementation; (b) identifying, evaluating and monitoring various disaster risks and strengthening early warning system; (c) exploiting know-how, innovative ideas and education in constructing or establishing a culture of safety and resilience at various levels of the country, (d) lessening the intrinsic risk issues; (e) improving and strengthening disaster preparedness at different phases for effective responses.

#### **2.4 Research on Disasters and School Safety**

As mentioned in the early sections on gradual development and promotion of DRR in schools, a couple of studies assessed the state of disaster preparedness in schools. Ozman (2006) examined as to how school authorities and teachers are prepared for an earthquake-related disaster impacts at schools. The study mainly evaluated different aspects of schools related to DRR, such as- planning, conveniences and equipment, implementation, and integration and culture building. The study also recommended to promote awareness among stakeholders on mitigation, creation and practicing a disaster prevention culture, regular organization of awareness training programs, introducing and developing course contents on preparedness, mitigation and risk reduction in the school curricula, while supporting school executives and teachers towards school safety.

Bastidas and Petal (2012) reviewed the existing reports on school safety from more than eighty countries to evaluate as to how schools carry out drills, to find out present concerns and issues while providing effective suggestions. They also suggested that the school personnel and authorities need to be actively responsive to the disaster management at schools and also recommended (a) availability of continuity plans in disasters, b) organizing regular disaster management or safety committee meetings, c) regular maintenance of school buildings and its ambient areas, d) deal with expected disaster losses and impacts, e) concentrating on developing school stakeholders' skills, and f) at least a couple of simulation drills every year. In this connection, from about thirty countries, disaster risk reduction curricula in schools have been examined by Selby and Kagawa (2012). Assessing students' perception on disaster risks and DRR aspects, teaching staff's professional capacity has been suggested by them. But Petal (2009) reported that the educational endeavors round the world so far have not been systematically examined and the impacts have never been scientifically assessed.

Another report by UNESCO and UNEP (2004) emphasized the significance of school safety highlighting that need for an improvement and safe construction of the schools which should be resilient to disasters. It also stated that safer schools save lives and can contribute to disaster management if used as shelters during disasters. The report is absolutely applicable for Bangladesh contexts as schools frequently experience being used as shelters in different disaster prone regions, such as- cyclone shelters in coastal area, flood shelters in flood prone region etc. However, all the existing literatures support the need and emergence of making schools safe for future generations.

## **2.5 Theoretical Framework**

The present study undergoes a theoretical framework as to how school children's vulnerabilities and risks of all possible hazards are identified and examined. The risk status of the school children can be described by drawing ingredients from social vulnerability theory, while it looks into the exposure to different natural hazards that might be triggered from a mixture of socio-economic, and political factors. All these factors are likely to expedite the level of vulnerabilities among various communities, groups and individuals in disastrous (Hewitt, 1983; Lewis, 1999; Phillips, 2015; Wisner et al. 2004; O'Keefe et al. 1976). It is also extensively argued that it is social characteristics of the communities that influence the magnitude of risks and their preparedness and risk management capacity as well (Hewitt, 1997; Wisner et al. 2004).

## **2.6 Disaster Preparedness at Schools from Global Perspectives**

School preparedness initiatives have been carried out since the adoption of the Sendai Framework for Disaster Risk Reduction (SFDRR). It targets to improve disaster resilience of both public and private investments through both structural and non-structural DRR measures particularly in critical services (schools and hospital infrastructures. It mandates on stronger buildings as to how they withstand devastation from disasters through adequately effective and proper building design and construction including standardization of building materials; retrofitting and rebuilding; upholding a culture of maintenance; and taking into account socioeconomic, structural, technological and environmental impact evaluations. In the following periods, the spirit of the SFDRR has been promoted effectively in different



regions of the world, such as- India, Thailand, Bangladesh etc. focusing on how school children can be made safe at schools while making school infrastructure a safe and resilient one to disasters. At the same time, establishing rights to school children has also been a prime focus of many current efforts.

### **2.6.1 Initiatives on School Safety**

With a view to promoting well-coordinated interventions on global school safety, the UNISDR established in 2000 later named as UNDRR has been facilitating many member states for DRR and resilience in the education sector which is widely known as GAD3RES. As part of this endeavor, this institution coordinates an international initiative for ensuing school safety as global umbrella program. The partnership programs include safe school initiatives to promote resilient educational facilities, school disaster management (SDM) and DRR and resilience education. Under this global initiative, countries round the world are committed to develop strategies and implement school safety compliance. In this connection, in order to share success of this initiative, the Government of Turkey has already hosted the first meeting on safe school leaders in 2014 in the City of Istanbul.

Inter-Agency Network for Education in Emergencies (INEE), an international NGO which is widely known as a global, open network of non-governmental organizations, agencies of the United Nations, donors, practitioners, researchers and individuals deriving from affected communities is playing a very important role in ensuring right in the education sector specifically in emergencies and post crisis recovery process. INEE has developed global minimum standards for Education in Emergencies based on a broad and consultative process that all individuals – children, youth and adults – have a right to education during emergencies. Moreover, since 1995, the Asian Disaster Preparedness Centre (ADPC) under the Asian Urban Disaster Mitigation Program (AUDMP) has been promoting necessary activities in school safety and has experienced of conducting such initiatives in Nepal and Indonesia with some national level institutions.

#### **2.6.1.1 One Million Safe Schools Initiative**

UNISDR in collaboration with some other acclaimed institutions like; WHO, UNESCO, UNICEF, World Bank and ADB has been implementing one million safe school program since 2010. The major focus of the initiative is to reduce all

risks/threats at schools and vulnerabilities of school children and ultimately to improve preparedness to ensure school safety and resilience. This UN campaign has widely been recognized and has been able to draw attention of many nations to undertake their own strategy for implementation at schools.

#### **2.6.1.2 Comprehensive School Safety Framework (CSSF)**

The CSSF is intended to cooperate to arrange for climate resilient and disaster risk reduction at schools and also focuses on development and humanitarian interventions in education sector. The aims of the CSSF are to safeguard school children and education workers from any harm, death and injuries at schools; to make effective planning for educational continuity in disasters; to protect education sector investments and to improve climate smart and disaster resilience through education. The framework having three important pillars (ensuring safe learning facilities, SDM, DRR and resilience in education) is being addressed by education sector of the nations and is aligned with disaster management at various levels.

#### **2.6.2 DRR Initiatives in Education: Asian Perspectives**

It was mentioned earlier that disaster risk reduction initiatives have been being adopted in country's education sector in addition to others of different regions. In Asian region, countries adopting DRR and resilience include Indonesia, the Philippines, Lao PDR, India, Nepal, Pakistan and Sri Lanka etc. All these countries have already developed disaster risk management plan and incorporated in the education sector. In India, the Central Board of Education has initiated disaster management course in the school curricula (UNCRD, 2008). All concerned with education sectors are being trained under the board. In Pakistan, communities are being supported by DRR projects since 2010 through undertaking vulnerability and capacity assessment at schools, community and local levels. Moreover, school based students' club being set up has been promoting awareness very effectively.

Nepal is an earthquake prone country that experienced tremendous devastation in 2015 earthquake. Schools of various levels face risks of earthquakes there. Keeping in mind the immense threat of earthquake risk at schools, saving lives of children and protecting school buildings have been a key focus of the comprehensive school safety framework. The country is working to ensure safety to all stakeholders at schools

under this framework. Leadership creating for school safety is being focused, while awareness raising on potential disaster risks and dissemination of information are also given due attention. In case of Sri Lanka, it is much ahead in education sector. It has developed a program on school based disaster risk management as part of the country's program entitled education for social cohesion during 2005-2010. The program is further intended to implement a number of initiatives (developing school curricula for disaster risk management, training of teachers, establishing a culture of safety, etc.) to promote DRR in education and schools. Knowledge and awareness campaigns are being regularly conducted for community and school stakeholders to enhance awareness and coping capacity. Moreover, training for teachers in elementary schools, primary and middle schools, delivering DRR knowledge and improving teaching approaches are also emphasized.

## **2.7 Natural Hazards and Disasters in Bangladesh**

Bangladesh with an area of around 148,000 km<sup>2</sup> ranks fifth in the top fifteen countries on earth with highest disaster risks (Rahman et al., 2016; Shaw et al., 2013). The country has been identified as six most natural disasters prone among 173 countries on earth (BBS, 2016). Just above 30% people live in the urban areas of Bangladesh with at least 40% of the total people living in miserable conditions. However, the following section presents a brief overview on the major hazards in Bangladesh. The country is highly prone to a number of natural calamities occur on regular basis. Flood and cyclones are the two regular natural disasters that hit the country and making a wide disruption to education sectors. In addition, riverbank erosion, drought, landslide, tornado, earthquake etc. are also prominent natural hazards in the country. All these natural disasters put communities at different geographic fabric into prolonged vulnerability threats (McEntire, 2001; DFID, 2005b; UNISDR, 2004a; UNISDR, 2004b). The country has experienced a number of devastating disasters (particularly flood and cyclones) in the past while millions of people had suffered. The following section presents some of the major hazards and risk reduction measures that are adopted in Bangladesh.

***Tropical Cyclone:*** As reported in various literature and statistics on natural hazards in Bangladesh, tropical cyclones are the most destructive natural calamity whilst floods are ranked as the second most devastating in terms of the number of deaths recorded

in the past incidences (Asgary and Halim, 2011; Shimi et al. 2010). The very geographic characteristics play a very supportive role in the occurrence of these natural catastrophes. The funnel shaped coastal region is highly supportive to cyclones and floodplains for recurring floods every year (Chowdhury, 2002). The country has faced nearly 200 severe cyclones with wind speeds of around 90km per hour that were formed in the Indian Ocean during 1891-1998, while a total of 38 severe cyclones destructed the coastal areas in Bangladesh from 1970 to 1998 (Alam and Collins, 2010). Some of the super cyclones that hit the country severely occurred in 1970, 1985, 1991 and 1997 (Khan, 2008). Another disaster named tidal surge associated with cyclone cause major devastations to human lives and properties (Alam and Collins, 2010). It was mentioned earlier that the cyclone 1970 was reported to kill half a million people while 1991 cyclone caused deaths of one lac forty thousand people (Chowdhury, 2002). In the recent past, a number of cyclones destructed the coastal communities, such as- *Sidr*, *Aila*, *fon*i, *bulbul*, *mohasen* etc. while millions of people were destructed and physical infrastructure including school buildings were devastated.

**Floods:** Bangladesh is well known to the world for being a highly adaptive country to flooding events. There are records of floods in the country since 1954. Flooding is the most frequent hazard resulting in heavy economic tolls on people and the national economy. Between 1972 and 2009 the country faced 10 major floods. Since 80% of the country's land is floodplains, every year these areas experience floods and millions of people have been adjusting with the prolonged flooding events (Chowdhury and Ward, 2004; Hossain, 2003). Though flood occurs every year, the intensity varies to a great extent but it is rising over time (McClean and Moore, 2005). Literatures reveal that nearly one third of the country's land experiences flooding events for about 5 to 7 months in a year (Islam, 2005), while one fourth of the lands is inundated during the monsoon season (Chowdhury and Ward, 2004; Hossain, 2003). Bangladesh experienced nearly 30 major floods during the past 50 years, of which 11 have been identified as destructive and 6 as the most devastating (Chowdhury and Ward, 2004). Major floods in the country that occurred are floods of 1987, 1988, 1998, 2004, 2007 (Khan, 2008). In 2017, nearly 8 million people experienced severe flash flooding incidence in north-eastern *haor* of Bangladesh (Sumiya et al., 2019). Bangladesh experiences four types of flooding events, of

which, river flood and rainfall induced flood is more common. Areas closely located to large rivers annually experience flooding events. Coastal region being located mostly at only 3 meter elevation from the sea level is highly vulnerable to storm surge induced floods. Besides, the urban areas (e.g. Capital City) experience severe stagnation of rainwater, leading to flooding and water logging during the monsoon season (FFWC, 2004; Dewan et al. 2007). A significant part of the total population of two big cities (Dhaka and Chattogram) are highly vulnerable to severe urban flooding. The most devastating and long term damage of floods is reported infrastructural damage, while millions of school children are the worst victims of floods in Bangladesh.

***Flood Risk Reduction Measures:*** Flooding and erosion of land and human settlements along the major river systems are endemic in Bangladesh and displacing hundreds and thousands of people from their land and homes, and creating a cycle of poverty and landlessness as a result of this dislocation, destruction of homes, and assets (Halli, 1991 and Rogge, 1991). Given the country's high vulnerability to floods, management interventions are very important in overall development of the country (Hossain and Kolsteren, 2003). Thomson and Tod (1998) reported that in Bangladesh, initiatives from all levels are very active and effective. Mitigation of floods in the country has been being widely emphasized since long in the aftermaths of the devastation floods. Mitigation measures mostly in the country encompasses structural interventions as Bangladesh experiences the highest population density in the world. Thousands of kilometers of embankment have been constructed to protect community's settlements, agricultural fields etc. (Huq and Alam, 2003). Historically the Bangladesh Water Development Board (BWDB) has been constructing flood control embankments and various other kinds of infrastructures in high-risk areas. In addition to embankments, the entire coastal communities are protected with polders of thousands of kilometers. Risk reduction from floods also includes plinth raising of homesteads as structural measures (Laska, 1991). Safeguarding infrastructural sector is one of the major focuses of food risk reduction in the country, while education sector is a dominant one. Thousands of schools located in very low lying flood plains are highly vulnerable to floods, while school buildings are often opened as shelter centres for rural communities.

**Landslide:** Landslides are reported to be usually triggered due to heavy rainfall in hilly areas (18% of the total area of the country). In the CHTs of Bangladesh, human settlements and infrastructure are vulnerable to landslide. The recent (2017) landslide disaster has caused a death toll of 160 in the CHTs. However, Chattogram and the adjacent hilly areas have recently experienced landslide disaster posing millions of people at risk (Hossain et al., 2019). Landslide early warning system in Bangladesh (online) has been prepared for Chittagong city under the BUET-JIDPUS project (MoDMR, 2017).

**Earthquake:** Geologically, Bangladesh is located in the tectonically active margin of the plates to the east and north and a number of geologic faults exist in the country. Major cities including Dhaka, Chattogram and Sylhet are at high risk of severe destruction due to earthquakes from nearby seismic geologic faults. The city dwellers along with the physical structures are highly vulnerable to earthquakes in the big cities. A study by Ahmed and Kabir (2020) reveals that absence of compliance to safe building codes and stakeholders' unwillingness and reluctance to follow the guidelines of the Bangladesh National Building Code (BNBC) is mainly responsible for such risks. City like Dhaka being home to over 20 million people are at high risk while there is huge lack of the implementation of safe building codes in constructions (Ahmed et al. 2019).

**Fire Incidents:** In Bangladesh significant number of people die due to fire incidents and currently the incidences are rising at an alarming rate. Statistics shows that from 2005 to 2015, there have been around 2000 fire-related deaths from nearly 130,000 fire incidents. In 2016 the total fire incidence was reported 12,880 causing damage to nearly BDT 1,000 million (BFSCD, 2016).

## **2.8 Impacts of Disasters on Schools in Bangladesh**

As stated in the previous discussion, disasters of many kinds regularly happen here in Bangladesh putting impacts on various sectors at varied magnitudes. Bangladesh being a disaster-prone country is at risk to natural and man-made hazards. Educational institutions are serious sufferers in these events. Children education system is severely impacted due to the regular occurrence of disasters. In Bangladesh, almost all schools either located in the urban areas or remote rural areas are somehow prone to regular

inundation, cyclones along with tidal surges, tornadoes and are at high risk of earthquakes. Meanwhile, some of the remarkable past disasters both cyclones and floods have devastated schools and school education in Bangladesh. Since 1970, due to cyclones of varied magnitudes, schools were badly affected. Alam et al. (2011) reported that in Bangladesh, on an average 9,000 educational institutions are fully or partially destroyed by cyclonic events, floods and riverbank erosion. From 2000-2010 a total of 50,000 educational institutions were either damaged or destroyed by floods. The physical or infrastructural impacts due to disasters are immense. In the cyclone of 1970, over 4000 educational institutions were damaged, while the 1991 cyclone destroyed nearly 10,000 schools in the coastal region of Bangladesh. In 2007, due to both flood and cyclone *Sidr*, over 13,000 schools were completely or partially destroyed. Nearly 3,000 schools (altogether 500 educational institutions) were highly affected due to the cyclone *Aila* in 2009. In the floods of 1998 and 2004, a total of over 13,000 and 17500 schools were completely or partially affected (UNICEF, 2010; ECHO, 2010). In 2007 as a result of a cyclone and floods, nearly 95% of schools experienced some level of impact and around 84% of schools were closed for an average of 26 days; about 65% of schools were used as shelters for cyclone affected people and 35% of schools were used to accommodate community members that were affected by the floods. This alternative use of schools resulted in a 3% school drop-out (Save the Children, 2017; Alam et al. 2011). Floods continue to occur regularly and impact education; disruption in the continuity of school education in Bangladesh has been reported in the recent massive floods of 2017 (particularly in the northeastern part of the country) and 2018 (NIRAPAD, 2017; ACAPS, 2017).

However, due to the regular occurrence of natural calamities, schools' teachings are often cut which have huge impact in the teaching learning process in Bangladesh. Like the Pandemic Covid-19, Bangladesh like all other countries on earth have completely shut down the educational institutions including schools since March 2020. Two major disasters in Bangladesh, other calamities like tornado, landslide etc. have also significant impacts on schools particularly in the remote rural areas.

## **2.9 Urban Disasters and Impacts on Schools**

Disasters impact the education sector extensively in Bangladesh with an estimated 5,000 schools being affected annually, and more of them by flooding than other disasters (Alam et al. 2010). As discussed earlier, the academic activities in schools of

urban areas particularly in the large cities (for example, Dhaka) are interrupted due to floods every year. Moreover, these schools are also vulnerable to earthquake and fire hazards. Over 300 schools in Dhaka were used as flood shelters in the 1998 flood (Alam et al. 2010; Islam, 2005; Ahsan and Khatun, 2004). The urban water logging problem is frequent and common in Dhaka in the wet months, which particularly impacts the city's poor (Parvin et al., 2013). Prolonged water logging affects schools in Dhaka by complete or partial inundation.

### **2.10 Schools Role in the Community**

The role of the schools is enormous as many activities are performed based on schools. Children of different ages come to schools from different community backgrounds. Therefore a huge interaction among all different segment of people takes place resulting in a very harmonious environmental is created, which is immensely required for social cohesion. There is another perspective of schools apart from its social implications. Schools located in remote rural and disaster prone areas are often used for multiple activities. Therefore in fragile contexts in Bangladesh, school buildings are constructed to support multipurpose, while they generate substantial income for the management. There are remarkable examples of how schools played important role in past disaster events in Bangladesh and how people could save their lives. A statistics shows that in the flood 1998, more than 3000 shelters were established in Dhaka City where most of these shelters were schools and other educational institutions. Schools are also reported as a gathering place for children where students can learn versatile staff which are indeed of high importance for their grooming. On the other hand, schools teach children with diverse know-how more specifically disaster related information, hazard risks and awareness. Knowledge earned from schools can also be disseminated among guardians of the children. This is how schools play crucial role in educating community people on disaster issues in addition to many other staff.

### **2.11 Initiation of DRR Interventions in Bangladesh**

Given the countries highly vulnerable to various natural hazards and disaster risks, DRR is extremely important to incorporate in the development process. After the establishment of ISDR and gradual development of DRR efforts round the world, Bangladesh has also been part of the international agreements and initiatives. The



Comprehensive Disaster Management Programme (CDMP) initiated in 2003 funded by the UNDP has been recognized as flagship programme while country's all disaster risks from every geographic contexts have been explored, evaluated and examined through the active participation of the communities. Hazard risks, impacts and their potential risk reduction measures were explored from the relevant communities and later the documents were shared with them. Therefore DRR interventions in Bangladesh are currently being successfully promoted through incorporating them into the development process. The initiation has already resulted in a recognized success in the reduction of deaths, injuries and property damage, while the examples are the recently occurred massive cyclonic events in Bangladesh (Shaw et al. 2013).

## **2.12 School Education and DRR Approaches in Bangladesh**

Initially, the priority of disaster management activities was more response oriented, but gradually shifted to a risk reduction oriented approach particularly after 2000. The National Plan for Disaster Management 2016-2020 (MoDMR, 2016) recognizes the importance of school safety with a focus on developing and implementing a school safety program including national school safety and school building-level emergency response plans. The national education policy emphasizes on initiating special measures to promote education in the areas identified as backward in education (MoE, 2010). The Standing Orders on Disaster (SOD) (MoDMR, 2019) prepared originally in 1997 and updated in 2019 guides and monitors disaster management activities including in the government schools. It has provided clarity and guidance around how other ministries should collaborate and coordinate on disaster risk reduction initiatives across the education sector. Risk reduction mechanisms are also initiated within the government to support risk reduction activities in the education sector. Launched in 2010, the National Education Policy seeks to build students' knowledge, social awareness and capacities with regard to issues in their environment and help build the nation's resilience against climate change and disasters. The National Children Policy 2012 dedicates a section on child protection during and after a disaster. Three primary ministries and their respective directorates and departments are involved in risk reduction within the education sector: The Ministry of Education (MoE), the Ministry of Primary and Mass Education (MoPME) and the Ministry of Disaster Management and Relief (MoDMR). The MoE through the National Curriculum and Textbook Board (NCTB) has incorporated disaster management issues into the primary and

secondary curricula for grades 3-11. School disaster risk reduction interventions include earthquake vulnerability assessment of school buildings, preparing evacuation plans, training of teachers on earthquake safety measures, and evacuation and classroom lectures on earthquake safety and preparedness for school children. Under the Memorandum of Understanding between the MoE and Comprehensive Disaster Management Program (CDMP II), the Directorate of Secondary and Higher Secondary Education reported activities to make schools safe from disasters, although these initiatives are yet to be widely implemented.

### **2.13 Comprehensive Schools' Safety Measures in Bangladesh**

In Bangladesh, DRR and Climate Change Adaptation (CCA) have been incorporated into some thirty-nine textbooks since 2005 through the NCTB. In 2014, the MoE with financial and technical support from CDMP, further integrated disaster preparedness in ten textbooks. NCTB has introduced disaster and climate change-related chapters within the textbooks, for instance in the General Science and Social Sciences subject areas that cut across the three levels of primary school (grades 1-5), junior high school (grades 6-8) and secondary high school (grades 9-10). Some DRR topics are also integrated in Religion and Moral Studies, Bengali, English, Bangladesh and Global Studies, English Literature, Bengali and Geography subjects at various grade levels. The latest development, however, is the adoption of the Framework for DRR in Education and Education in Emergencies in schools, which is now under the process of review and approval by the MoE (Lim et al. undated). The framework is to guide mainstreaming Comprehensive School Safety (CSS) in the country's education sector. The Framework is inclusive and based on the three pillars of the global CSSF (Comprehensive School Safety Framework): i) Safe School Facilities, ii) School Disaster Management (SDM) & Educational Continuity, and iii) Climate-Smart Disaster Risk Reduction Education (GADRRRES, 2017). The main steps of the CSS are intended to provide national guideline for assessing the structural integrity of school facilities, and for construction and retrofitting of schools.

### **2.14 DRR Curriculum Development in Bangladesh**

Since disasters are frequent in Bangladesh and the impacts are multifaceted in the education sector, there has been huge advocacy for introducing DRR education in the existing curriculum. Context based relevant DRR curriculum initiation has also been

suggested for long. However, a slow incorporation of the DRR know-how in the curriculum of different levels has been observed in the past. Since 2004, DRR has been progressively included into 39 textbooks, while in January 2014, the Ministry of Education of the Government of Bangladesh declared to cover more ten texts in near future. In addition to lessons on disasters and risk reduction approaches, the concerned national textbook board has also been attempting to incorporate climate change issues to teach students as to how these contemporary problems might trigger more risks of disasters. In various grades of school curriculum, DRR topics have been incorporated. Topics that have been incorporated in different grades/levels include the issues of earthquake in grade 3; in grade 4, disaster and disaster management under Bangladesh and global studies; flood and drought in grade 4 as well; poem on cyclones in grade 5; climate and disaster in the same grade as well and separately climate change in the same level; natural disasters in Bangladesh, their conception, classification, types, disaster planning etc. are included in grade 6; fire as human induced disaster in grade 7; floods, riverbank erosion, drought in Bangladesh in the same grade as well; cyclone and tidal surges, diseases during disasters, prevention, mitigation and early warning etc. are in grade 8; objectives of disaster management, cyclone of disaster management, national disaster management structure etc. are in grade 9 and 10; disaster prone earth, different types of disasters, human made disasters, UN contribution to disaster management and post disaster management in Bangladesh etc. in grade 11 and rivers and flood control, conception and impacts of flood, flood control, salinity issues etc. are incorporated in grade 11 as well. However, all these lessons incorporated in different levels are effective in creating awareness not only among school stakeholders but also the society as a whole. But future research and need based geographic context specific curricula might be more effective in enhancing disaster preparedness and achieving community resilience.

### **2.15 Disaster Risks at Schools in Dhaka City**

Dhaka City as mentioned time and again in the dissertation, as it has been developed in floodplain in a very haphazard manner hosting over 20 million people with enormous population density (over 40,000 per square kilometer), it is highly vulnerable from various hazard risks. Khan (2008) reported that Dhaka City is one of the 20 high risk cities on earth. Under urban resilience project by the RAJUK since

2015, seismic zonation has been carried out, while the most crucial issue for city is its unplanned and faculty constructions without following the guidelines of the country's national building code. However, in order to expedite the application of the building and other safety compliances effectively and proper management of the Capital city, Dhaka was divided into two city corporations a decade back, while the city tends to expand toward north. The Dhaka North City Corporation (DNCC) is ever expanding to rural areas, while remarkable continuous development activities are being conducted. More than five hundred schools are located within this area with varied characteristics. Many of which are highly prone to water logging since they have been constructed in the floodplain. Schools in DNCC area are highly complex and diverse in terms of their age, height, building structure, location, accessibility, environmental conditions, safety compliance and hazard risks etc. However, a detail description of the geographic profile of the study area, DNCC is presented in the following chapter.

*Chapter III*  
**RESEARCH DESIGN**

**3.1 Introduction**

This chapter presents the overall study design dealing with a framework of study, methodological tools, sampling design and procedure, sample size determination, data collection, processing and analysis. The study mainly focuses on the vulnerability assessment of schools and DRR awareness and preparedness measures in schools among stakeholders. Mainly qualitative approach has been applied, while both primary and secondary data have been used. Primary data have been collected through interviews with a semi-structured questionnaire from the school key stakeholders, FGDs, KIIs. Epicollect5 apps and GIS arc software have been also used for field survey, data storage, analysis and map making. Secondary data have been collected from the relevant institutions like the Ministry of Education, Primary and Mass Education, BANBEIS etc. In addition, the existing knowledge from the published materials have widely been consulted.

**3.2 Study Area**

As the study area, Dhaka North City Corporation has been selected since the city tends to expand toward the north. Earlier it was under the Dhaka City Corporation and later two city corporations were made. As a whole the history of the Municipality of Dhaka established in 1864 is quite old. After the country's Independence in 1971, it was declared as the Capital. In the year 1978, Dhaka Municipal Corporation was renamed as Dhaka City Corporation (DCC) and later in 2011, DCC was divided into two parts as Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC). DSCC covers the entire older part of the city while population density in some wards is over 200,000 persons per square kilometer. However, as mentioned earlier, DNCC is the area where rapid expansion and urbanization are taking place. The population of DNCC is 5.9 million and total area is 196.22 square kilometers (DNCC 2019). The newly declared city corporation DNCC is not only home to millions of people, the future of Dhaka City also depends on it. Over five hundred schools of various characteristics have been established in DNCC area.



The overall area of DNCC is developed than other area of Dhaka city except few new included areas. DNCC consists of 10 zones, 54 wards covering the Thana of Gulshan, Banani, Rampura, Badda, Khilgaon, Tejgaon, Tejgaon Industrial Area, Uttara, Uttar Khan, Dakshin Khan, Mirpur, Pallabi, Mohammadpur, Adabar, Sha Ali, Darusalam, Sher e Bangla Nagar and Kafrul.

**Table 3.1: State of Schools-2018**

Types of School	Bangladesh	Dhaka City	DNCC
Govt. Primary School	1,34,147	342	122
Secondary School	20,465	353	306
English Medium School	146	124	87
Total	1,54,758	819	515

*Source: BANBEIS 2018 and DPEO-2019, Dhaka*

Practically Dhaka City's majority people are migrants from a couple of districts including Faridpur, Kumilla and Barishal. Except the very local people known as Dhakaiyas (around 20%) living in DSCC, all the citizens are migrants and they like to live in the northern part because the convenient characteristics in terms of open spaces, services, transportation systems, housing facilities etc. Dhaka North City Corporation has been chosen as the study area since this area has a variation from geographical, structural, social and economic perspectives. There are very high standard, medium and bellow standard schools are available in this area. The DNCC has been selected for the present study since most of schools with diverse nature are located here. A significant number of new wards have recently been established, most of which are located in the floodplains. This area is one of the most high risk areas prone to massive destruction of buildings following earthquake and fire incident. New included eastern part of DNCC like; Beraid, Badda, Nandipara, Uttar Khan and Dakshin Khan are vulnerable to water logging, fire and different types of pollution.

### **3.3 Sampling Design**

In the present study, a multiple sampling method has been applied. The selection of the study area is purposive to ensure a well representation of schools that are mostly located in the DNCC. In addition, stratified and random sampling techniques have been also applied. In order to ensure the representation of different categories and types of schools located in the study area, such sampling techniques have been

adopted. Study wards (20 wards were selected from total 54 wards a total of 10 zones) were selected following stratified sampling techniques basis on geographical location. A total of 115 schools were selected randomly from 515 schools (20 primary schools out of 122, 20 English medium schools out of 87 and 75 secondary high schools out of 306).

The present study area and sampling design as shown in the following Table 3.2 is divided into ten zones from which wards (two from each zone) have been selected and thereby schools of various categories have been identified for survey.

**Table 3.2: Selection of the Wards and Study Schools**

Zones & Area	Ward No.	Selected Wards	Total Schools	Selected Schools (Types)
Zone-1(Basundhara R/A, Khilkhet, Uttara Sector-1,4,11,)	Ward: 1, 17	1 (Uttara) 17 (Khilkhet)	34	11 (P-2, H-7, E-2)
Zone-2 (Mirpur-1, 2, 7, 10, 11, 12, 13, 14, Pallabi)	Ward: 2, 3, 4, 5, 6, 7, 8, 15	6 (Pallabi), 15 (Vashantek)	104	13 (P-2, H-9, E-2)
Zone-3 (Gulshan1,2, Banani, Rampura, Mohakhali, Tejgaon, Maghbazar, New Esktan)	Ward: 18, 19, 20, 21, 22, 23, 24, 25, 35, 36	19 (Gulshan, Banani), 24 (Tejgaon)	53	12(P-2, H-8, E-2)
Zone-4 (Kafrul, Kazipara, Paikpara, Shewrapara, Dhruksalam, Gabtoli)	Ward: 9, 10, 11, 12, 13, 14, 16	13 (Shewrapara) 16 (Kafrul)	64	12 (P-2, H-8, E-2)
Zone-5 (Mohammadpur, Lalmatia, Adabar, Shyamoli, Sher e Bangla Nagar, Farmgate )	Ward: 26,27,28,29,30,31,32,33,34	30 (Adabar) 32 (Lalmatia)	67	12 (P-2, H-8, E-2)
Zone-6 (Rajuk Uttara, Turag, Diabari)	Ward: 51,52,53,54	53 (Diabari) 54 ( Turag)	27	11 (P-2, H-7, E-2)
Zone-7 (Part of Dakshin Khan, Islam Bag)	Ward: 47,48,49,50	48 (Dakshin Khan) 49 (Ashkona)	36	11(P-2, H76, E-2)
Zone-8 (Uttar Khan)	Ward: 44,45,46	45 (Uttar Khan) 46 (Uttar Khan)	34	11 (P-2, H-7, E-2)
Zone-9 (Natun Bazar, VataraShahajadpur, Madani Avenue, Dumni)	Ward: 39,40,43	39 (Madani Avenue) 43 ( Dumni)	35	11 (P-2, H-7, E-2)
Zone-10(Badda, Satarkul, Beraid, AftabNagar, Meradia)	Ward: 37,38,41,42	38 (Badda) 42 (Beraid)	39	11 (P-2, H-7, E-2)
TOTAL	54	20	515	115 (23 %)

Note: P (Primary School-20%), H (High School-75%), E (English Medium School-20%)

### 3.3.1 Selected School Types

The study schools were selected considering the building types, year of construction (high rise, medium and relatively newly constructed on floodplains, level of education (primary school, secondary school, boys' school, girls' school, co-education and



English medium school etc.). Therefore to cover all different schools specifically those located in the newly declared wards (floodplains), the selection of all zones has been considered and later representative wards were taken through stratified sampling and school selection was done through random sampling. In case of student selection for Focus Group Discussion level/standard 5-10 has been considered.

### 3.3.2 Sampling Size Determination

Selection of schools for the research, the following formula is used to calculate the sampling size determination where population size is ignored.

$$n = \frac{z^2 p(1-p)}{e^2}$$
$$= 115$$

Where,

$p = 0.70$  Estimate of the school proportion (here we assume that 70% of the schools in study area are vulnerable to different risks)

$z = 1.645$  The standard value of  $z$  at 90%

$e = 0,07$  Precision level 7%

### 3.4 Data Collection Method

In the study as mentioned both primary and secondary data have been gathered. After the selection of the schools, questionnaire survey was carried out with a semi-structured questionnaire through face to face interviews. In the beginning, in order to have field based ideas on the state of schools' location, vulnerabilities etc. field observation along with a reconnaissance survey was carried out. The school heads or principals were interviewed. In addition, FGDs were conducted with all school stakeholders, such as- students, teachers, school management committee, administrative bodies etc. (Table 3.4). Primary data were also collected through key informant interviews (Table 3.6).

### 3.4.1 Interviews

As mentioned earlier, the formal face to face interviews was conducted with the heads of the schools. In some cases, as informal discussion, senior teachers have also been consulted from different schools. In order to conduct surveys, three sets of questionnaires were developed, one of which was for the heads of the schools, checklists for FGDs and checklists for KIIs. There were a little variations in the questionnaires of the FGDs with different stakeholders.

**Table 3.3: List of Schools Survey Contacted**

<b>Primary Schools</b>	<b>English Medium Schools</b>
<ul style="list-style-type: none"> <li>• Kurmitola Model Govt Primary School</li> <li>• Azompur Govt Primary School</li> <li>• West Vashantek Govt Primary School</li> <li>• Pallabi Govt Primary School</li> <li>• Bhola Govt Primary School</li> <li>• Tejgaon I/A Govt Primary School</li> <li>• North Kafrul Govt Primary School</li> <li>• Ibrahimpur Govt Primary School</li> <li>• Doll's House Pre School</li> <li>• North Kafrul Govt Primary School</li> <li>• Lalmatia Govt Primary School</li> <li>• Diabari Govt Primary School</li> <li>• Bawnia Govt Primary School</li> <li>• Faydabad Govt Primary School</li> <li>• Beraid Govt Primary School</li> <li>• Uttar Badda Govt Primary School</li> <li>• Uttar Khan Govt Primary School</li> <li>• Medhadi Child Care School</li> <li>• Dumni Govt Primary School, Dumni</li> <li>• Rajabari Govt Primary School</li> </ul>	<ul style="list-style-type: none"> <li>• Sunderland International School</li> <li>• Blooming Sun International School</li> <li>• Juvenile English Medium School</li> <li>• East West International School</li> <li>• Green Dale International School</li> <li>• Sea Breeze International School</li> <li>• Bijoy International School</li> <li>• East West International School</li> <li>• Lyceum International School</li> <li>• Mac Master English Medium School</li> <li>• Mangrove English Medium School</li> <li>• British Standard School</li> <li>• Sunbeams International School</li> <li>• Mascot English Medium School</li> <li>• Sunway School and College</li> <li>• Kid's Haven School</li> <li>• Starlit school of English</li> <li>• Badda International School</li> </ul>
<b>Secondary High Schools</b>	<b>Secondary High Schools</b>
<ul style="list-style-type: none"> <li>• Diabari Model High School</li> <li>• Diabari Adarsho High School</li> <li>• Rahela Khatun Ideal School</li> <li>• Turag Model School</li> <li>• Shahid Model School and College</li> <li>• Ideal Life School and College</li> <li>• Uttara Ideal School and College</li> <li>• Little Star High School</li> <li>• Kurmitola High School</li> <li>• Begam Rokeya Adorsha School</li> <li>• The Ideal Academy</li> <li>• Dakshin Khan Girl's High School</li> <li>• Mascot Inovative School and College</li> <li>• Uttar Khan Union High School</li> <li>• B H Khan School and College</li> <li>• Uttar Khan Collegiate School</li> <li>• Uttar Khan Public School</li> <li>• Uttar Khan Girl's High School</li> </ul>	<ul style="list-style-type: none"> <li>• Ashkona Adarsha High School</li> <li>• Ashkona Public High School</li> <li>• Northview City School</li> <li>• Begam Rokeya Adarsho Biddhaloy</li> <li>• Sharafer Pathshala</li> <li>• Uttara High School and College</li> <li>• Milestone School</li> <li>• Mother Teresa Catholic School</li> <li>• Pallabi Mazedul Islam Model High School</li> <li>• Cosmo School</li> <li>• Balughat High School</li> <li>• Bangladesh Muktijoddha High School</li> <li>• Vashantek School and College</li> <li>• Banani Bidyaniketon School and College</li> <li>• Tejgaon Adarsha School and College</li> <li>• Badd Alatumnesa High School</li> <li>• Tejgaon Model High School</li> <li>• The New School Dhaka, Banani</li> </ul>

Secondary High Schools	Secondary High Schools
<ul style="list-style-type: none"> <li>• Amirzan High School, Dumni</li> <li>• Dumni High School, Dumni</li> <li>• Light Fair School</li> <li>• Kalatan Public School</li> <li>• Nobodut Model High School, Dumni</li> <li>• Motherland School</li> <li>• Solmaid High School</li> <li>• Alesa Bibi Memorial High School</li> <li>• Badda Model School and College</li> <li>• Badda Girls' High School</li> <li>• Badda High School</li> <li>• Dynamic School and College</li> <li>• Bright Star Kindergarten</li> <li>• Rampura Ekramunnesa Boys' School</li> <li>• Rampura Ideal School</li> <li>• Trimohony High School</li> <li>• Fauzia Star School</li> </ul>	<ul style="list-style-type: none"> <li>• Nakhalpara Hossen Alli High School</li> <li>• Purbo Nakhalpara Urban Slum Ananda School</li> <li>• Senapolli High School</li> <li>• Ibrahipur High School</li> <li>• Dhaka Metropolitan High School</li> <li>• Haji Ashraf Ali High School</li> <li>• Dakshin Kafrul High School</li> <li>• North Kafrul High School</li> <li>• Dakshin Kafrul Model High School</li> <li>• Sweet Bird School</li> <li>• Adabor Ideal School</li> <li>• Rainbow Preparatory School</li> <li>• Greenland Residential School</li> <li>• Lalmatia Girls' High School</li> <li>• Beraid Muslim High School</li> <li>• Siraj Mia Memorial School</li> <li>• Rawshon Ara Girl's High School</li> </ul>
<b>Total Schools = 115</b>	

### 3.4.2 Focus Group Discussions (FGDs)

In order to collect necessary data from the school stakeholders, a total of 20 FGDs were conducted with the stakeholders (students, teachers, school management committees) of the schools (Table 3.3 and Table 3.4).

**Table 3.4: List of Stakeholders- FGD Conducted**

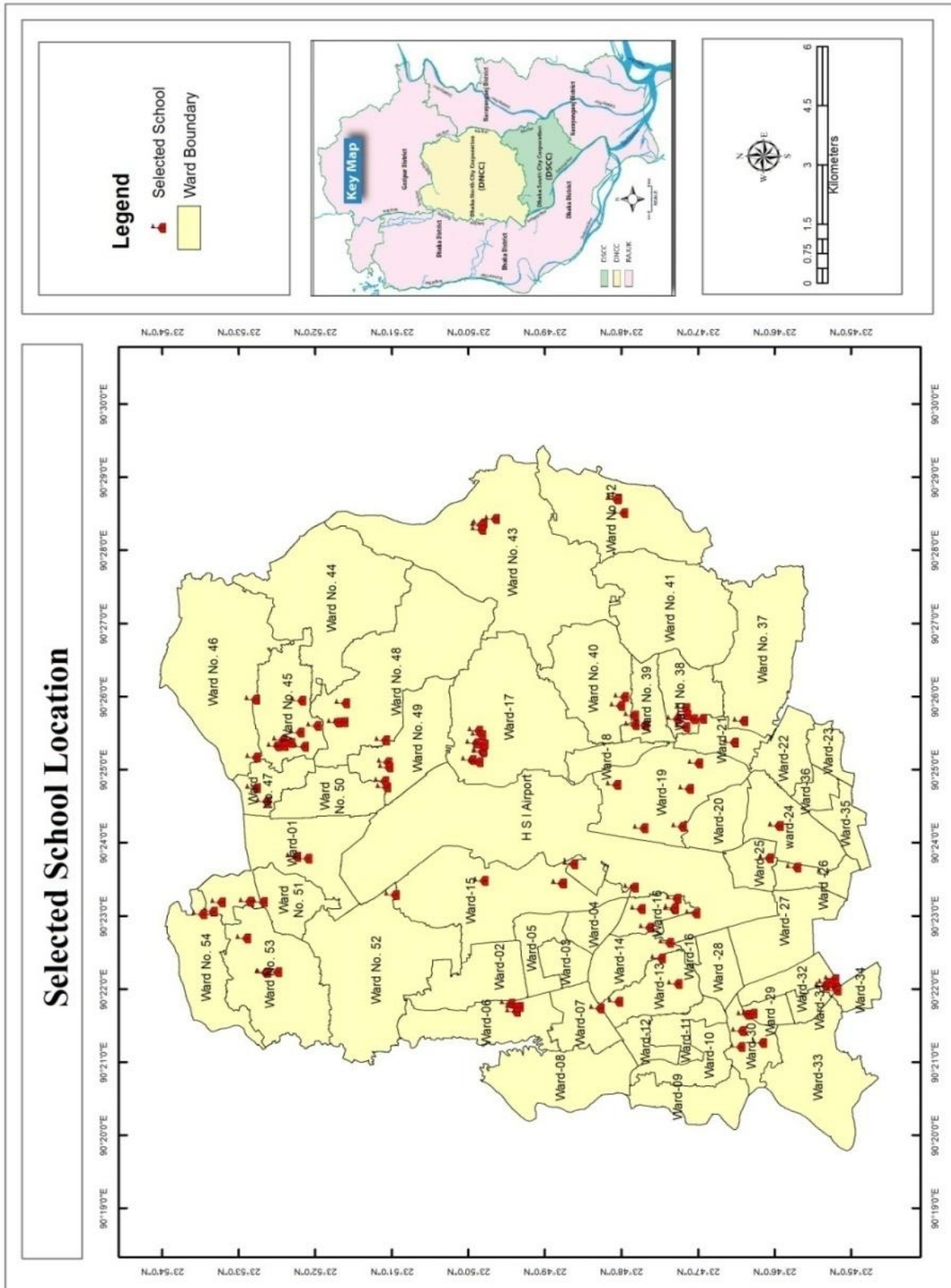
Stakeholders	Primary School	Secondary School	English Medium	Total
Students	02	05	03	10
Teachers	01	02	02	05
Management Committee Members	01	02	02	05
<b>Total</b>	<b>04</b>	<b>09</b>	<b>07</b>	<b>20</b>

**Table 3.5: List of Schools-FGD Conducted**

Primary and English Medium Schools	Secondary High Schools
Bawnia Govt Primary School	Dakshin Kafrul High School
Faydabad Govt Primary School	Vashantek School and College
Sunderland International School	Diabari Model High School
Mascot English Medium School	Uttar Khan Girl's High School
Sea Breeze International School	Little Star High School

### 3.4.1.3 Key Informant Interviews (KIIs)

Key informants are the important persons who are responsible for execute the policy and work for the betterment of the institutions. The researcher found out relevant



Source: Field Study, 2020

Fig. 3.2: Location of Selected Schools

information by conducting face to face interview and over telephone conversation. The list of the key informants consulted is shown in Table 3.6.

**Table 3.6: List of Key Informant Interviews (KII)**

Key Informants	Number
Chief Engineer, DNCC	01
Ward Commissioner	04
Education Ministry/Directorate	01
Thana Education Officer, DNCC area	04
Total	10

#### **3.4.4 Secondary Data**

Secondary data have been collected from the relevant institutions. Moreover, different books, publications, annual reports, journals and periodic, etc. relevant facts, figures and other relevant materials, previous research reports, seminars, meetings and conference papers etc. have been consulted as the bases for study and analysis. Documentary analysis also will be used for the study.

#### **3.5 Instruments of Data Collection**

As discussed earlier, the instruments applied for data in the present study include field observation, informal discussion, face to face interviews with a semi-structured questionnaire, key informant interviews, focus group discussions etc.

#### **3.6 Data Processing and Analysis**

Data collected from the study schools were analyzed and interpreted using software like epicollect5, SPSS10.01 versions, Arc GIS for map, excel, etc. After processing data, necessary analysis and interpretation were also made. In this regard, graphical presentation and tabular analysis with statistical techniques have been done. In addition, a number of relevant maps have been produced using geographical information system.

#### **3.7 Relevance and Limitation of the Study**

From the existing knowledge, it was revealed that know-how regarding DRR among different stakeholders of schools in the study area is almost absent. Teachers and

students seldom receive training regarding DRR. There is also a lack of knowledge to teach students on DRR curricula. There is hardly safety drills conducted by the schools. The implementation of DRR policy and guidelines of Bangladesh government are less than expectation. Most of the schools of Dhaka city are not constructed by following BEED/RAJUK building code. There is no engineering equipment to use during disaster like earthquake, firing and collapse of building. Initiative from government and NGO is very less in this issue. Given all the shortcomings on DRR approach, the present study explores hazard risks and vulnerabilities of the schools and based on empirical study finds out effective measures to enhance schools' resilience to various disasters. Therefore the present can be considered as a time demanding and there is immense scope to explore the issues explained from the schools in the city.

Study findings are unique and empirical in nature and the recommendations made in Chapter VII are expected to reach the authorities concerned for initiating DRR related interventions at schools of not only the DNCC but also other parts of the city. Taking the major findings from the study, if those DRR measures to be applied, the schools, one of the most important and sensitive sectors of the country are expected to achieve safety and resilience and the city can be able to ensure a culture of safety in school education in cities and later the ideas can be replicated elsewhere in the country.

*Chapter IV*

## **VULNERABILITY AND DISASTER RISKS REDUCTION AT SCHOOLS AT DNCC AREA**

### **4.1 Introduction**

School vulnerabilities refer to the issues concerning physical structures, environmental and social condition of the schools. Making sure that it is secured, has followed building code, alarm systems and exterior design can mitigate a lot of potential risk. School disaster risk management plan is extremely required to lessen the risks of disasters for millions of school stakeholders specifically children. By assessing physical, environmental and social vulnerabilities of the schools and its potential liabilities, it will be effective and possible to decide on bringing in security systems and additional measures.

By taking advantage of a school vulnerability assessment, it will be in a great position to get everything that we need out of our schools. This is paramount important, so that we can mitigate the danger and liabilities of the schools. Consider these points the study will be able to reach out to the authority that can help them one of these vulnerability assessments.

Finally, by identifying the school's weaknesses, it will be better able to put together a much needed emergency plan. By having a plan in place, better protection of lives and health of the people will be possible who populate and make school building vulnerable every day. The study explores the following findings from the schools in terms of its physical, environmental and social characteristics.

### **4.2 Physical Infrastructure of the Schools**

Sustainable school infrastructure depends on the affiliation of the authority. The annual allotment for school infrastructure and other facilities and proper monitoring depend on it. The study found that out of 100 schools 52 schools are privately run. These schools are operating in residential building, commercial building and separate premise without following building code and other facilities. The affiliation of the

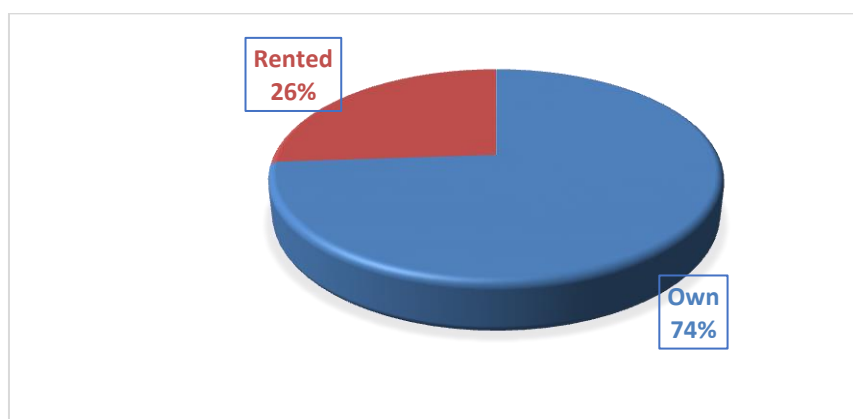
study schools have shown in the table no. 4.1. Construction of the buildings, monitoring of the schools and management of the schools depend on affiliation of the schools. Private and English medium schools are over looked by govt. authority like; Thana Education Office.

**Table 4.1: Affiliation of the School**

School Type	Frequency	Percentage
Cambridge	4	3
Edexcel	3	3
Government	13	11
MPO	33	29
Private	62	54
Total	115	100

*Source: Field Study, 2020*

The study found that 74 schools out of a total of 115 have been constructed in own lands(Fig. 4.1). At the same time the rest of the schools have been established in the rented places (Fig. 4.2). A significant (28%) of the school buildings have not received any approvals from the concerned authority. Interestingly, English medium schools where relevatively children from well off families are enrolled have not found with any standards. Over 90 % the schools are found multi-storied up to 8 storied (26%) and 6% tin shed building. Nearly 95% school buildings have been closed by walls, while 65% schools do not have assembly areas and 54% schools have not kept any space for playgrounds. Out of 115 schools 106 schools are co-educated, 5 are girls and remaining 4 schools are boys.



**Fig. 4.1: Ownership Status of School Buildings**

Over 90% schools have no access to PWD, 72% schools having single stair. Schools are established between the years of 1963-2019.





**Fig. 4.2: School in Own Building**



**Fig. 4.3: School in Residential Building**

School stakeholders stay in school except holiday 9 hours in day. During this time if any fire incident or earthquake Richter scale 7 happens then huge number of people will be affected.

#### 4.3 People Engaged in Schools

The study finds out a total of 106,803 populations (including teachers, students and school management staff) in 115 study schools in the DNCC (Table 4.2). On an average 929 populations remain present 0730 to 0430 hours except holiday in each school. In this period, if any earthquake or fire incident happens then many people may be affected due to lack of disaster preparedness.

**Table: 4.2 People Engaged in the Study Schools**

Category	Male	Female	Total
Student	50,154	51,804	1,01,958
Teacher	1,808	2,051	3,859
School Admin	569	417	986
G/Total	52,531	54,272	1,06,803

*Source: Field Study, 2020*

#### 4.4 Vulnerabilities Assessment of Schools

In the present study, vulnerability assessment of the schools in the DNCC area is the major focus, while the study explores all different vulnerabilities, such as- physical or infrastructural, social, location issues and environmental. In order to explore such vulnerabilities, in the beginning the locational accessibility has been made. Later with

a checklist, all different issues/ vulnerabilities have been identified. The following Table 4.3 shows a number of issues existing in the schools.

#### 4.5 Vulnerability Assessment Variables

There are certain variables that can help to make a vulnerability assessment stronger. The study considers the following variables for vulnerability assessment of the study schools (Table 4.3). As mentioned, one of the most important variables to assess schools' vulnerability is the accessibility that depends on their locational characteristics. Other variables considered for assessing vulnerabilities include physical or infrastructural conditions of the school, access to and from schools, state of drainage, fire compliance etc.

**Table 4.3: Vulnerability Assessment Variables/ Checklists**

Variables/Checklists	Good (%)	Moderate (%)	Poor (%)
School building area & locational characteristics	35	36	29
Physical/infrastructural conditions of school buildings	34	35	31
Building Resilience (state of construction following BNBC)	20	54	26
Access,, to and from school buildings	30	50	20
Drainage system	28	37	35
Fire Compliance	29	23	48
Ambient Environmental quality	27	37	36
Overall Teaching/learning Environment (considering level of noise, student-teachers' comfort in uninterrupted power supply etc.)	32	43	25
Students' Health	29	37	34
Access to Safe Drinking water	32	40	28
Sanitation and Hygiene (toilet facilities etc.)	23	37	40
Health Safety (medical facilities/first aid etc.)	28	27	45
Transportation (for teacher and student)	18	25	57
Security (guard, CCTV)	35	37	28
Communication (on emergency)	37	38	25

*Source: Field Study, 2020*

Health, sanitation, transport facilities, ambient environmental parameters etc. have also been included in the assessment. From Table 4.3, it is observed that in terms of locational convenience, one third of the schools is at good state, while in terms of the state of physical condition, again one third of the schools remains at good condition. From the assessment of all the variables at schools, it can be stated that an overwhelming majority of the schools (over 60%) have not been constructed with effective and adequate safety compliance. Therefore, most of the schools in the study area have risks of disasters at varied scale.

#### 4.5.1 Physical/ Infrastructural Vulnerabilities of Schools

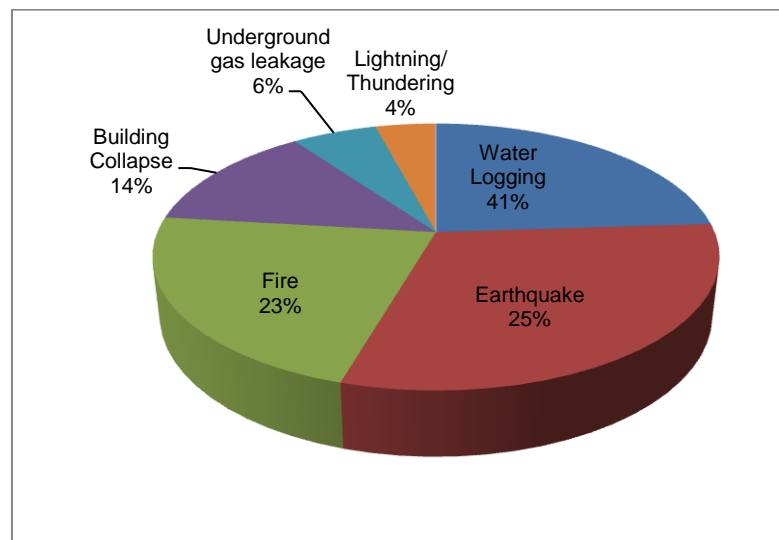
Physical or infrastructural characteristics of the schools are considered the most important indicators in assessing their state of vulnerabilities. As discussed earlier, schools being established elsewhere (e.g. floodplains) are physically vulnerable to various hazards. In the present study, risk of earthquake, water logging, fire incidence, collapse etc. have been considered to assess school buildings' physical vulnerability.

**Table 4.4: Physical Vulnerabilities of the Study Schools**

Hazards	High %	Mod %	Low%	None%
Earthquake	25	26	32	17
Water Logging	41	29	27	3
Fire	23	46	26	5
Building Collapse	14	23	51	12
Underground gas leakage	6	9	17	66
Lightning/ Thundering	4	9	35	48

*Source: Field Study, 2020*

Table 4.4 shows that a significant number of the schools have high vulnerability considering hazard risks mentioned. A considerable portion of the schools is prone to water logging which is a serious threat disrupting usual activities in the schools.



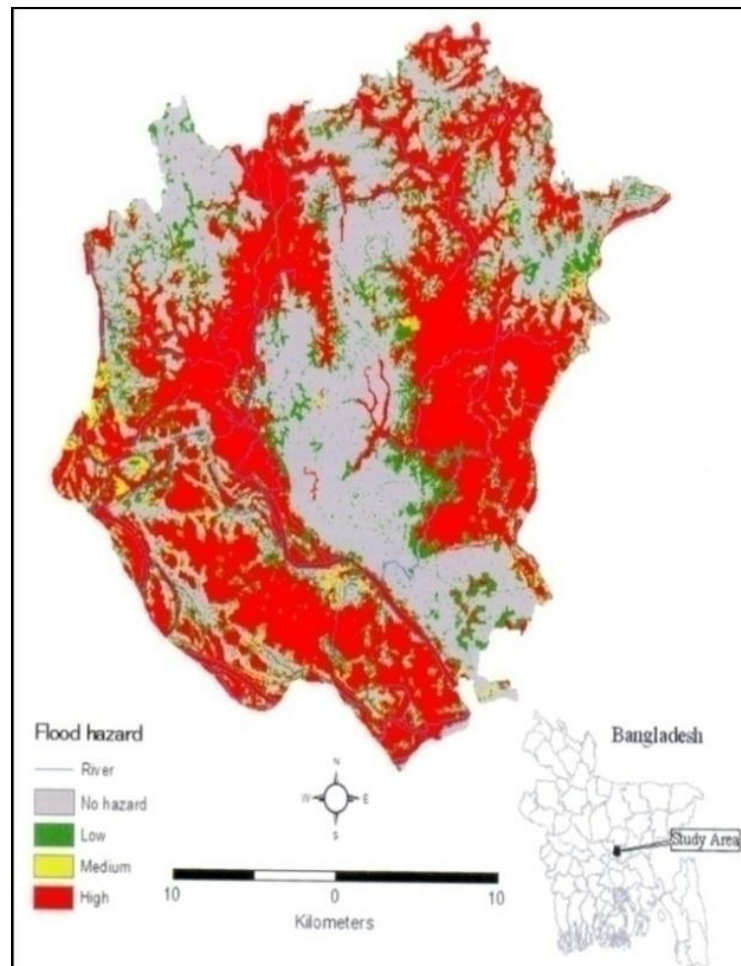
**Fig. 4.4: Highly Physical Vulnerable Schools of Study Area**

*Source: Field Study, 2020*

##### 4. 5.1.1 Water Logging/ Flooding

Dhaka City frequently experiences water logging in the monsoon. In recent years Dhaka City is facing extensive water logging during the monsoon (June to October) as a common and regular problem of the city like water pollution, traffic

congestion, air and noise pollution, solid waste disposal etc. Prolonged water logging drastically damages schools, (Figures 4.6 and 4.7). The city of Dhaka used to face flooding in the past as it did in 1988 and 1998 severely. Later construction of the embankments around the city protects it but heavy monsoon being common disrupts the city in different parts (Fig. 4.5). The city's relatively low lying areas are still vulnerable to flooding, in which there is no embankment. As discussed school buildings not properly designed and constructed often experience prolonged water logging.



**Fig. 4.5: Flood Risk Map of Dhaka (Shaw et al. 2013)**

Water logging is reported to hamper school education every year substantially. Sometimes, prolonged stagnation leads to shutting down all the schools for a number of days while students cannot attend schools. Past experiences show that school children face tremendous difficulties while coming to school. Even their settlement being vulnerable put them a prolonged vulnerability threat. There is a mandate of

fulfilling certain class lectures for holding annual examinations and publication examinations. Results from focus group discussion and key informant interviews show that students, teachers and their guardians have to face immense sufferings to complete certain syllabuses before the annual or public examinations. But reality is, sometimes, students of these schools have to sit for examinations without completing the lessons. This is how, prolonged water logging leads to a gap in the teaching – learning process.



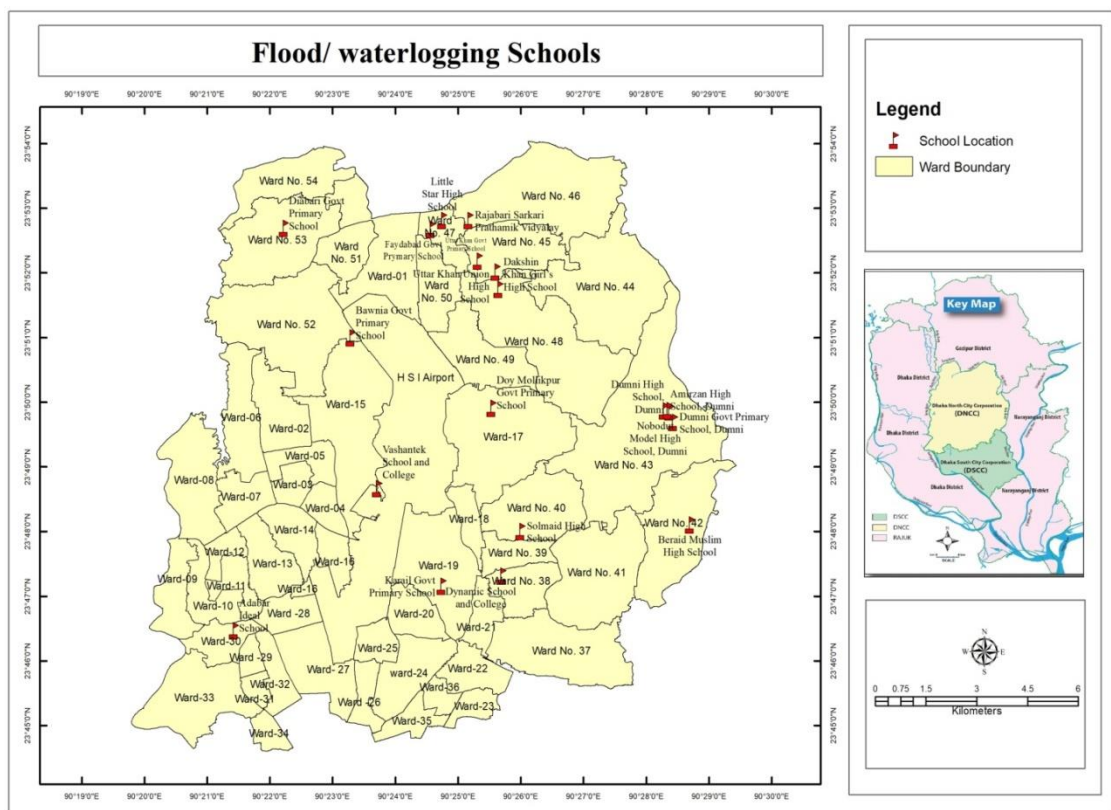
**Fig. 4.6: Water Logging in Beraid Govt Primary School**



**Fig. 4.7: Water Logging in Uttar Khan Girl's High School**



The problem is exceptional and the government and development authorities have no control over the weather. Nevertheless, the devastating impact of the downpour that paralyzes Dhaka often is a salutary reminder of the severity of the problem, and the necessity for the government to take counteractive measures on a priority basis. Dhaka City could hurtle towards an ecological disaster if destruction of the natural drainage and water bodies isn't stopped and an effective management of urban drainage system isn't set up. Planning, design, operation and maintenance of urban drainage systems is a challenge for urban authorities because of unplanned development activities, and the effectiveness of storm water management systems can be directly linked to the efficacy of urban management.



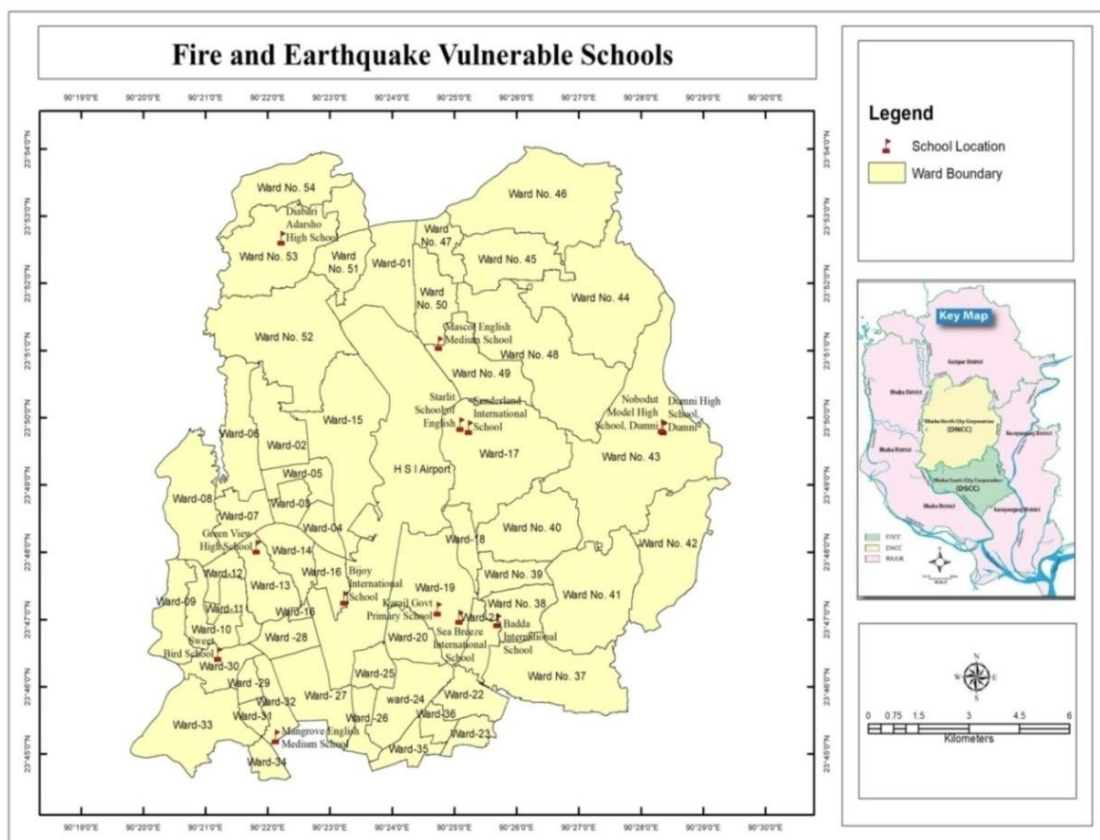
**Fig. 4.8: Flood/ Water Logging Schools**

*Source: Field Study, 2020*

The study found 41% schools are highly vulnerable of water logging, 29% moderately vulnerable, 27% schools are low vulnerable and rest of the schools only 3% are free from water logging problem. Due to water logging 47% schools remain closed up to 3-7 days.

#### 4.5.1.2 Earthquake Hazard Risks

The study found that 12% schools are highly disrupted to earthquake hazards and 34% are moderately disrupted (Table 4.4). That indicates the innocent students in school are vulnerable to earthquake hazard. From earthquake risk assessment, it can be stated that the existing faulty constructed buildings of Dhaka City can easily be demolished with the apprehended magnitude of earthquakes (Fig. 4.9). However, the study schools being structurally very poor not constructed maintaining the building codes are assumed to be collapsed with an earthquake of high magnitude (6.5 and above).



**Fig. 4.9: Earthquake and Fire Vulnerable Schools**

*Source: Field Study, 2020*

Since the study area is expanding given the huge demand over housing sector. Land owners not making any delay, not taking any approval from the authority even not properly developing the land are constructing buildings. School owners are also interested to maximize profits rather offering supports to the children. Therefore they are also reluctant to comply safe building guidelines and as a result schools buildings are becoming vulnerable to earthquakes and collapses.

#### 4. 5.1.3 Fire Hazard

Fire incidences have increased manifold in the recent years particularly in Dhaka City. Starting from older part, the modern planned buildings in DNCC area have also recently experienced huge fire incidence. Indeed, most fires are preventable. A building becomes more dangerous when it is air conditioned and covered by glass. Apart from arson, major causes of school fires include improper overloaded electrical outlets and excessive accumulation of rubbish.

Fire Tragedy Kumbakonam on 16 July, 2004 At least 87 children were killed in a devastating fire in Krishna Higher Secondary School, a private school in the small Tamil Nadu town of India, while 32 admitted to hospital with severe burn injuries. Some victims died of suffocation, as the exit passage was narrow.

The reasons of this incident were:

- Fire in school kitchen due to short circuit
- Building had no proper ventilation,
- Only one entrance and a single flight of stairs
- Rescue operations were hampered for lack of access

Fire destroyed the Eastern Guilford High School in November 2006 while the school remained closed during the incidence. On 26 August 2016 at Manikganj Govt Primary school (Fig. 4.10), an electric led to fire incident while the school was closed. Local people save the school with a short damage. Fire broke out on 16 November 2020, Jolpaitola J K Model School, Gazipur (Fig. 4.11) destroyed school's properties, books and other necessary documents. In addition, in the Rohingya camp, schools were also burnt due to recent fire incidents.



Fig. 4.10: Fire Incident of ManikganjGovt Primary School





**Fig. 4.11: Fire Incident of Jolpaitola J K Model School, Gazipur Photo courtesy Bangla Tribune**

However, the investigation from the field in the present study shows that in terms of fire compliance, the school buildings have been found at a very poor state. In most of the school buildings, fire compliance has not been maintained (Table 4.5). An overwhelming majority of the schools are not with effective fire compliance even in a

**Table 4.5: Fire Compliance States of Study Schools**

Fire Elements	Yes %	No %
Combustible Materials	48	52
Hanging Loose Electric Wire	81	19
Fire Extinguisher	51	49
Fire Hydrant	4	96
Alarm System	9	91
Emergency Exit	4	96
Open Space	36	64

*Source: Field Study, 2020*



**Fig. 4.12: Fire Risk at School and Fire Compliance**

*Field Study, 2020*

significant number of schools, combustible materials are existing. The study found several schools in the DNCC are functioning in narrow buildings and apartments without fire compliances. The state of fire compliances is shown in Table 4.5. From the FGD results it has been recorded that stakeholders of the schools do not know about the application of the fire equipment though in some cases they are available. However, the school stakeholders opined that they would require regular drills but certainly to be organized by the management authority or it is required to be mandatory by the school administration or the ministry. In addition, a close monitoring of the drills need to be observed to ensure the application of the fire compliance tools.

#### **4. 5.1.4 Building Collapse**

Since a majority of the school buildings' structural conditions are not properly maintained, most of them are vulnerable to collapse in earthquakes. The study found 14% school buildings are vulnerable to building collapse (Fig. 4.13) due to unplanned and poor construction by local unskilled contractors and lack of proper maintenance of very old buildings.



**Fig. 4.13 School Buildings Vulnerable to Building Collapse**

*Field Study, 2020*

#### **4.5.1.5 Underground gas Leakage**

An underground gas leakage and explosion and resultant consequences is also very common in the city. A pipeline near a mosque exploded in September 2020, during evening prayers outside the Capital City of Dhaka, killing 24 Muslim worshippers and leaving dozens with life-threatening burns. Due to poor quality of equipment and unplanned underground

installations, pipelines have huge leakages in Dhaka city. Titas Gas Transmission and Distribution recently conducted a baseline survey in its distribution areas and found that 35,000 gas risers out of 5.65 lakh (around 6.2%) were leaky. The study found 14% schools are under threat of underground gas line accident. These schools are located near within 25 feet distance of big gas pipelines. The school stakeholders stated that they have found several times repairing the underground gas pipeline near their schools.

#### 4.5.1.6 Lightning/Thunder Storm

In the present study, an assessment was made to explore the risks of thunders of the schools. The study found 4% schools are highly vulnerable to lightning/ thunder storm. These schools are located ward no 42, 43 which are under developed and newly included area of DNCC. These school building has no thunder arrester and there is no high rise building and tower which can protect school building from thundering. Lightning/ thundering occurs usually in the month of March to April in our country.

#### 4.5.2 Environmental Vulnerability

Environmental components include air, water, noise level, drainage etc. which have been assessed in the present study. Study findings as shown in Table 4.6 and Fig. 4.14 reveal that the study schools are having various environmental threats. Both the environmental quality within the school compound and ambient areas extremely suffer from different issues. Since children are the most important stakeholders of the schools, it is highly required to maintain very convenient environmental quality in the school compound, where they stay for longer time.

**Table: 4.6: Environmental Vulnerabilities of Study Schools**

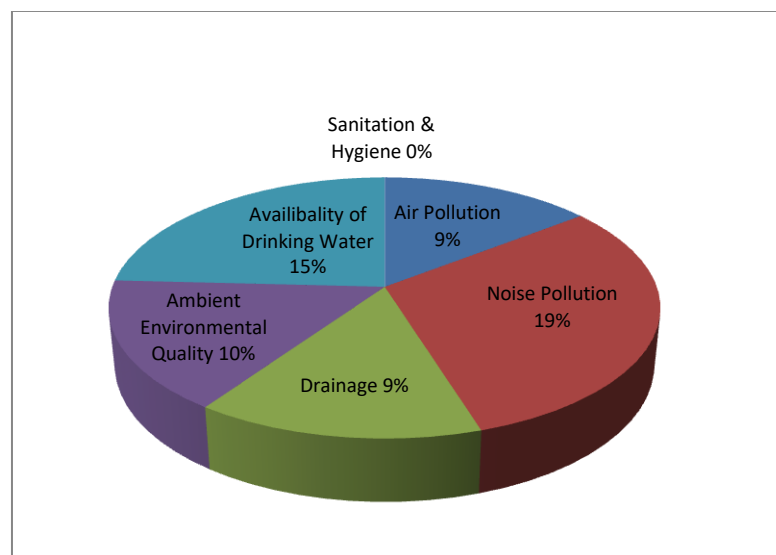
Environmental Issues	High %	Med %	Low %	None %
Air Pollution	9	76	13	2
Noise Pollution	19	16	63	2
Drainage Condition	9	29	53	9
Ambient Environmental Quality	10	16	27	47
Availability of Drinking Water	15	34	44	7
Sanitation & Hygiene	0	28	60	12

*Source: Field Study, 2020*

Children exposed to very unhealthy environment often get affected with diseases while coming and going to schools. The following section presents separately the state of environmental parameters as observed from the study schools.

#### 4.5.2.1 Air Pollution

The study found around that 10% schools are highly vulnerable to air pollution and an overwhelming majority of the schools (76%) are moderately vulnerable (Fig. 4.14). These vulnerable schools are located mostly in Tejgaon industrial areas, Ashkona Hajj camp area and Uttara Diabari area, which are located in ward numbers 24, 25, 47, 49, 50 and 53 (as shown in the map). On the other hand rest 15% schools of presidential area Uttara, Gulshan and Banani are comparatively free from air pollution risk. Field observations also reveal that school ambient areas are used for different purposes from where smoke, fumes and hazardous and toxic contaminants come to the schools.



**Fig. 4.14: Highly Environmental Vulnerable Schools of Study Area**

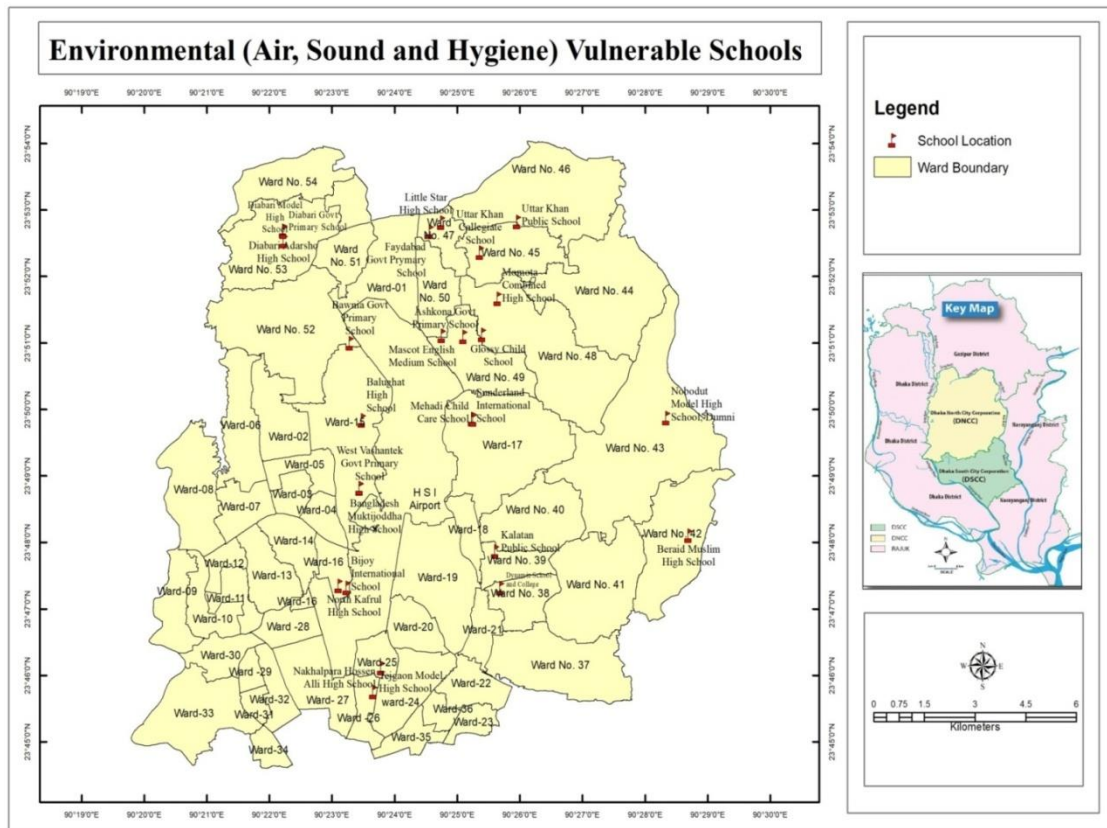
*Source: Field Study, 2020*

School children often get affected due to various diseases as report in the focus group meetings. Small scale industries located around the schools are sources of both toxic air and intolerable noise.

#### 4.5.2.2 Noise Pollution

Schools are considered to be most critical infrastructure. Maintaining optimum noise level which is tolerant to school stakeholders is absolutely required for convenient

teaching learning process. Unfortunately in Dhaka City, noise level exceeds than the tolerate limits everywhere. Though a limit of around 50 decibel is required in the school ambient areas, sometimes the level goes beyond 80 decibel. However, the study observed that 19% schools are highly vulnerable to noise pollution and 16% are moderately vulnerable. The main causes of noise pollution found the study are: traffic noise, air traffic noise, construction sites, industries and markets collocated to the schools.



**Fig. 4.15: Environmental Vulnerable Schools**

*Field Study, 2020*

FGDs with students from different schools of various levels complains about the poor environmental quality more specifically noise level. They complained that they are unable to attend classes with proper attention.

#### **4.5.2.3 Drainage Condition**

Since the study schools face tremendous problems of water logging every year, they school compound have been observed to have water in the playground for long. This study found 9% schools are highly affected and 29% schools are moderately affected poor drainage condition. Most of the schools have been constructed through land

filling. Drainage is one the serious threats for schools in accessing to them. Students require substantial open spaces as they spend significant time at schools. But study findings reveal that schools being constructed elsewhere, proper drainage has not been maintained. As a result, school stakeholders face immense sufferings to and from schools. Poor drainage also leads to creation of other problems like diseases through infestation of mosquitoes etc. as reported in the focus group meetings with the stakeholders.

#### **4.5.2.4 Ambient Environmental Quality**

An ideal ambient environment for schools is quite absent in urban area; because of, unplanned urbanization. Most of the schools found located to main road which create traffic sound and very risky to in and out students to the schools. A six-year old student of Wills Little Flower School was crushed to death under the wheel of a bus in front of the school at Kakrail in Dhaka 03 February 2010 morning. The most of injuries to Dhaka city students occurred while they were crossing the road near the school campus during their get-off and get-on time for school. This risk also remains for many schools (16%) of the study area; these schools are proximity to main road below 50 feet. The study found 4% schools are much closed to market which disturb learning process in the schools. Some open dust bean and marshy wet land found near to the schools. The study found over all 10% schools is highly vulnerable to ambient environment. Out of the schools studied, a significant part (45%) of private schools have been identified with very poor environmental conditions. Moreover, around 70% of school schools have been explored suffering from health related issues directly related to environmental conditions at schools.

#### **4.5.2.5 Availability of Safe Drinking Water**

In the rural areas, school students normally depend on tube well water for drinking. But in schools of the urban areas in Bangladesh, the main water source is WASA, a few schools found their own deep tube well water supply system. These sources of water how much safe for drink is a question to all. That's why; the researcher observed some school authority set water filter in corridor of their schools. But these filters are not sufficient for the students and not well maintain. The students carry water bottle from their home. During dry season some areas like; Dakhinkhan, Ashkona urban dwellers face water supply problem. The students cannot go to school for scarcity of water (Principal, Mascot English Medium School, Ashkona). This



study found 15% schools are highly vulnerable to safe drinking water. Govt Primary Schools in DNCC area are facing this problem in high.

#### 4.5.2.6 Sanitation and Hygiene

This study explored high levels of dissatisfaction with school toilets among the students in all newly included wards of DNCC as reported in the focus group discussions with students. A majority of the students in each study schools reported a lack of toilet paper and water. According to the study, almost 30% of schools in DNCC do not have access to healthy toilet facilities, govt. primary schools are facing this problem comparatively higher than other schools, and only 12% of schools in study areas have access to standard toilet facilities inside school buildings. As mentioned earlier, schools being constructed elsewhere, contamination of environmental component is very common which also influence health and hygiene.



**Fig. 4.16: High Standard Toilet Established at School by NGOs**

*Field Study, 2020*

In the present study, it has been observed that except some schools established by some NGOs, health and hygiene are not given importance. From the FGDs with students, it has been recorded that students staying at schools for long tremendously suffer from hygiene facilities as they are reluctant to use toilets. The consequence of not using toilets when required, children suffer from many complicated diseases in future. Therefore, access to safe drinking water and having clean and hygiene toilets are highly desired by the children and this was supported by almost all students.

## 4.6 Social Vulnerability of the Schools

### 4.6.1 Contagious Diseases-COVID 19

School children are increasingly exposed to various epidemics in the city of Dhaka. Contagious diseases like: diarrhea, chicken pox, whooping cough, chikungunya, dengue fever and newly added Corona virus are the concern for parents and school authority. The study found 19% school's students are at risk of different contagious diseases. The hygiene and sanitary condition of schools and their family are responsible for this risk. The school authority manage this situation by not attend the school of affected students.

As a result school infrastructures are damaging due to long term closing the schools and students are depriving their proper education. Though some schools managing e-learning education by using zoom apps (Fig. 4.17), but maximum schools could not manage this apps due to socio-economic problems of the school and students. However, all the students of the schools not having access to digital technology and lack of capacity to access to necessary data and other required equipment cannot obtain satisfied results.



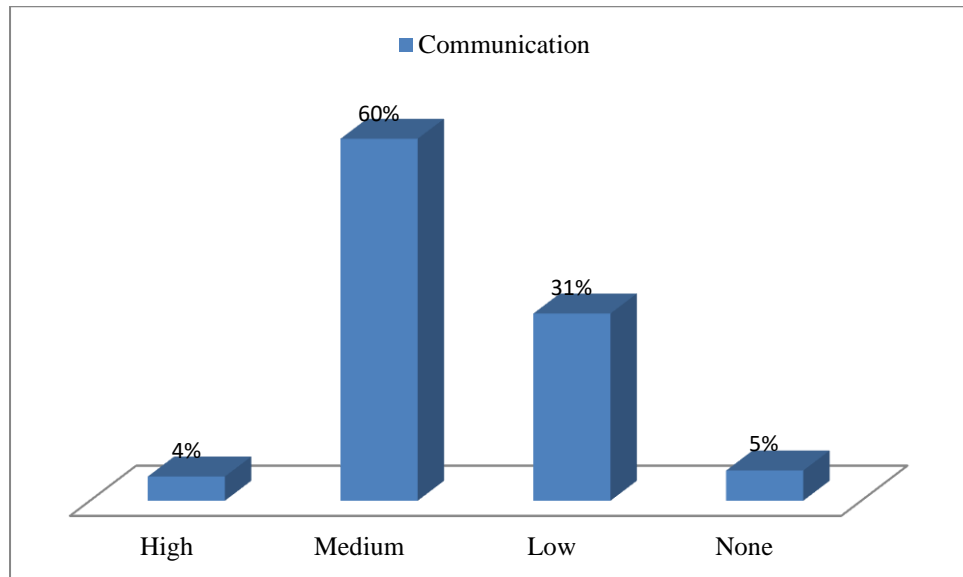
**Fig. 4.17: Mascot Innovative School and College Students Attending Class with Zoom Wearing Mask, 16 March 2020**

### 4.6.2 Communication

In the present study, state of communication was also evaluated as to how students and other stakeholders can access to communication in times of need. The study explored some renowned schools having all communication channels. During any emergency the school authority can communicate their appropriate required service station. These schools have operated digital class in COVID-19 pandemic situation, whilst other schools could not manage due to lack of proper communication opportunities. Since schools host children who are highly sensitive and young are



required to be given priority in case of communication for any undesired incidence.



**Fig. 4.18: Risk on Communication Issues of Study Schools**

*Source: Field Study, 2020*

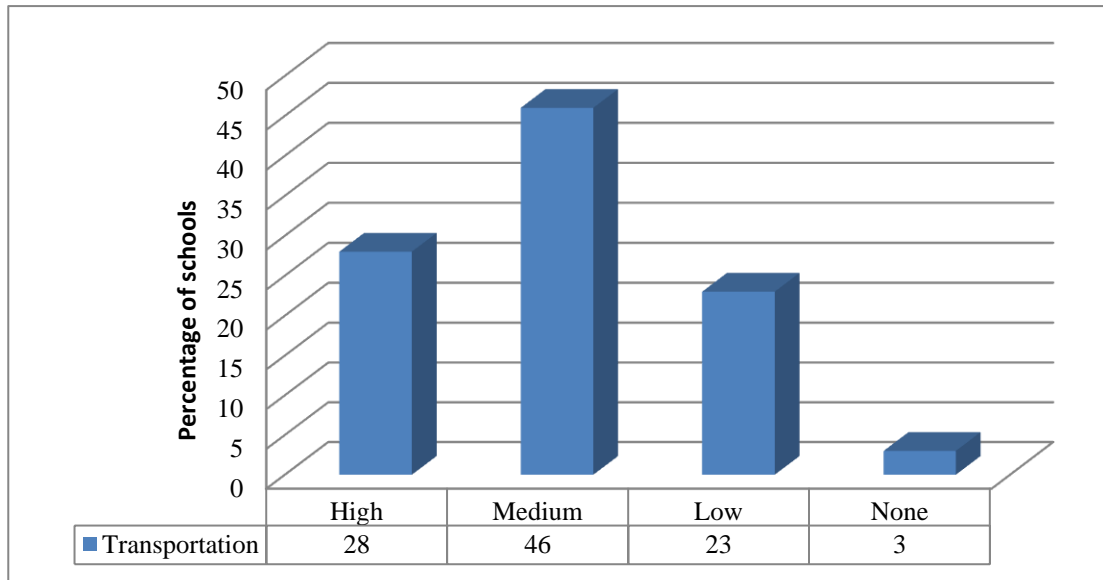
The study found only 4% schools have well communication system and 60% schools have medium communication system. About 36% schools are behind these opportunities (Fig. 4.18). These schools are govt. primary school and few are private schools.

#### **4.6.3 Transportation**

It has been discussed earlier that transports to and from schools are highly important for all stakeholders. Not only students but also teachers experiences huge sufferings during heavy monsoon rain and water logging conditions. The study found only 3% schools have own school transport, 28% school students highly faced transportation problem and about 50% schools have medium risk with transportation. The students within short distance come to school on foot. Students of class 9-10 have opined that public buses normally do not allow them to pay half fare. Some school vans used for travel to school students are also not comfortable to them as sometime they seem to be expensive and unreliable.

To be practical, the city of Dhaka has not been observed friendly for children or school students. Throughout the year, they face difficulties. A tiny fraction of the children use personal automobiles but they also face tremendous traffic congestions

during school hours. A majority of the student depends on public transport if it is long distance. In short distant, they depend on rickshaws but during heavy downpour students complained not to access to this mode as well, either they are unable or get highly expensive for their guardians.



**Fig. 4.19: Risk Associated with Transports to and from Schools**

*Source: Field Study, 2020*

The Fig. 4.19 shows risk related to transportation of varied magnitudes. The students have to spend a significant time for their way to go school by bus and as well as they were gave ride from their parents. The study shows that on an average, time from home to school for students is around one hour by bus and 2-3 hours by van. Furthermore, the traffic jam issues seriously hamper their standard of living such as reducing students' effective daytime and reducing sleeping time. Even though, some public buses, minibuses and metered taxis are serving as a public transportation in Dhaka City, the crisis goes beyond control. The situation normally goes from bad to worse for students facing almost regularly while attending schools.

*Chapter V*  
**PERCEIVED DISASTER RISKS AND  
AWARENESS AT SCHOOLS**

**5.1 Introduction**

Perception on disaster risk and reduction measures is extremely important, while school stakeholders can undertake effective measures accordingly. The present study has evaluated perceived risks by interviewing the school stakeholders to estimate how they evaluate a hazard, or how much others would worry about the risk they are exposed to the hazard. Schools are one of the best places for communities from which information can easily be disseminated through students and teachers as discussed in the previous sections. Successful implementation of the DRR intervention depend on risk perception. Therefore it is imperative to explore and evaluate stakeholder's own risk and as to how risks are perceived. However, this chapter presents stakeholders' perception and level of awareness on hazard risks and their opinions on potentially required interventions.

**5.2 Stakeholders' Perception on DRR**

The study assessed DRR related perceptions of the stakeholders. The following section presents perception of teachers, students, guardians, school management committee and school administration as to what extent they are aware of hazard risks and disaster risk reduction. The study explored perception on DRR from the stakeholders at diverse opinions. In addition, a couple of case studies have also been presented.

**5.2.1 Perception of Teachers on DRR**

The researcher has conducted face to face interview with head of the school to find out their perception on DRR; two case studies and over all perceptions on DRR are highlighted in bellow.

*Case Study 1: Headmaster of Amirjan High School, Dumni*

“This school is located in ward no 43, eastern side of DNCC near Rupgonj, Narayangonj. This school affected by water logging all most every year. Though the students come to the school from short distance but face problem during water logging. The school has conducted fire and earthquake safety drills in the year of 2015. After that the school does not conduct any safety drill because, local people may thought this school is under threat of fire and earthquake risk.”

*Case Study 2: Headmaster Vashantake High School, Vashantake*

“The school is co-located west of Dhaka Cantonment in under development area. Access to the school is very narrow and an old wet land behind the school. Several time the school affected by water logging. The students face problem with transport. Local MP donated solar panel to the school, high voltage battery of this panel were seen behind his chair for monitoring purpose. He is under risk of any accident but he thought nothing will happen.”

Over all Perceptions of Teachers on DRR are:

- During big flooding events/prolonged water logging condition, schools are used as a flood shelter and schools remain closed
- In 2004 flood, some schools were closed for 15-20 days
- Furniture, walls and floor of the school get damaged and syllabuses are not timely completed
- In water logged situation, students are reluctant to attend classes
- There is always risk of accident in water logged condition
- Students are forced to take classes during water logging condition
- Cancellation of classes and poor attendance hamper academic schedule
- Water purification system is unavailable
- It is very unhealthy staying in damp rooms of the school
- Drains are narrow and rickshaw pullers charge very high fare
- The schools have less possibility for earthquake and fire accident
- The schools have first aid box but on emergency they take student to local pharmacy
- The ambient environment is not suitable for teaching
- The students are coping with the situation

### 5.2.2 Students' Perception on DRR

In the present study, a number of FGDs were conducted with selected students of the schools to assess their perception on DRR. In this regard, three case studies have also been carried out. However, from all the assessment, students' perception on DRR as explored is as follows.

*Case Study 1: Perception of a student (class-V), Govt Primary School, Faydabad, Uttar Khan*

"I have no practical knowledge on DRR, but I know the emergency No. 999 that I learnt from watching TV. During rainy season it is very difficult to come in school. We face also tremendous problems in staying at schools (e.g. using toilet). During heavy rain, our school remains closed for some days. We cannot use school play grounds in most of the time a year".

*Case Study 2: Perception of a student (class-VII), Vashantek High School, West Vashantek*

"Fire service vehicle cannot enter the school for narrow access. I do not know how to operate fire extinguisher though it is in school. Open dust bean near the school causes air pollution. Most of us suffer from breathing problems and asthma".

*Case Study 3: Perception of a student (class-X), Mohammadpur*

"Safety drills at our schools are seldom organized but once a drill on earthquake many years back was arranged. Ambient air pollution through elsewhere waste dumping causes serious bad smell. During rainy season, we suffer a lot, cannot come to school as school ground goes under water. We do not find any transport while coming to school. Due to discontinuation of schools, we cannot complete our syllabuses timely".

Overall perceptions of students on DRR are:

- Class rooms, school walls and furniture get damaged
- School playgrounds cannot be used for entire wetter season
- Girls face more difficulty than boys because of clothing practices. Very often, the students' uniforms get wet
- Classes and exams sometimes get postponed
- Local roads get damaged due to prolonged water stagnation. Difficult in walking to the school building
- Breathing problem in highly contaminated water
- Scarcity of pure drinking water at school
- Suffer from water borne diseases (diarrhea, skin infection etc.)
- During stagnation of water at the students' house, their parents move to their relative's house
- Accidents in water logged condition are also very common
- In high stagnant water, students get psychologically weak
- Acute transport problem during water logging

### **5.2.3 Perception of Guardians/ Parents on DRR**

The researcher has discussed with available Guardians/ Parents to find out their perception on DRR which are highlighted in bellow:

- Water logging causes educational irregularity of students
- Have to buy books as their children's books get damaged due to rain
- Children sometimes are reluctant to attend school and stay at home
- Exposure to contaminated water leads to diseases like asthma, skin diseases, infection, fever, diarrhea etc.
- The treatment cost of skin diseases is very high
- Faced devastating floods in 1988 and 1998, while schools were suspended for a long time
- Water logging makes them worried about their children
- Do not afford to buy new books and cloths if they are damaged by rain
- Faced financial crisis during flood time in the past
- Experience accidents in streets during water logging as manholes remain open
- When flood is over, this playground becomes very muddy and slippery and bad smell exists everywhere
- During water-logging, transportation becomes a major challenge
- Broken parts of glasses are found in these waters, there are various insects too. Even ditches of sewage lines pose a danger, which makes them worried about sending the children to schools
- Water logged condition results in students' poor performance

### **5.2.4 Perceptions of School Management Committee on DRR**

The researcher has conducted five FGDs with available School Management Committee to find out their perception on DRR which are highlighted in bellow:

- The school playground gets water logged due to heavy rain
- Students are stuck in their own house due to water logging
- Presence of industrial area adjacent to the school, poses tremendous health hazard as those industries emit chemical and black smoke
- Difficult for girls to come to schools due to their clothing practices
- The family income reduces due to water logging

- To overcome gap through the sincerity of the teachers is another big challenge for the committee
- During flood, scarcity of pure drinking water starts. Water-borne diseases are very common especially diarrhea, fever, cough, skin diseases etc.
- Negligible allocation for the provision of pure drinking water and healthy toilets in schools
- Open manhole during water logging poses dangers to students

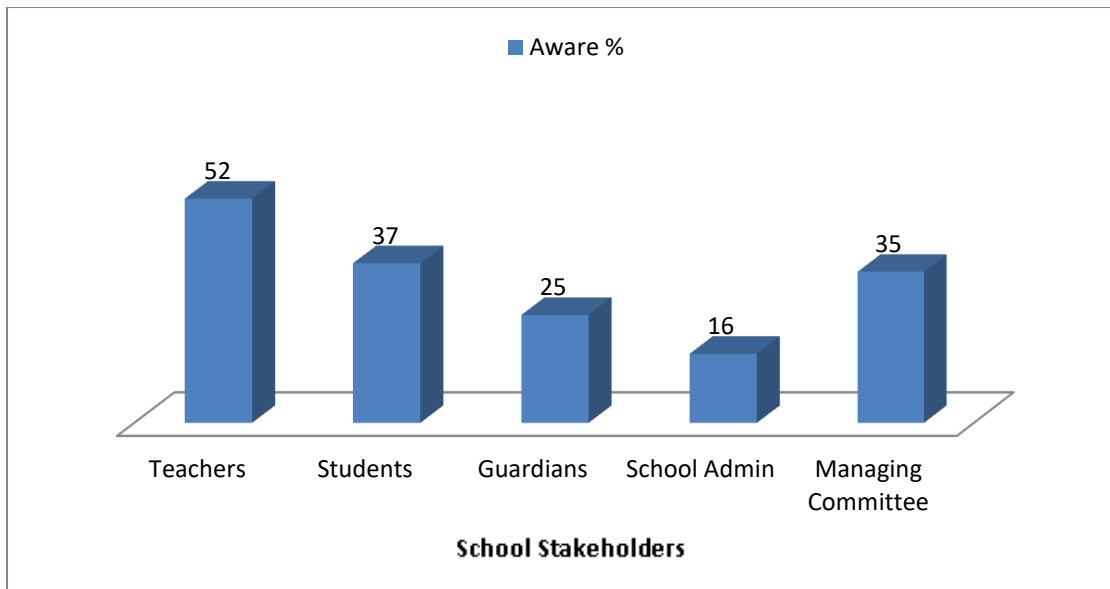
### **5.2.5 Perception of School Administration**

The researcher has conducted four interviews with Thana Education Officers of DNCC area to find out their perceptions on DRR which are highlighted in bellow:

- Heavy rainfall induced water logging in Dhaka City severely hampers school education. The schools are used as shelters and in some occasions they remain closed
- Water logging disrupts education system particularly school students in the peripheral areas and the syllabuses cannot be completed in due course

### **5.3 Stakeholders' Awareness on DRR**

In the study, through an extensive consultation with the key stakeholders of the schools in the study area, it has been observed that two major stakeholders particularly teachers and students are more or less having awareness on hazard risks and the need of disaster risk reduction measures for protecting them from undesired impacts. Study results also show that dealing with the risks that are existing in schools are seldom highlighted and discussed. Therefore, regular drill to raise awareness is expected by all stakeholders. It is also strongly felt by them to immediately initiate DRR interventions in their schools to reduce potential risks particularly of earthquake and fire incidents.



**Fig. 5.1: Stakeholders Awareness on DRR**

*Source: Field Survey 2020*

The study has found that over 50% teachers are aware on DRR (emergency number, operating procedure, evacuation route during fire and earthquake, alarm system, assembly point, first aid and knowledge sharing). Awareness on the same issues of other school stakeholders is: Students (37%), Guardians (25%), School Admin (16%) and School Managing Committee (35%) (Fig. 5.1).

The following Table 5.1 shows whether and to what extent the stakeholders are aware of DRR issues while a variation of responses was received.

**Table 5.1: School Stakeholders Awareness (%) on DRR Issues**

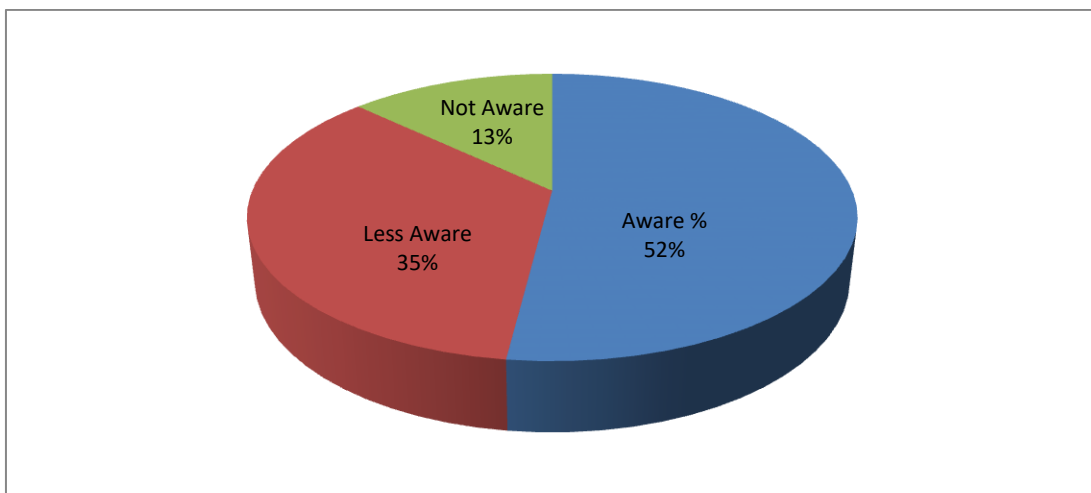
Stakeholders →	Teachers	Students	Guardians	School Admin	School Managing Committee
Aware on DRR issues					
Emergency Number	67	52	50	35	55
Operating Procedure	50	27	12	12	21
Evacuation Route	35	25	15	07	16
Alarm System	46	48	25	21	46
Assembly Point	54	42	27	19	41
First Aid	62	35	36	20	43
Knowledge Sharing	52	30	12	0	20
Average (%)	52	37	25	16	35

*Source: Field Study 2020*



### 5.3.1 Awareness of Teachers on DRR

In the study, from the assessment of FGD results on their awareness on DRR, it is observed that students' protection is the priority as perceived by them. It is the responsibility of teacher to enhance self-awareness and his students and staff on probable disaster risks. However, teachers have been found mostly aware (52%), while it is seen as very effective in increasing the same among others. Here the study has found 13% teachers are not aware on DRR and 35% teachers are less aware on DRR (Fig. 5.2).

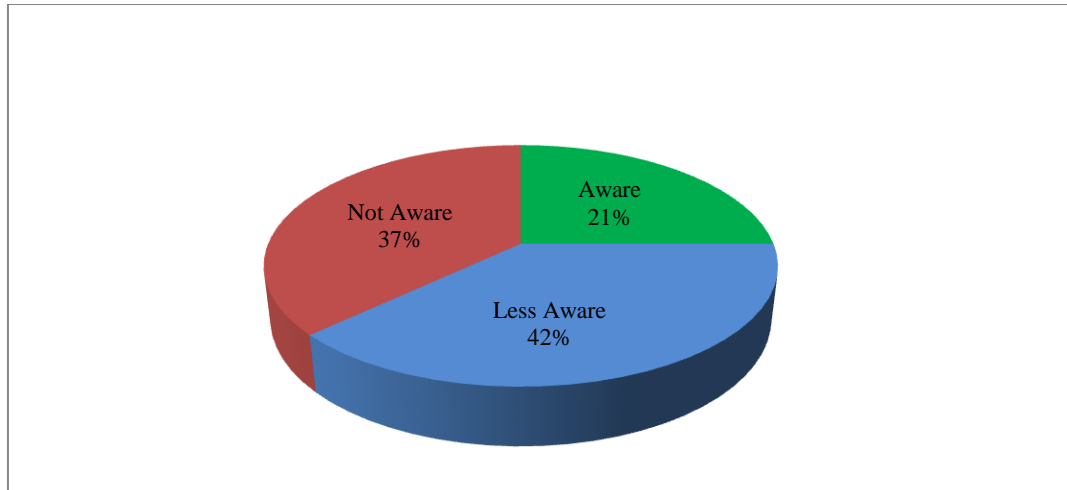


**Fig. 5.2: DRR Awareness of Teachers**

*Source: Field Survey 2020*

### 5.3.2 Awareness of Students on DRR

From the investigation, it has been observed that a significant part of the students are aware of hazards and their potential threats. FGD results, case studies and informal discussions with a number of students of different schools reveal that they know the risks of earthquake, fire, water logging etc. They are also aware of environmental issues that put them into a unhealthy condition In addition, health and hygiene related risks are also well known to them. From the following Fig 5.3, it is observed that 21% of the students are aware of DRR, whereas a significant part (42%) students are less aware and 37% students are not aware on DRR issues like; action to be taken when vibration start, awareness about safe and unsafe areas at schools, aware of the special alarm (usually the school bell is rung in a different rhythm than normal time).



**Fig. 5.3: DRR Awareness of Students**

*Source: Field Survey 2020*

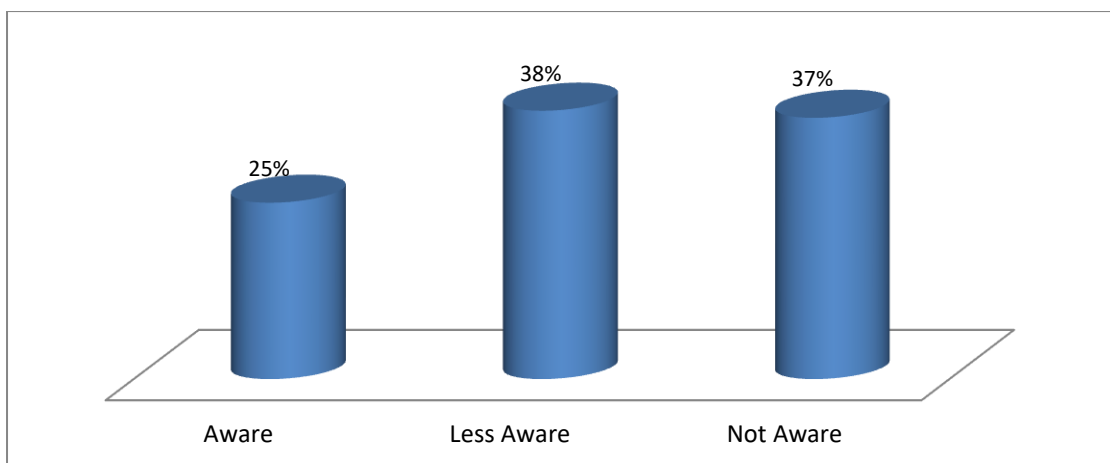
Table 5.1 shows that around one third (27%) of the students have ideas about how their schools are operated while an overwhelming majority (73%) do not have any idea about the issue. All (100%) the students confirmed that no mock drills on fire and earthquakes are arranged in their schools on since 2017. It was also reported that in the Bengali medium schools, since 2008, such safety drills have been being regularly arranged as part of the programs organized by the Comprehensive Disaster management Program initiated in 2003. A mega earthquake took place in Nepal in 2015 and since then many of the schools in the DNCC started various drills on earthquake and fire hazards. Over time, it has been ignored by the school management committees. Immediate after the massive earthquake in Nepal, there was a huge concern in school authorities to protect school children from potential destructions. It was also known from the study, some schools also made agreements with Bangladesh Fire Service and Civil Defense and as part of this, initiated quite a few safety drills.

FGD results also show that students opt to have more drills on the hazard risks. They also blamed ignorance of the school authorities in this regard. They are aware of their threats and some of them opined that schools are posing threats to them. Table 5.1 shows that most of the students know about their assembly points though such assembly is not regularly organized due to many reasons, initially due to ignorance of the school management and lack of open space in front of the schools as well. However, awareness among students significantly vary in different types of schools.

This variation depends on the type of schools, location, status, medium etc. It is also well understood, students coming from relatively well-off families are better aware as they have already learn all the stuff before their enrollments. School authorities intending to maximize profit with student enrollments are often reluctant in further additional investments of arranging drills, meetings with guardians, sports etc. All the issues are more or less known to students as they opened up whiling making informal discussions with them. But most of them do not intend to share much in front of their teachers.

### 5.3.3 Awareness of Guardians on DRR

Guardians' awareness level also significantly differs like students depending on various factors. Social and economic status of the guardians are important factors in this regard. However, the study identified that a significant number of the parents are not aware of disaster risks and the need of reduction measures. One fourth of them have been found aware (Fig. 5.4). Though the study has not investigated any relationship between awareness of guardians and their economic status, it can be stated that in the newly developed wards, the study schools have not been very old and they have been constructed elsewhere not complying building guidelines. They have been located close to the relatively low class housing areas. As a result, students' socioeconomic backgrounds are assumed to be mostly from middle income to low income.



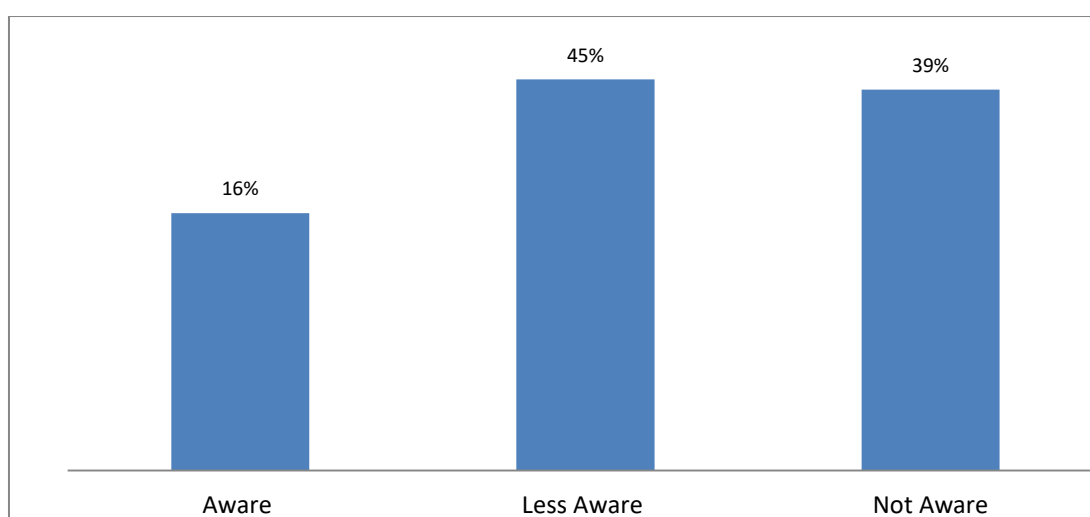
**Fig. 5.4: DRR Awareness of Guardians**

*Source: Field Survey 2020*

There has been a mandate of the schools in Bangladesh to hold regular meetings with guardians. If guardians are not aware and economically solvent, they will have hardly any voice to utter on disaster risks and other issues at schools.

#### 5.3.4 Awareness of School Administration on DRR

In the study, one of the stakeholders was school administrations that administer and monitor schools. A teachers' officer (TO) is assigned by the Ministry of Primary and Mass Education of the Government of Bangladesh to regularly monitor school activities, whether the schools are operating in a right manner and whether the teachers are taking classes etc.



**Fig. 5.5: DRR Awareness of School Administration**

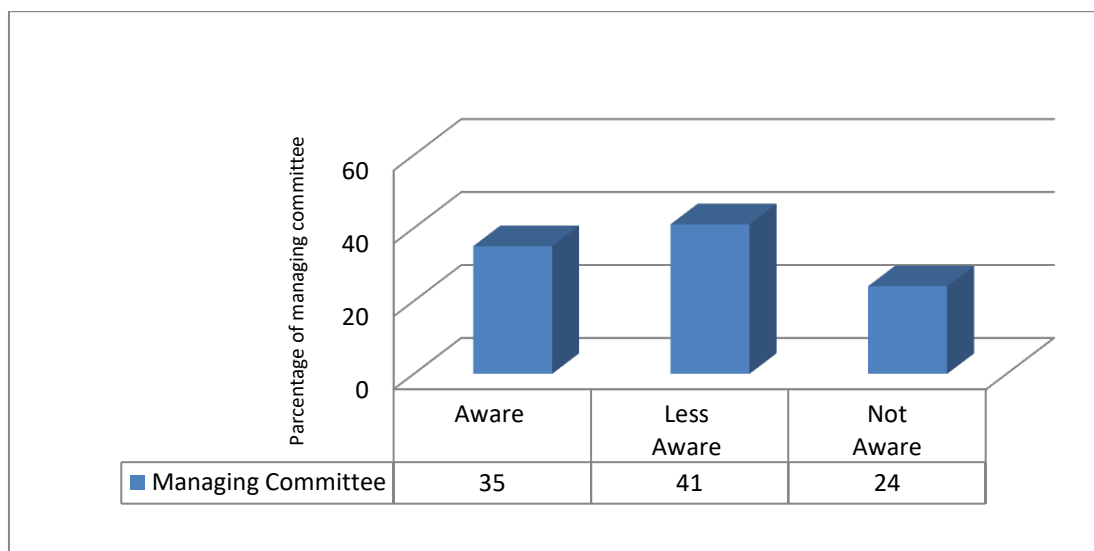
*Source: Field Survey 2020*

Administrator from the Ministry level seldom visits the schools though they are mandated to do so. Sometimes, there is a close links with school management committee and persons from the ministry or the government. School committee is always careful about making officers satisfied about their schools rather maintaining regular tasks for their students. However, the study identified a negligible number of school administrators are aware of disaster issues, while about 40% of them are not at all aware of the hazard risks and required risk reduction measures.

#### 5.3.5 Awareness of School Managing Committee on DRR

As discussed before, schools located in relatively hazard prone areas and close to the low income group of people should not have very affluent school management

committee, while their awareness level is not satisfactorily good. When school management committee is eager to maximize profit rather performing a noble work by setting up schools, it is more likely that those management committee will less aware on disasters and they are reluctant to initiate any safety drills. The study has found only 16% school administration are aware on DRR whereas, 45% are less aware and rest of the 39% are not aware on DRR (Fig. 5.6).



**Fig. 5.6: DRR Awareness of School Managing Committee**

*Source: Field Survey 2020*

#### **5.4 DRR Curriculum in School Education**

From the study (FGDs with teachers) it has been explored that most of the teachers are not aware of the curriculum let alone disaster issues. Generally a curriculum refers to how a teacher plans his subject until accomplishment including the aim and objectives of the subject, the lesson plans, and syllabuses and how they will be taught. Finally it is also important to evaluate students’ learning outcomes from the lecturers. In the present study, it was asked to the teachers about DRR curriculum and most of them could only talk about some topics that are to be taught to the students. The aim and objectives are not known to them. The topics are not taught to the students with importance. However, in the previous chapter, it was mentioned that the incorporation of DRR related curriculum is very slow. But more important is to train the teachers on DRR curriculum for effective teaching learning process.

## **5.5 Conclusions**

The study however, observed that all stakeholders of schools (teachers, students, school administration, guardians and school managing committee) are very much reluctant on DRR issues. In most cases, stakeholders have been found with just having an idea or perception. The study explored that the schools in DNCC are operating with a number of hazard risks, while the lives of millions of children are at high risk or threat. Having awareness on disaster risks and risk reduction measures is the first step which needs to be dealt by all stakeholders. It is certainly not the task of a specific stakeholder. But increasing awareness among all stakeholders, dealing with risks, initiatives to tackle all disaster impacts through strengthening preparedness, if possible improving early warning are highly required to protect millions of children attending the hazardous schools in the study area.

*Chapter VI*  
**DRR MEASURES AT SCHOOLS IN DNCC AREA**

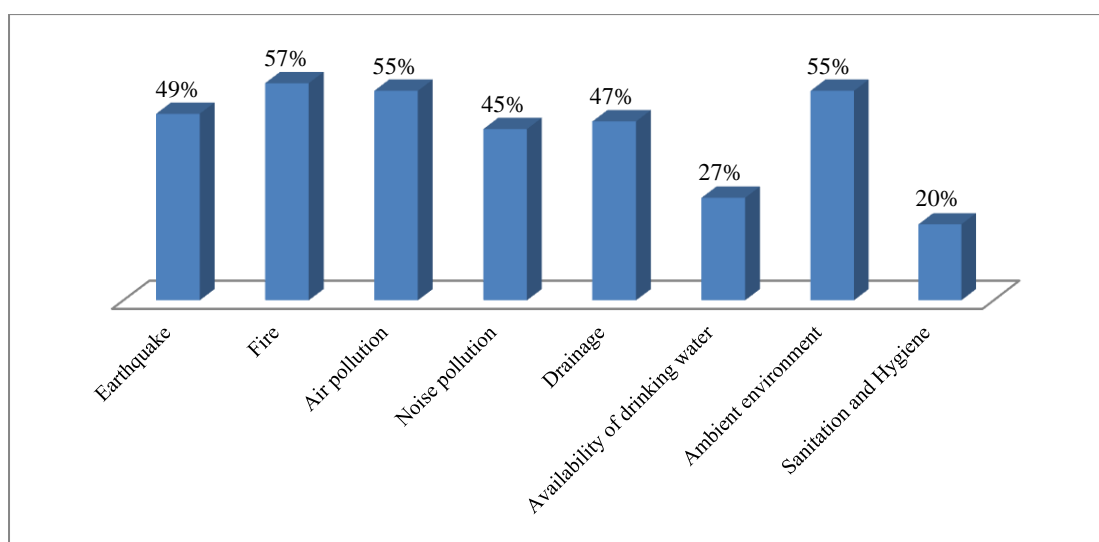
**6.1 Introduction**

In the previous chapters, an investigative evaluation has been made as to what extent the key stakeholders of the schools at DNCC area of Dhaka City are aware of disasters and risk reduction measures. In addition, their perception on the existing disaster risk and vulnerabilities at schools has also been assessed. This chapter deals with the perceived DRR interventions of the stakeholders in the study schools. In the beginning, an evaluation is made on how they perceive DRR measures or whether they are at all aware of the existing DRR initiatives at schools. Their opinions regarding the effective DRR that are required are also assessed afterwards. The findings on stakeholders' DRR related perception are based on the focus group discussions and key informant interviews that were conducted with them. A number of questions were asked in the meetings. For example- what sort of measures are undertaken to address fire and earthquake; whether any mock drill is regularly arranged; what type of measures are adopted in water logging; whether there exists any disaster emergency plan etc.

**6.2 State of Disaster Preparedness at Schools**

The evaluation of DRR preparedness of the stakeholders shows that a number of preparedness on various aspects are conducted at schools which are shown in Figure 6.1 and Table 6.1. It has been found from the field that school stakeholders can play important role to reduce the impact of disasters (water logging, fire, securing items that could shake loose in an earthquake and other environmental hazards) and sometimes avoid the danger completely. But the study explored the level of DRR preparedness of study schools which is not satisfactory at all. According to the school authority, as the school was not severely affected in the past so their initiatives regarding disaster preparedness is less. The state of DRR preparedness is shown in Fig 6.1. Where, probable devastating disaster like; earthquake, fire, drainage system

and other environmental issues related preparation is neglected. The study has found 49% schools with no DRR preparedness for earthquake disaster, while this state for fire is 57%, air pollution is 55%, drainage is 47% and ambient environment is 55% (Figure 6.1). However, as mentioned earlier that the children are attending schools with enormous hazard risks.



**Fig. 6.1: DRR Preparedness of the Study Schools**

*Source: Field Study, 2020*

The same findings are elaborated in Table 6.1 which shows the state of schools' preparedness on a number of aspects like earthquake, fire, environmental pollution, drainage congestion, access to drinking water, sanitation and hygiene etc. The state of DRR preparedness of schools has been scored from good, moderate to poor and none. The results show that DRR preparedness scores mostly are none and in addition, significant scores are found to be moderate and poor. Among all preparedness score, the worst situation exists on two major hazards- earthquakes and fire which are two potential threats for the schools.

**Table 6.1: State of DRR Preparedness of Study Schools**

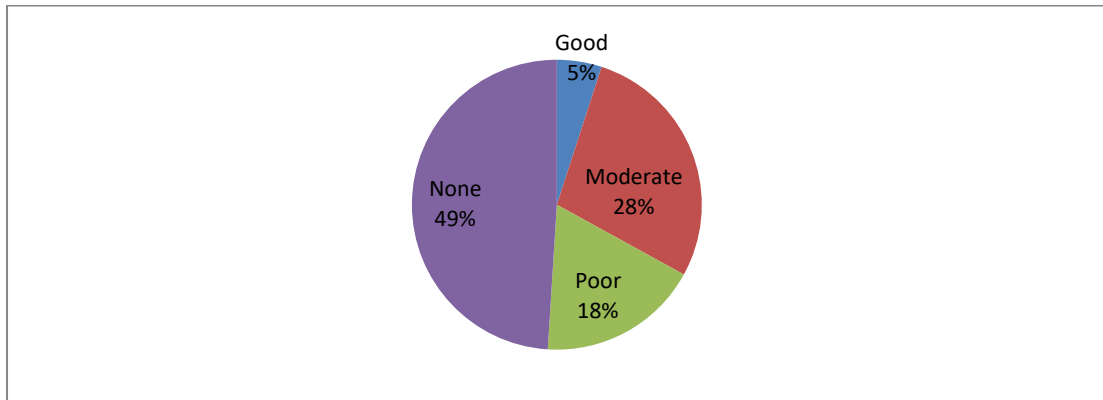
DRR preparedness on	Good %	Moderate%	Poor %	None %
Earthquake	5	28	18	49
Fire	7	15	21	57
Air pollution	4	19	22	55
Noise pollution	3	24	28	45
Drainage	5	16	32	47
Availability of drinking water	6	36	32	27
Ambient Environment	17	16	12	55
Sanitation and Hygiene	8	43	29	20

*Source: Field Study, 2020*



### 6.3 Preparedness on Earthquake Hazard in Schools

The following Figure 6.3 shows the state of schools' preparedness on earthquake hazard. As mentioned earlier the result is quite unsatisfactory. Since most of the schools under newly established wards in DNCC area, most of the schools are not yet prepared and certainly there is a reluctance among the management committees.



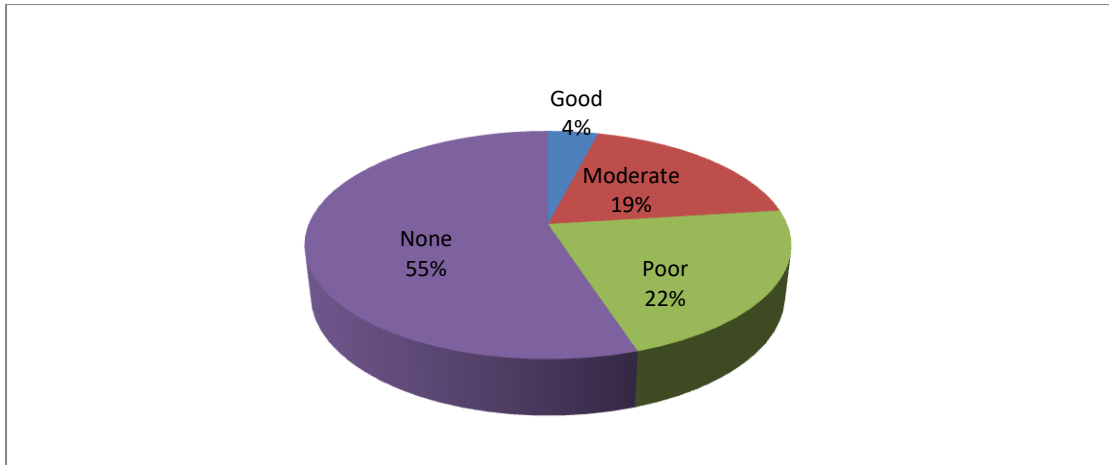
**Fig. 6.2: Preparedness on Earthquake Hazard of the Study Schools**

*Source: Field Study, 2020*

However, the study has explored only 5% schools are well prepared regarding earthquake hazards and 28% moderately prepared. About 50% schools have no preparedness on earthquake hazards and 18% schools have poor preparation. Therefore, the occurrence of a moderate earthquake is likely to severely destruct most of the newly constructed school infrastructure.

### 6.4 Preparedness on Fire Hazard in Schools

Like earthquake hazard risks, preparedness for fire hazard is also insignificant. Figure 6.3 shows an overwhelming majority of the schools are not equipped with fire hazard risk reduction measures as perceived by the school stakeholders. Like earthquake hazard, only 4% have been found with fire related risk reduction measures as opined by the respondents. To compare with this finding, it is reality in the City of Dhaka, while it is widely discussed that in case of a severe earthquake who are to respond and whether there will be a coordinated response mechanism and whether responders/agencies are equipped with necessary tools and technologies to overcome the catastrophe.



**Fig 6.3: Preparedness on Fire Hazard of the Study Schools**

*Source: Field Study, 2020*

## **6.5 Stakeholders' Perceived Measures on DRR**

The following section presents the different measures or interventions as required to tackle disasters at schools as perceived/suggested by the stakeholders. While conducting focus group discussion and key informant interviews, stakeholders' suggestions were recorded which are presented below. Firstly the very measures that are generally adopted by all stakeholders are evaluated. Later, their suggestions on DRR are recorded.

### **6.5.1 Measures Adopted by the Teachers**

The following measures on DRR adopted by the teachers on different situation, which are:

- Work to quickly drain out water from the schools through placing sacks of sand
- Advise students to sleep with mosquito nets, drink clean boiled water, keep food covered etc.
- Advise students to finish their study at home and come to them if they face any difficulties of understanding.
- Extra classes are regularly conducted.
- Students are made aware of safety during the flood.
- Keep contact with the guardians and students through mobile phone to get the update and keep them informing
- Students are encouraged to manage safe transport.

- Arrange pure drinking water for the students.
- School authority regularly arranges discussion with teachers on the current issues faced by the school focusing on infrastructural development.
- Ensure quality education in schools and sound health of the students is encouraged.

### **6.5.2 Measures Adopted by the Students**

The students have also adopted DRR measures guidance their teachers and parents, which are:

- Extra homework is given to study at home and students take private tuition.
- Complete their syllabuses at home during water logging sometimes taking help from their fellow mates.
- Work with teachers to make their playground free of water with littered polythene, pump out water from the field and sometimes fill the field with sand.
- Contact with others through mobile phone or social media to recover the academic losses
- Learned mechanisms for water purification.
- Received awareness from Plan International waste disposal in proper place and drain cleaning, setting public toilets and raising awareness among people of earthquake, water-logging etc.

### **6.5.3 Measures Undertaken by Guardians**

DRR measures taken by the guardians/ parents are as follow:

- Take their children to school during water logging (30%).
- Teach their children when school is closed (60%).
- Advise children not to go outside during flood so that they are safe from snake and other insects.
- Continuously communicate with school authority & take precautions and teach their children to maintain hygiene.
- Received local municipal member's suggestions on how to respond during and before water logging and how to manage their household waste.

#### **6.5.4 Measures Taken by School Administration**

School administrations have taken measures on DRR, though it is not visible in all schools. Their measures are as follows;

- Explore where preparedness programs are necessary at schools and accordingly steps are taken for implementation
- Providing supports and disaster preparedness where emergency and this task is conducted based information about disasters in the school stakeholders
- In 2017, due to excessive rainfall, the list of the damaged institutions is prepared.
- Cleanliness of the educational institutions is emphasized.
- Immediate aftermath flooding events, bleaching powder is supplied to clean the institutions quickly to ensure hygiene under Emergency in Education Fund.
- Emphasizes on issues like establishing new buildings, expansion of classrooms, construction of boundary wall in schools, provision of new books to flood affected students from buffer stock (20% books reserved in every district for emergency).
- E-Monitoring system is planned to be developed so that the schools of remote areas are monitored.
- During flood, schools are used as shelter centers. Teachers are instructed to take make up classes.
- Weak students are given extra care. Teachers must ensure that these students do not drop out from schools. Schools are inspected to ensure that classes are regularly taken.

#### **6.5.5 Measures by School Management Committee**

School Management Committee is mainly interested on account, but few schools SMC have taken some DRR measures, which are as follows;

- Intervention to elevate plinth of the playgrounds
- Where necessary repairing toilet facilities

- Arrange boats where necessary at schools during monsoon
- Reconstruction, maintenance and repairing of roads and enhancing accessibility to schools
- Continuous communication with guardians and motivating them to send their children to school
- Supply enough kits for schools
- Prepare plan to elevate the school fields.
- Contact with political leaders, local administration, scouts for the improvement of roads and water-logging.
- Try to maintain good drainage to let storm water pass quickly.
- Makes sand packed road for movement of students.
- Improvement of school's sanitation and installation of deep tube-well for drinking water
- Occasionally arrange rally with the participation of students on various diseases like Chikungunya, dengue etc.
- Keep contact with the students even during floods through mobile phone or visit their houses.
- Make students aware of the flood/water logging.
- Encourage students to drink pure and clean water.

## 6.6 Measures to Enhance DRR Strategies

The suggestive measures of stakeholders to enhance DRR strategies shown in the following Table 6.2.

**Table 6.2: Suggestive Measures of Stakeholders to Enhance DRR Strategies**

Stakeholders	Suggestive Measures on DRR
Teacher	<ul style="list-style-type: none"> <li>• Classroom and school plinth should be elevated</li> <li>• Drainage system should be improved</li> <li>• Establishment of high rise buildings might solve the classroom problems</li> <li>• Road infrastructure must be improved</li> <li>• Government and local authority should take necessary steps to solve the issue of water logging</li> <li>• Pollution should be controlled and measured in an effective way and waste treatment plant may established</li> <li>• School playground should be elevated for the convenience of both teachers and students</li> <li>• Illegal infrastructure should be diminished not only to improve the water logged condition but also to make road more wider</li> </ul>

Stakeholders	Suggestive Measures on DRR
	<ul style="list-style-type: none"> <li>• Transportation system should be improved</li> <li>• Continuous supply of electricity has to be ensured. Mid-day meal can also be provided in the schools of water logged areas</li> <li>• Foot over bridge is important in the locality for the safety of the students</li> </ul>
Student	<ul style="list-style-type: none"> <li>• School playground should be raised and in parallel, drainage system should be improved</li> <li>• Regular maintenance of roads has to be ensured</li> <li>• Transport has to be arranged by the schools during water logged conditions</li> <li>• Technology and information system has to be improved to ensure the continuity of education</li> <li>• Infrastructure must be improved. In this regard, City Corporations must play active role to manage the wastes</li> <li>• Illegal land grabbing and illegal structure cause water logging. Therefore, illegal land filling has to be stopped in the areas</li> <li>• Regular drills are done with the students.</li> </ul>
Guardians	<ul style="list-style-type: none"> <li>• Safe and good environment have to be ensured</li> <li>• Higher elevation of land and good drainage system should be ensured</li> <li>• The continuation of the children education has to be ensured</li> <li>• Drains should be cleaned periodically</li> <li>• Community participation is important to solve this problem</li> <li>• Water bodies need to be kept free from being filled up. Sometimes college authority discusses with the representative of the guardians to find out a solution to the existing problem</li> <li>• Awareness building programs need to be arranged by the schools</li> <li>• Recovering water bodies from illegal occupation nearby schools is essential</li> <li>• Umbrellas and raincoats should be provided in case of excessive rainfall and water logging</li> <li>• Disaster preparedness technique should be taught</li> <li>• Pure drinking water must be arranged for the students</li> </ul>
School Admin	<ul style="list-style-type: none"> <li>• To ensure the continuity of studies after flood, schools are instructed to take extra classes. This needs to be properly monitored</li> <li>• Local administration and headmasters must ensure make-up classes</li> <li>• The existing arrangement of counseling facilities to the students has to be ensured</li> <li>• Post disaster preparedness should be integrated and combined</li> <li>• Above all, comprehensive school safety ensuring resilient school buildings has to be ensured</li> <li>• Regular maintenance of the schools and ensure their suitability</li> <li>• In case of specific hazards like earthquake and fires, regular maintenance</li> <li>• Supporting school management to regularly monitoring drainage and enhance accessibility</li> </ul>

Stakeholders	Suggestive Measures on DRR
Managing Committee	<ul style="list-style-type: none"> <li>• School ground should be raised so that students can move about and play</li> <li>• Toilet and hygiene condition should be ensured</li> <li>• Govt should spend more on providing safe drinking water</li> <li>• Financial support from individuals or NGOs should be arranged for the students</li> <li>• Cleaning up the sewerage lines periodically and keeping the water bodies free from being filled up can be two effective ways to reduce the frequency of the floods</li> <li>• Drainage system should be improved</li> <li>• Dhaka City Corporation and WASA have to seriously take this issue</li> </ul>

### 6.7 Role of Institutions to Improve DRR Actives in Schools

School related national and local level institutions have a great role to improve of DRR activities. The researcher has found out institutional role on DRR activities for schools discussing with teachers, school admin and SMC. The findings of the institutional roles to improve DRR activities of schools are highlighted in the Table 6.3.

**Table: 6.3 Roles of Institutions to Improve DRR Activities at Schools**

Institutions	Role on DRR Initiatives
MoDM&R	<ul style="list-style-type: none"> <li>• For raising awareness, defining hazard risks and measures</li> <li>• A vulnerability plan to be prepared</li> <li>• Making policies and guidelines to reduce schools' vulnerabilities</li> <li>• Making an advisory committee for the successful implementation of the vulnerability plan</li> <li>• For all stakeholders, preparing goals to reduce disaster impacts</li> <li>• Assessing level of capacity of school stakeholders and accordingly preparing plan</li> <li>• Regular monitoring the school vulnerabilities through education officer and others concerned</li> </ul>
Ministry of Education	<ul style="list-style-type: none"> <li>• To identify the number of schools located in vulnerable areas</li> <li>• To evaluate the nature and type of hazard risk and threats</li> <li>• To evaluate the type of potential impacts due to disasters</li> <li>• Identification of disaster tolerant buildings at schools</li> <li>• Evaluating the need of mock drills where necessary</li> <li>• Enhance collaboration among stakeholders so that they can effectively play role during disasters at schools</li> <li>• Introducing disaster related lessons in the curricula</li> <li>• Arrange training of trainers regularly on DRR and other relevant issues</li> <li>• Recording different urgent statistics on school buildings, such as- date of construction, potential threats etc.</li> <li>• Initiative to encourage students to better respond to disasters and other issues</li> <li>• Ensuring master trainer for disaster management and school safety</li> </ul>
DNCC	<ul style="list-style-type: none"> <li>• Initiating specific policy for schools of the city but no long term planning is in place</li> <li>• Need to improve urban infrastructure and to enhance resilience to disasters</li> <li>• Regular improvement of drainage systems in collaboration with LGRD of Bangladesh</li> </ul>
Ward Councilor	<ul style="list-style-type: none"> <li>• Implementation of the measures is taken by DNCC</li> <li>• Mosquito spray in regular basis.</li> <li>• Surrounding cleanliness and water spray during dry season.</li> <li>• Should monitor various environmental risky issues.</li> <li>• Make aware and active the ward disaster committee with equipment.</li> </ul>

*Chapter VII*  
**CONCLUSIONS AND RECOMMENDATIONS**

**7.1 Summary of the Findings**

The chapter mainly includes summary of the major findings, conclusion and based on research some specific findings and also suggests future research scope. However, the following section presents a summary of the major findings of the study.

- A significant number of schools (26%) are located in residential and commercial buildings, among them 44% schools are multistoried (above 6 storied) while 72% schools have single stair with NO open space/ playground (54%).
- Around 30% schools were constructed without following BNBC & approval from concerned authority.
- Highly vulnerable water logging schools (42%); 23% and 25% schools are found highly vulnerable to fire and earthquake hazards respectively.
- Poor accessibility (20%); environmentally highly vulnerable (air pollution-9%, noise-19%), 85% schools with single exits and NO emergency exits; 93% schools have no PWD stairs.
- Around 27% students do not convenient transport facilities. Almost 100% student face difficulties with transports during heavy rains.
- The study reveals that 52% of teachers are found aware of emergency number, operating procedure, evacuation route, alarm system, assembly point and first aid as DRR measures.
- Only 37% students and 16% school admin are aware on DRR. An overwhelming (75%) of the guardians are not aware on DRR.
- Regular awareness program/ mock drills on fire and earthquake are absent. After the year of 2015, most of the schools (92%) did not continue fire and earthquake drills.
- Earthquake preparedness exists in schools 51%; fire compliance 26%; drainage management (53%), sanitation level (80%), availability of safe drinking water (73%).



## **7.2 Conclusions**

The study has investigated that the study schools at DNCC area are vulnerable to different hazards (water logging, earthquake, building collapse, fire, environmental pollution etc.). Physical/ infrastructural vulnerabilities of the schools include very poor construction of building, poor accessibility to & from school, poor drainage condition, lack of fire compliance etc. Heavy rain induced water logging is common at schools; Students face tremendous air pollution and noise pollution and transport related problems while coming to school during rainy season. Students of Govt. primary schools severally face unhealthy toilet facilities and safe drinking water. In terms of terms of hazard risks, two major hazards are prevalent, earthquake and fire. Evaluation of the existing risks at school reveals that most of the schools located in the newly established wards in DNCC area are prone to water logging and the schools have been set up not maintaining proper construction guidelines and even not properly raising plinth of the school compounds. A significant number of schools are located close to the low class housing areas where small scale industrial activities are being operated. As a result the schools receive both contaminated air and intolerable noise. Moreover, schools established in the rental buildings are highly vulnerable to fire incidents. Particularly English medium schools are operating in rented buildings.

The stakeholders expressed varied opinions on the existing hazard risks, suggested measures for DRR at schools. In most cases, other than teachers, stakeholder have not found with adequate knowledge on DRR related interventions. However, considering the massive risks of diverse hazard risks existing in the study schools at DNCC area, there is an urgent need to introduce effective DRR interventions and it is also required to protect millions of children from casualties.

## **7.3 Recommendations**

*Specific recommendations are:*

- Strengthening school safety measures including retrofitting, fire compliance, improving drainage systems, promoting safe storage teaching and learning equipment and supplies; strengthening early warning systems etc.
- Schools located/rented in the residential buildings need to be immediately relocated with proper accessibility & other compliances.

- Awareness on DRR measures/preparedness among stakeholders (students, teachers, school management committee etc.) to be enhanced. Since mock drill round the world is considered very effective medium to enhance awareness, regular mock drills for earthquake evacuation and fire hazard are required.
- Emphasis on DRR education- research-based knowledge for DRR education in the school curricula to be ensured through teaching and learning.
- Strengthening enabling environment and policy- Communication and coordination between and among school stakeholders and governments; integrating DRR into education sector policies; advocacy for policy to reduce everyday vulnerabilities of communities.
- School disaster management: Promoting standard- Adopting a flexible education calendar; promoting an adjustment in exam schedules; providing first aid boxes.
- BNBC-RAJUK should carry out improvement of building code enforcement and implementation as urban resilience.
- DRR Education and updating curriculum on DRR are required. In this case, the concerned agencies have to introduce, arrange training and monitor the effectiveness of the programs on regular basis.
- Culture of Safety- Since schools are the most important place for communities through which society can be made aware. Therefore, school based a culture of safety has to be developed to make the schools and society as a whole more resilient to disasters.

*General recommendations are:*

- Promote the use of formal and informal channels to reach children and young people with information on disaster risk reduction.
- Promote the integration of disaster risk reduction as an intrinsic element in the Decade of Education for Sustainable Development.
- School administrators should intensify symposiums on disaster risk reduction to elevate students' awareness on disaster and make sure that the school

adhere to the building code and maintain coordination with the disaster risk reduction council of the city.

- Students should cooperate and participate actively on drills regarding disaster risk reduction.

#### **7.4 Further Research**

The present study has just explored the existing state of hazards and vulnerabilities at schools. At the same time, stakeholders' perception on risk, their suggested measures are evaluated. Future research can be to explore mechanisms on how the effective DRR measures can be imitated in the schools of the DNCC area

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**B) Locational Vulnerabilities of the School** (Objective No. 01: Investigate of Vulnerability & Risk)

8. Investigate the locational vulnerability of the school based on proximity of the following:

Events	Low=150-200 ft Score: 1	Med=100-150 ft Score: 2	High=50-100 ft Score: 3	Very High=bellow 50 ft Score: 4
Airport				
Railway				
Main Road				
Residential Building				
Commercial Building				
Industry				
Market				
Fuel Storage				
Chemical Storage				
Low laying area				
Nearby Wetland				

9) In your opinion, what are the locational advantages/ opportunities of the school?

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10) Please tell us the locational disadvantages/ issues of the school!

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**C) Environmental Vulnerability of the School**

11. Assess the overall environmental vulnerability of the school. (Give Tick)

Event	Probability				Risk				Preparedness			
	High	Med	Low	None	High	Med	Low	None	Poor	Fair	Good	None
Score	3	2	1	0	3	2	1	0	3	2	1	0
Noise pollution												
Air pollution												
Ambient water quality												
Availability of drinking water												
Drainage condition												
Sanitation/ hygiene												
Others (pls specify)												

12. Assess the teaching environment of the school. (Give Tick)

- a) Ventilation      b) Light/ fan      c) Cleanliness      d) Seating arrangement

13. Availability of school playground      a) Yes      b) No

If **yes**, area of school playground (acre) -----

14 (a). Is the school playground available for use round the year?

- i) Yes      ii) No

14 (b) If the answer is **yes** then what are different usages of the playground?

- (i) Sports (type-----)  
 (ii) Assembly  
 (iii) Mock drill (specify type of drills-----)  
 (iv) Exhibition (cultural/political/others-----)

14 (c) If the answer is **No** then mention the number of days used.

-----days used

-----days unused (water logging/drainage congestion/occupied by construction materials/others)

**D) Technical Vulnerability of the school**

15. Assess the following facilities and rank accordingly

Event	Probability				Risk				Preparedness			
	High	Med	Low	None	High	Med	Low	None	Poor	Fair	Good	None
Score	3	2	1	0	3	2	1	0	3	2	1	0
<b>Communications</b> (Police, Fire service, Hospital, Parents, School Authority) #												
<b>Transportation</b> (Own school bus/micro/van for teachers and students) #												
Any Others												

# **Communication** concern person by telephone/ mobile/ waki-taki on emergency.

# **Transportation** if the school has own transport then probability risk is less otherwise it is med to high.

**E) Disaster Risks Related Information**

15 (a). Is the school building vulnerable to following disaster risks? (i) Yes (ii) No

15 (b). If **yes**, then please give your opinion on the magnitude/ severity of potential hazard risks.

Hazard Types	Risk					
	Life Threat	Health Safety	High Disrupt	Mod Disrupt	Low Disrupt	None
<b>Score</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
Water-logging						
Floods						
Earthquake						
Fire						
Building Collapse						
Pollution (air/water/noise etc)						
Underground gas leakage						
Lightning/thunder storm						
Contagious Diseases						
Security						

16. Does the school remain closed due to natural calamities? a) Yes b) No

If **yes** then please give information on school closure due to natural hazards (extreme weather conditions).

Hazard Types	School remain closed (No. of Days)	Comments
Water-logging		
Floods		
Fire		
Building Collapse		
Pollution (air/water/noise etc)		
Underground gas leakage		
Lightning/thunder storm		
Other hazard (pls specify)		

**F) Fire Hazard Risks of the School**

17. Please give information on fire related risks of the school.

a) Hanging loose or cut electric wire from or around the building: a) Yes b) No

b) Any combustible material in the school compound (plastic board, wooden panel, falls ceiling, decoration etc): a) Yes b) No

If **yes** then name the combustible materials?

-----  
 -----

c) Availability of fire extinguisher a) Yes (number of extinguisher-----) b) No

d) Availability of hydrant a) Yes (number of hydrants-----) b) No

- e) Building has fire/emergency exit doors: a) Yes (number of exits-----) b) No
- f) Is there any fire alarm system? a) Yes b) No
- g) Emergency exit direction sign displayed or not: a) Yes b) No
- h) Availability of adequate open space: a) Yes (area-----) b) No
- i) Is there any designated assembly point? a) Yes b) No
- j) Is there any First Aid room in school? a) Yes b) No

**G) Awareness/ Perception on DRR (Obj 2: Awareness of School Stakeholders)**

18. What are the actions taken by school regarding awareness on disaster risk reduction?
- a) Regular (how many times per year) mock drills for earthquake evacuation
  - b) Regular (how many times per year) mock drills for fire hazard
  - c) Any other safety drills (pls specify) -----

19. Please give information on disaster related curriculum for students.

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20. Are the all school stakeholders aware of DRR? (Give Score)

Stakeholders	Aware (2)	Less Aware (1)	Not Aware (0)
Student			
Teacher			
School Staff			
Managing Committee			
Guardians			

**H) Disaster Risk Reduction Measures at School (Obj 3: Preparedness)**

21. What types of measures have been taken to reduce risks of the following hazards?

Disasters	Measures	Comments
Water-logging		
Floods		
Earthquake		
Fire		
Building Collapse		
Pollution (air/water/noise etc)		
Lightning/thunderstorm		
Underground gas leakage		
Contagious Diseases		
Security		



22. Do the stakeholders undertake any measures to address risks of hazards at school?

If **yes**, what types of measures are undertaken by different Stakeholders of school?

<b>Stakeholders</b>	<b>Measures Undertaken</b>
Student	
Teacher	
School Staff	
Managing Committee	
Guardians	

23. What roles can school stakeholders play to enhance/ improve DRR strategies at your school?

<b>Stakeholders</b>	<b>Roles</b>
Student	
Teacher	
School Staff	
Managing Committee	
Guardians	

24. What roles can the following institutions play to improve school DRR activities?

<b>Institutions/Agencies</b>	<b>Roles/ Responsibilities</b>
MoDM	
Ministry of Primary & Mass Education	
DNCC	
Ward Councilor	
Others(Specify)	

25. In your opinion, how can disaster risk reduction measures at your school be enhanced/ improved?

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**Thank you very much for sparing your valuable time.**



PhD Research, Session: 2016-17  
**Assessing Disaster Risk Reduction at School Level: A Study of Dhaka North City Corporation Area**

Sample No:

**Focus Group Discussions with Teachers**

School address-----

Number of participants: M-----F----- Average Teaching Experience-----

1. Please give your opinion on various problems at your school.

a) Teaching environment -----

b) Safe school building/class/office room environment-----  
 -----

c) Environmental quality (noise/sound)-----

Air quality-----

Water quality (drinking water and other sources)-----

d) School ambient environment-----  
 -----

2. In your opinion, does the school face the following hazards? i) Yes ii) No  
 If **yes** then give your opinion and rank the following hazards according to severity.

Hazard Risks	Yes	No	Rank according to severity
Water-logging			
Floods			
Earthquake			
Fire			
Building Collapse			
Pollution (air/water/noise etc)			
Underground gas leakage			
Lightning/thunder storm			
Other hazard (pls specify)			

3. Give your opinion on any other issues/problems that you face while staying/teaching at school.

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4. Does your school arrange any awareness/mock drill programs on disaster risk reduction?

i) Yes    ii) No

If yes then what are the different awareness programs that are organized at school?

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5. Is there any disaster (water logging/floods/earthquake/fire etc.) related lessons in the curriculum?    i) Yes    ii) No

If yes then what are the lessons that you teach on disaster issues.

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-----

6. Give your opinion on how to initiate/improve disaster risk reduction measures at your school.

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-----  
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PhD Research, Session: 2016-17  
**Assessing Disaster Risk Reduction at School Level: A Study of Dhaka North City Corporation Area**

Sample No:
------------

**Focus Group Discussions with Students**

School address-----

Number of participants: M-----F----- Class-----

1. Please give your opinion on various problems at your school.

a) Teaching environment: -----

b) Safe school building/class room environment-----

-----

c) Environmental quality (noise/sound)-----

Air quality-----

Water quality (drinking water and other sources)-----

d) School playground-----

2. In your opinion, do you face the following hazards? i) Yes ii) No

If **yes** then give your opinion and rank the following hazards according to severity.

Hazard Risks	Yes	No	Rank according to severity
Water-logging			
Floods			
Earthquake			
Fire			
Building Collapse			
Pollution (air/water/noise etc			
Underground gas leakage			
Lightning/thunder storm			
Other hazard (pls specify)			

3. Give your opinion on any other issues/problems that you face while staying at school.

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-----  
-----

4. Does your school arrange any awareness/mock drill programs on disaster risk reduction?      i) Yes      ii) No

If **yes** then what are the different awareness programs that are organized at school?

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-----  
-----  
-----

5. Are you taught any disaster (water logging/floods/earthquake/fire etc.) lessons in your curriculum?      i) Yes      ii) No

If **yes** then what are the lessons that you are taught on disaster issues.

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-----

6. Give your opinion on how to initiate/improve disaster risk reduction measures at your school.

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Appendix -2c

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**Assessing Disaster Risk Reduction at School Level: A Study of Dhaka North City Corporation Area**

Sample No:
------------

**Focus Group Discussions with School Management Committee**

School address-----

Number of participants: M-----F----- Average age-----

Education----- Experience-----

1. Please give your opinion on various problems/issues at your school.

a) Teaching environment: -----

b) Safe school building/class/office room environment-----

c) Environmental quality (noise/sound)-----

Air quality-----

Water quality (drinking water and other sources) -----

d) School ambient environment-----

2. In your opinion, does the school face the following hazards? i) Yes ii) No  
 If **yes** then give your opinion and rank the following hazards according to severity.

Hazard Risks	Yes	No	Rank according to severity
Water-logging			
Floods			
Earthquake			
Fire			
Building Collapse			
Pollution (air/water/noise etc)			
Underground gas leakage			
Lightning/thunder storm			

3. Give your opinion on any other issues/problems of the school.

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4. Does your school arrange any awareness/ mock drill programs on disaster risk reduction? i) Yes ii) No

If **yes** then what are the different awareness programs that are organized at school?

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5. Give your opinion on how to initiate/ improve disaster risk reduction measures at your school.

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6. Give your opinion on the role/ responsibilities of different stakeholders to improve disaster risk reduction measures at your school.

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7. What roles can the following institutions play to improve school DRR activities?

<b>Stakeholders</b>	<b>Roles/ Responsibilities</b>
MoDM	
Ministry of primary and mass education	
DNCC	
Ward Councilor	
Teachers	
Students	
Guardians	
Local political leaders	



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**Key Informant Interviews (KII)**

Sample No:

Key Informant: Mayor, MoEdu, MoPME, Ward Councilor, Thana Edu Officer

Name of the Respondent:	
Appointment:	Duration:
Address:	

1. Please give your opinion on the overall state of *teaching/learning environment* at school in DNCC.

.....

.....

.....

2. In DNCC, what are following hazards that the schools face?

If **yes** then give your opinion and rank the following hazards according to severity.

Hazard Risks	Yes	No	Rank according to severity
Water-logging			
Floods			
Earthquake			
Fire			
Building Collapse			
Pollution (air/water/noise etc)			
Underground gas leakage			
Lightning/thunder storm			
Other hazard (pls specify)			

3. Give your opinion on any other issues/problems of the school.

.....

.....



4. What type of *supports you provide* to the school particularly for disaster risk reduction?

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5. Give your opinion on how to *initiate/improve disaster risk reduction measures* at your school.

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6. Give your opinion on the *role/responsibilities* of different stakeholders to improve disaster risk reduction measures at the schools of DNCC.

Stakeholders	Roles/ Responsibilities
MoDM	
Ministry of primary and mass education	
DNCC	
Ward Councilor	
Teachers	
Students	
Guardians	
Local political leaders	
Others(Specify)	

*Appendix -4*

**Study School Environment of DNCC area**





## Study School Ambient Environment of DNCC area



### Study School Classroom Environment of DNCC area





## Study School Sanitation and Hygiene of DNCC area





### Study School of DNCC area Vulnerable to various Hazards



### Study School Awareness Building of DNCC area





**Individual Interview with Headmasters/ Principles of study Schools by Researcher**



**Key Informant Interview (KIIs) and Focus Group Discussions (FGDs) with school stakeholders and school admin by Researcher**

